Appendix A
Scoping Summary

The Appendices herein contain supporting information. These Appendices contain highly detailed figures and other graphic information, which are difficult to translate for screen reading software; therefore, the Appendices have not been translated into an auditory format. If you have a disability and/or have difficulty accessing any material in this document, please contact us by mail, email, or telephone, and we will work with you to make all reasonable accommodations. Please indicate 1) the nature of the accessibility need; 2) your preferred format; 3) the material you are trying to access and its location within this document; and 4) how to reach you if questions arise while fulfilling your request. You can direct your requests to:

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Making Conservation a California Way of Life.

June 21, 2022

Danielle LeFer
California Department of Parks and Recreation
1925 Las Virgenes Road
Calabasas, CA 91302

RE: Topanga Lagoon Restoration Project – Notice of Preparation of an Environmental Impact Report (NOP)
SCH # 2022050478
GTS # 07-LA-2022-03959

Dear Danielle LeFer:

Thank you for including the California Department of Transportation (Caltrans) in the environmental review process for the above referenced NOP. The Topanga Lagoon Restoration Project is a multiagency plan that seeks to restore ecological values of the coastal lagoon by expanding the existing footprint from its current condition of less than 1 acre to 7 -10-acres. The project would improve the ecological condition and hydrologic functions of the lagoon to more closely resemble a natural condition. As part of the Project, the existing Pacific Coast Highway bridge over Topanga Creek would be reconstructed with a longer span to accommodate a wider lagoon. The project would also improve coastal access and recreation in a way that supports and enhances biological and cultural values. The California Department of Parks and Recreation (CDPR) is the Lead Agency under the California Environmental Quality Act (CEQA).

The project encompasses 59 acres of Topanga State Park and Topanga Beach located on the coastal slope of the Santa Monica Mountains, west of the intersection of Topanga Canyon Boulevard (TCB) and State Route 1/Pacific Coast Highway (SR-1/PCH). The northern portion of the lagoon area is owned by the CDPR as part of Topanga State Park. The PCH bridge owned by Caltrans bisects the lagoon and constrains the size of its mouth and channel. The lifeguard tower, beach, restrooms, and parking areas south of the PCH are managed by Los Angeles County Department of Beaches and Harbors (DBH) and are currently experiencing impacts from coastal erosion and storm surges. The project area is located within the Santa Monica Mountains National Recreation Area (SMMNRA) but is owned and managed by three public entities: CDPR, DBH and Caltrans.

The proposed project is anticipated to have a net benefit to the environment as it a restoration project that seeks to protect and enhance existing biological, cultural and visitor services resources, and proactively address the threat of future climate change and sea level rise. However, the project has the potential for short- or long-term environmental effects. The Environmental Impact Report (EIR) will assess the level of impact to all environmental resources, including Transportation, from the proposed project alternatives and identify measures to avoid,

minimize, and mitigate impacts to the maximum extent feasible. Caltrans looks forward to reviewing these analyses in the EIR.

Additionally, we encourage the Lead Agency to evaluate the potential of additional Transportation Demand Management (TDM) strategies and Intelligent Transportation System (ITS) applications to better manage the transportation network, as well as transit service and bicycle or pedestrian connectivity improvements. For more TDM strategies, please refer to the Federal Highway Administration's Integrating Demand Management into the Transportation Planning Process: A Desk Reference (Chapter 8). This reference is available online at: http://www.ops.fhwa.dot.gov/publications/fhwahop12035/fhwahop12035.pdf

Caltrans encourages the Lead Agency to promote alternative transportation. This will increase accessibility and decrease Greenhouse Gas Emissions, which supports Caltrans' mission to provide a safe and reliable transportation network that serves all people and respects the environment. For supplementary strategies that will promote equity and environmental preservation, please refer to the 2010 Quantifying Greenhouse Gas Mitigation Measures report by the California Air Pollution Control Officers Association (CAPCOA), which is available online at: http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf

As a reminder, any transportation of heavy construction equipment and/or materials which requires use of oversized-transport vehicles on State Highways will need a Caltrans transportation permit. Caltrans recommends that the Project limit construction traffic to off-peak periods to minimize the potential impact on State facilities. If construction traffic is expected to cause issues on any State facilities, including SR-1, please submit a construction traffic control plan detailing these issues for Caltrans' review.

Finally, any work completed on or near Caltrans' right of way may require an encroachment permit. However, the final determination on this will be made by Caltrans' Office of Permits. This work would require additional review and may be subject to additional requirements to ensure current design standards and access management elements are addressed. For more information on encroachment permits, see: https://dot.ca.gov/programs/traffic-operations/ep.

If you have any questions regarding these comments, please contact Ronnie Escobar, the project coordinator, at Ronnie.Escobar@dot.ca.gov, and refer to GTS # 07-LA-2022-03959.

Sincerely,

Miya Edmonson

MIYA EDMONSON
LDR/CEQA Branch Chief
cc: State Clearinghouse

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Jun 22 2022

STATE CLEARINGHOUSE

SENT BY EMAIL ONLY

June 22, 2022

Danielle LeFer
California Department of Parks and Recreation
1925 Las Virgenes Road
Calabasas, CA 91302
danielle.lefer@parks.ca.gov

Subject: Notice of Preparation of a Draft Environmental Impact Report for the Topanga Lagoon Restoration Project, SCH # 2022050478, California Department of Parks and Recreation, Los Angeles County

Dear Ms. LeFer:

The California Department of Fish and Wildlife (CDFW) has reviewed a Notice of Preparation (NOP) of a Draft Environmental Impact Report (EIR) from the California Department of Parks and Recreation (CDPR) for the Topanga Lagoon Restoration Project (Project). Thank you for the opportunity to provide comments and recommendations regarding those activities involved in the Project that may affect California fish and wildlife. Likewise, we appreciate the opportunity to provide comments regarding those aspects of the Project that CDFW, by law, may be required to carry out or approve through the exercise of its own regulatory authority under the Fish and Game Code.

CDFW's Role

CDFW is California's Trustee Agency for fish and wildlife resources and holds those resources in trust by statute for all the people of the State [Fish & G. Code, §§ 711.7, subdivision (a) & 1802; Pub. Resources Code, § 21070; California Environmental Quality Act (CEQA) Guidelines, § 15386, subdivision (a)]. CDFW, in its trustee capacity, has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and habitat necessary for biologically sustainable populations of those species (Id., § 1802). Similarly, for purposes of CEQA, CDFW is charged by law to provide, as available, biological expertise during public agency environmental review efforts, focusing specifically on Projects and related activities that have the potential to adversely affect State fish and wildlife resources.

CDFW is also submitting comments as a Responsible Agency under CEQA (Pub. Resources Code, § 21069; CEQA Guidelines, § 15381). CDFW expects that it may need to exercise regulatory authority as provided by the Fish and Game Code, including lake and streambed alteration regulatory authority (Fish & G. Code, § 1600 *et seq*.). Likewise, to the extent implementation of the Project as proposed may result in "take", as defined by State law, of any species protected under the California Endangered Species Act (CESA) (Fish & G. Code, § 2050 *et seq.*), or CESA-listed rare plant pursuant to the Native Plant Protection Act (NPPA;

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Fish & G. Code, §1900 *et seq.*), CDFW recommends the Project proponent obtain appropriate authorization under the Fish and Game Code.

Project Description and Summary

Objective: The proposed Project is a multi-agency effort to restore the ecological values and enhance the hydrologic functions of the Topanga Lagoon ecosystem and the adjacent upland. The proposed Project intends to conduct restoration activities and expand the existing one-acre footprint of the lagoon. In addition, the riparian, transitional, and upland habitat along Topanga Creek would be restored to a certain extent depending on each build alternative. Within the Project site lies the Topanga Ranch Motel and State Park concessions, which include Cholada, Wylie's Bait and Tackle, Rosenthal's Wine Bar and Patio, Reel Inn, Oasis Imports, and Malibu Feed Bin. The motel and concession leases would be altered depending on each build alternative. The proposed Project also seeks to reconstruct the existing Pacific Coast Highway (PCH) bridge over Topanga Creek with a longer span to accommodate a wider lagoon. The lifeguard tower, restrooms, helipad, and parking area associated with Topanga Beach would also be reconstructed as part of the proposed Project. The Project proposes three build alternatives and a no project alternative that will be discussed in the EIR. Construction activities for Alternative 2 through Alternative 4 is anticipated to last approximately 24 months.

- **Alternative 1: No Project Alternative** – Alternative 1 would result in no restoration activities towards the Topanga Lagoon and adjacent upland. The Project site would remain the same and consist of 3.6 acres of wetted area, 33.8 acres of riparian/transitional/upland area, and 4.18 acres of Topanga beach. The PCH bridge would not be reconstructed, and Topanga Ranch Motel and existing business leases would remain. The lifeguard tower, helipad, and restrooms would not be reconstructed. Each respective area would continue to function under its existing conditions.

- **Alternative 2: Maximum Lagoon Habitat and Removal of Motel** – Alternative 2 would result in the maximum increase in lagoon, wetland, and riparian bank habitats. Following complete buildout, the Project site would encompass 9.5 wetted acres, 27.8 acres of restored riparian/transitional/upland habitat, and expansion of the beach to 4.39 acres. Grading and soil removal would be required to recontour the creek and widen the lagoon. Restoration would entail recontouring the western side of the lagoon with more natural side channels to accommodate sea level rise and storm surge conditions. In addition, the Topanga Ranch Motel and all existing business leases would be removed and replaced with riparian and transitional habitats. Furthermore, the existing PCH bridge would be replaced with a new bridge that spans 460 feet (200-foot primary span, with side spans of 130 feet each). Lastly, the lifeguard headquarters, beach restroom, and helipad would be demolished, relocated north, and reconstructed closer to the existing realigned access road.

- **Alternative 3: Limited Lagoon Habitat Expansion and Retention of Motel** – In Alternative 3, expansion of the lagoon as well as riparian and transitional habitat on the west side of the existing creek channel would not be as extensive as Alternative 2. Following complete buildout, the Project site would encompass 7.7 wetted acres, 29.47 acres of restored riparian/transitional/upland habitat, and expansion of the beach to 4.42 acres. In Alternative 3, only the existing main channel within the lagoon area would be restored. Grading and soil removal activities would also be required in this alternative. In

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regard to the Topanga Ranch Motel, 21 structures would be restored to its historic configuration, which would include relocation of some structures from the west side to avoid further flood and bank erosion. Aside from a restaurant concession that would be remodeled and remain in operation, no other business leases would remain. The changes to the PCH bridge would remain the same as detailed in Alternative 2. In addition, the existing realigned access road would be moved slightly to the east. Similar to Alternative 2, the lifeguard headquarters and beach restroom would be demolished, relocated north, and reconstructed closer to the realigned access road. However, the helipad would be relocated at PCH with a gated separation from the west end of the parking lot on the same level.

- **Alternative 4**: **Maximum Managed Retreat and Partial Motel Retention** – Alternative 4 would result in an expanded lagoon as well as riparian and transitional habitat, primarily on the west side of the existing channel. Following complete buildout, the Project site would encompass 7.6 wetted acres, 29.48 acres of restored riparian/transitional/upland habitat, and expansion of the beach to 4.56 acres. In Alternative 4, PCH would be realigned to move northward, curving the freeway inland over the lagoon and expanding the beach area to its maximum amount. In addition to realignment of PCH, the existing PCH bridge would be replaced with a new bridge that spans 460 feet (200-foot longer center span and a 130-foot side span on each side). In addition, 17 structures of the Topanga Ranch Motel located east of the current motor court access lane would be retained. Similar to Alternative 3, the restaurant concession would be remolded, continue to operate, and the other existing business leases would be terminated. Lastly, the lifeguard headquarters and helipad would be demolished, relocated north, and rearranged with parking for staff, emergency vehicles, and ADA disabled parking. Alternative 4 would provide the most sea level rise resilience and maximize recreational the beach area.

Location: The Project site encompasses 59 acres of Topanga State Park, Topanga Ranch Motel, and Topanga Beach located on the coastal slope of the Santa Monica Mountains in unincorporated Los Angeles County. The Project site is within the Santa Monica Mountains National Recreation Area and located west of the intersection of Topanga Canyon Boulevard and State Route 1 Pacific Coast Highway. The Project site is located on Assessor Parcel Number: 4448-002-901, 4448-001-900, and 4448-002-900.

Comments and Recommendations

CDFW offers the comments and recommendations below to assist the CDPR in adequately identifying, avoiding, and/or mitigating the Project's significant, or potentially significant, direct, and indirect impacts on fish and wildlife (biological) resources. The EIR should provide adequate and complete disclosure of the Project's potential impacts on biological resources [Pub. Resources Code, § 21061; CEQA Guidelines, §§ 15003(i), 15151]. CDFW looks forward to commenting on the EIR when it is available.

Specific Comments

1) Alternative 3 and 4. The Topanga Creek flows through Topanga Canyon directly west of the Topanga Ranch Motel until it reaches the Topanga Lagoon. Riparian habitat with high biological value also resides along the stream banks located west and north of the Topanga

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Ranch Motel. The motel is surrounded by undisturbed habitat that provides essential ecological resources for wildlife that dwell within it. Additionally, the Topanga Ranch Motel has been closed to the public and vacant since 2005.

Alternative 3 proposes a full retention of the Topanga Ranch Motel. Alternative 4 proposes a partial retention of the Topanga Ranch Motel. Both build alternatives would involve rehabilitation activities in an effort to have the motel open to the public and operational for overnight accommodations. Retention and operation of the motel would facilitate an increase of human presence within the Project site. Increased human presence may produce a multitude of adverse impacts, including but not limited to, increase of human-wildlife interactions, encroachment on fully protected species, increased potential of human-wildlife conflict, introduction of non-native species, injury or death of wildlife, and destruction of riparian and upland habitat. Elevated levels of human presence near or within wildlife breeding grounds may result in reduced reproductive success and an overall reduced local species population. Moreover, operation of the Topanga Ranch Motel may also alter wildlife behavior through introduction of elevated noise, increased trash or debris, unnatural food sources via trash receptacles, and new artificial lighting. The CDPR should consider the effects of Alternative 3 and Alternative 4 on wildlife and biological resources in relation to increased human presence and anthropogenic factors.

The Project should move forward with the alternative that prevents environmental damage and provides the least significant environmental effects on biological resources within the Project site (CEQA guidelines §15021(c) and §15002(a)(3)). Furthermore, for all build alternatives, the EIR should provide a complete discussion of the purpose and need for, and description of, the proposed alternative, including all staging areas; access routes to the construction and staging areas; and grading footprint. Each Project alternative should be thoroughly evaluated, even if an alternative would impede, to some degree, the attainment of the Project objectives or would be more costly (CEQA Guidelines, § 15126.6).

2) Impacts to Mountain Lion (*Puma concolor*). The Project is located within the range of the Southern California/Central Coast Evolutionary Significant Unit of mountain lion. More specifically, the Project is located within the range of the San Monica Mountain's mountain lion population. Mountain lions typically require large areas of undisturbed habitats and can inhabit in a variety of habitats, including but not limited to, riparian woodlands, oak woodlands, streams, and chaparral. Mountain lions have also been deemed as a keystone species that support plant recruitment in riparian areas, stabilize stream banks, and sustain healthy habitats for aquatic and terrestrial species (CBD 2019). In addition, CDFW's Mountain Lion Predicted Habitat model predicts that the riparian, transitional, and upland habitat along Topanga Creek may provide medium suitability for mountain lion (CWHR 2016). The proposed Project may impact mountain lion through temporary and permanent habitat modification, restoration activities, grading, and removal of riparian vegetation.

   a) Protection Status. CDFW considers adverse impacts to a species protected by CESA to be significant without mitigation under CEQA. As to CESA, take of any endangered, threatened, candidate species, or CESA-listed plant species that results from the Project is prohibited, except as authorized by State law (Fish & G. Code §§ 2080, 2085; Cal. Code Regs., tit. 14, §786.9). The mountain lion is a specially protected mammal in the State (Fish and G. Code, § 4800). In addition, on April 21, 2020, the California Fish and Game Commission accepted a petition to list the Southern California/Central Coast

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Evolutionary Significant Unit of mountain lion as threatened under CESA (CDFW 2020). As a CESA candidate species, the mountain lion in southern California is granted full protection of a threatened species under CESA.

b) Analysis and Disclosure. During Project-related construction activities, several temporary impacts may occur such as habitat modification, increased human presence, increased levels of noise and dust, and encroachment on foraging habitat. Although there may be temporary adverse effects during Project activities, the overall Project aims to restore riparian habitat along Topanga Creek resulting in a permanent beneficial effect for mountain lion. The EIR should analyze and discuss the Project's temporary, permanent, and cumulative impact on mountain lion throughout the Project. Impacts on mountain lion behavior, reproductive viability, and overall survival success should also be analyzed and discussed in the EIR. In addition, the EIR should analyze from the standpoint of the following impacts: 1) introducing an operational motel; 2) habitat modification and encroachment during construction activities; 3) increased human presence; and 4) use of herbicides, pesticides, and rodenticides. Lastly, the EIR should discuss the Project's potential effect on any on-going or planned habitat recovery and restoration efforts for mountain lion.

c) CESA. If the Project or any Project-related activity will result in take of a species designated as endangered or threatened, or a candidate for listing under CESA, CDFW recommends that the Project proponent seek appropriate take authorization under CESA prior to implementing the Project. Appropriate take authorization under CESA may include an Incidental Take Permit (ITP) among other options [Fish & G. Code, §§ 2080.1, 2081, subds. (b) and (c)].

3) Impacts to Southern California steelhead (*Oncorhynchus mykiss*). Southern California steelhead (southern steelhead) is designated as an Endangered Species Act (ESA)-listed endangered species and a candidate CESA-listed species. Southern steelhead are anadromous fish that will spawn within Topanga Creek, migrate downstream to the Topanga Lagoon for smoltification, migrate to the ocean, and return to its spawning grounds as a mature adult. Furthermore, the NOP states that the only currently reproducing population of southern steelhead within the Santa Monica Mountains is present within the Project site. Although the Project aims to restore habitat and enhance fish passage, Project-related activities such as grading, soil removal, and recontouring of the stream bank will have a temporary and permanent impact on the southern steelhead population and its habitat.

a) Protection Status. Pursuant to Section 2074.2 of the Fish and Game Code, on April 21, 2022, the California Fish and Game Commission (Commission) determined that listing southern steelhead as threatened or endangered under CESA may be warranted (CDFW 2022a). This commences a one-year status review of the species, and at a future meeting, the Commission will make a decision whether listing of southern steelhead as threatened or endangered under CESA is warranted. During the status review, southern steelhead is protected under CESA as a candidate species pursuant to Section 2085 of the Fish and Game Code, provided that notice has been given as required by Section 2074.4 of the Fish and Game Code. The CDPR is prohibited from undertaking or authorizing activities that result in take of any endangered, threatened, or candidate species, except as authorized by State law (Fish & G. Code, §§ 86, 2062, 2067, 2068, 2080, 2085; Cal. Code Regs., tit. 14, § 786.9).

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b) Analysis and Disclosure. The EIR should analyze and discuss the Project's potential impact on southern steelhead population, habitat, substrate, and passage. The EIR should assess the potential impacts of habitat modification from restoration activities, grading, removal of soil, and vegetation removal along stream banks. Additionally, the EIR should assess the Project's effects on substrate composition within the Topanga Lagoon and Topanga Creek. An analysis of passage should include passage of adults from the ocean to spawning grounds within Topanga Creek and passage of smolts or juveniles from nursing grounds to the Topanga Lagoon and the ocean. The EIR should analyze the Project's effect on the hydrology and hydraulics (velocity, depth, and temperature) of Topanga Lagoon and Topanga Creek and how those effects may impact southern steelhead. An adequate analysis should provide the following information at a minimum:

- A study reach extending from the ocean and the Topanga Lagoon to upstream spawning and rearing habitats within Topanga Creek whereby the Project's effects on flow is analyzed;
- Project effects on flow (cfs, acre-feet) and hydraulics (velocity, depth, dissolved oxygen, temperature, and wetted perimeter) during the wet season (November through March), dry season (April through October), and both above-average and below-average water year (i.e., wet season/above-average water year, wet season/below-average water year, dry season/above-average water year, and dry season/below-average water year) under pre-project (i.e., baseline conditions) and post-project conditions;
- Percent changes in flow, velocity, depth, temperature, and wetted perimeter (acres gained/lost) under Project conditions;
- Project effects on water quality (dissolved oxygen and turbidity) throughout the study reach under pre-project (i.e., baseline conditions) and post-project conditions;
- Any Project-related temporal, partial, or total barriers that would impact fish passage for southern steelhead; and
- Any additional potential effects to on-going habitat recovery and restoration efforts for southern steelhead on a local or regional scale.

CDFW recommends such analysis and evaluation apply a function flows approach to evaluate impacts on biological resources. The functional flows approach provides the basis for guidance provided in the California Environmental Flows Framework (UC Davis 2022). Functional flows are distinct aspects of a natural flow regime that sustain ecological, geomorphic, or biogeochemical functions, and that support the specific life history and habitat needs of native aquatic species. Retaining key functional flow components in managed flow regimes is thus expected to support foundational physical and ecological processes that sustain biological communities.

c) Avoidance. The Project should be conditioned to fully avoid all impacts to southern steelhead. No work should occur in the lagoon, stream channel, or stream banks during the winter rainy season, which typically occurs between December 1 through March 31 (NMFS 2012). Additionally, no work should occur during periods of high flow and when steelhead smolt are likely to be in the area during periods of receding flows from November 1 through June 15.

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d) CESA. If the Project or any Project-related activity will result in take of a species designated as endangered or threatened, or a candidate for listing under CESA, CDFW recommends that the Project proponent seek appropriate take authorization under CESA prior to implementing the Project. Appropriate take authorization under CESA may include an Incidental Take Permit (ITP) among other options [Fish & G. Code, §§ 2080.1, 2081, subds. (b) and (c)]. To obtain appropriate take authorization under CESA, early consultation with CDFW is encouraged, as significant modification to a project and mitigation measures may be required to obtain a CESA permit. Revisions to the Fish and Game Code, effective January 1998, may require that CDFW issue a separate CEQA document for the issuance of an ITP unless the Project's CEQA document addresses all Project impacts on CESA-listed species and specifies a mitigation monitoring and reporting program that will meet the requirements of an ITP. For these reasons, biological mitigation monitoring and reporting proposals should be of sufficient detail and resolution to satisfy the requirements for a CESA ITP.

4) Impacts to Special Status Fish. The Project site supports habitat for the tidewater goby (*Eucyclogobius newberryi*) and arroyo chub (*Gila orcuttii*). Tidewater goby is designated as an ESA-listed endangered species and the arroyo chub is considered a California Species of Special Concern (SSC). The tidewater goby is an endemic fish species that is primarily found in coastal lagoons, estuaries, and coastal brackish waters. Tidewater gobies spend all of their life stages in lagoons, estuaries, and river mouths (USFWS 2005). Unlike tidewater goby, arroyo chub are native to streams and rivers of the Los Angeles watershed and have been introduced to streams along the coast (UCANR 2022). Arroyo chub can be physiologically adapted to varying stream habitats but are primarily found in stream habitat with slow-moving water, mud, sand substrate (CDFW 2022g). Project restoration and construction activities may result in temporary or permanent habitat modification, direct injury, reduced capacity, and population decline.

a) Protection Status. Tidewater goby is protected under the ESA and meets the CEQA definition of endangered, rare, or threatened species (CEQA Guidelines CEQA§ 15065). Arroyo chub is a sensitive species with a state ranking of S2 and protected as an SSC. CEQA provides protection not only for ESA-listed species, but for any species including but not limited to SSC which can be shown to meet the criteria for State listing. Take of SSC could require a mandatory finding of significance by the CDPR (CEQA Guidelines, § 15065). Inadequate avoidance and mitigation measures will result in the Project continuing to have a substantial adverse direct and cumulative effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species by CDFW or U.S. Fish and Wildlife Service (USFWS).

b) Analysis and Disclosure. The EIR should analyze and discuss the Project's potential impact on fish species population, habitat, substrate, and passage. The EIR should analyze and disclose temporal and permanent habitat modification related to removal of substrate, soil removal, recontouring of Topanga Creek, grading activities, and widening of Topanga Lagoon. The EIR should also analyze the Project's effect on the hydrology and hydraulics (velocity, depth, and temperature) of Topanga Lagoon and Topanga Creek and how those effects may impact special status fish species. An adequate analysis should provide the information listed under Analysis and Disclosure in Specific Comment #3.

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c) Avoidance. The Project activities should be conditioned to fully avoid all impacts to tidewater goby and arroyo chub. No work should occur during the winter rainy season, which typically occurs between December 1 through March 31 (NMFS 2011). No work should occur during peak breeding activities for tidewater goby which occurs from April 1 through June 31. Additionally, no work should occur during the breeding season for arroyo chub which occurs from February 1 through August 31 (UCANR 2022).

d) ESA. Take under the federal ESA is more broadly defined than CESA; take under ESA also includes significant habitat modification or degradation that could result in death or injury to a listed species by interfering with essential behavioral patterns such as breeding, foraging, or nesting. Consultation with the USFWS, in order to comply with ESA, is advised well in advance of any Project-related ground-disturbing activities where impacts to special status fish will occur.

5) Impacts to California grunion (*Leuresthes tenuis*). According to the NOP, the beach adjacent to Topanga Lagoon supports a significant run of California grunion. Impacts to grunion may result from Project activities occurring below the highest tide line during grunion spawning season (March-August). Activities such as sand moving and use of heavy equipment in the intertidal zone may disturb or bury incubating grunion eggs and larvae.

California grunion are endemic to California and Baja California and support a culturally important recreational fishery. Recent data have shown declines in grunion run sizes in Los Angeles, Orange, and San Diego Counties over the past decade (Martin *et al.* 2019). In February, the California Fish and Game Commission adopted new regulations to protect and recover the grunion population, establishing a bag and possession limit and closing the month of June to recreational take of grunion. Recreation take of grunion is now prohibited during the months of April, May, and June.

a) Analysis and Disclosure. The EIR should discuss the Project's potential impact on California grunion and grunion spawning habitat.

b) Avoidance. If Project activities will occur in the intertidal zone, CDFW strongly recommends avoiding grunion spawning season (March–August) for these activities to the greatest extent feasible. If Project activities must occur below the highest tide line during grunion spawning season, the EIR should provide measures to mitigate for the Project's potential impacts on California grunion. Additionally, CDFW recommends that a qualified biological observer monitor the work site prior to the start of activities in the intertidal zone during the previous expected grunion run period (3–4 nights in a row). If grunion are observed at the work site, the Project should suspend activities below the highest tide line for at least two weeks to allow grunion eggs to incubate and hatch out. The expected run schedule and further information about grunion can be found on CDFW's website: https://wildlife.ca.gov/Fishing/Ocean/Grunion.

6) Hydroacoustic Effects on Fish. Alternative 2 through Alternative 4 proposes to widen the Topanga Lagoon and restore riparian, transitional, and upland habitat along Topanga Creek. In addition, the PCH bridge will be demolished and reconstructed over the Topanga Lagoon. These Project activities may produce hydroacoustic effects on the fish species within the Project site. Fish are susceptible to pressure-mediated (sound pressure and barotrauma) injury to the ears and general body tissues. Sound pressure caused by construction

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equipment, tunneling, and pile driving could result in altered behavior, tissue damage, injury, or mortality of fish; fish could be impacted both physiologically and physically (Popper *et al*. 2019). In addition to impacts on individual fish, the Project could adversely impact a population of fish if exposure to sound pressure has an impact on breeding or feeding success or alters migratory patterns.

a) Analysis and Disclosure. In preparation of the EIR, CDFW recommends the EIR evaluate and discuss the following:

- Species of native and non-native fish that are present or could be present within the Project site;
- For native fish species, specify whether the species is sensitive, special status under CESA and/or the Endangered Species Act, or may meet the CEQA definition of endangered, rare, or threatened (CEQA Guidelines, § 15380);
- Project construction and activities that would result in sound pressure and ground vibrations;
- Sound pressure sources and sound pressure levels (decibels) associated with each source, including peak sound pressure (Peak) and accumulative sound elevation level (SEL);
- Frequency and duration of each sound pressure source;
- Project's impact on fish resulting from each sound pressure source; and
- Methods to attenuate sound pressure to avoid/minimize impacts on fish.

7) Stream Delineation and Impact Assessment. Alternative 2 through Alternative 4 intend to expand the Topanga Lagoon and restore wetted and riparian habitats within the Project site. Restoration activities involve grading, soil removal, vegetation removal, and widening the Topanga Lagoon and recontouring a portion of Topanga Creek.

b) Analysis and Disclosure. In preparation of the EIR, CDFW recommends the EIR include a stream delineation and evaluation of impacts on any river, stream, or lake. The delineation should be conducted pursuant to the USFWS wetland definition adopted by CDFW (*Cowardin et al.* 1979). The EIR should discuss the Project's impact on Topanga Creek and Topanga Lagoon including impacts on associated natural communities. Impacts may include channelizing or diverting streams, impairing a watercourse, and removing or degrading vegetation through habitat modification (e.g., loss of water source, loss of substrate, encroachment, and edge effects leading to introduction of non-native plants).

b) Fish and Game Code Section 1602. CDFW exercises its regulatory authority as provided by Fish and Game Code section 1600 et seq. to conserve fish and wildlife resources which includes rivers, streams, or lakes and associated natural communities. As a Responsible Agency under CEQA, CDFW has authority over activities in streams and/or lakes that will divert or obstruct the natural flow, or change the bed, channel, or bank (including vegetation associated with the stream or lake) of a river or stream or use material from a streambed. For any such activities, the project applicant (or "entity") must notify CDFW. Accordingly, if the Project would impact streams, the EIR should include measures to notify CDFW pursuant to Fish and Game Code section 1602 prior to starting activities that may impact streams. Please visit CDFW's Lake and Streambed

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Alteration Program webpage for more information (CDFW 2022d).

8) Impacts to California Species of Special Concern. The NOP states that the greater area of the Project site provides habitat for two SSC species: two-striped garter snake (*Thamnophis hammondii*) and southern western pond turtle (*Emys marmorata pallida*). Two-striped garter snakes are highly aquatic and forage primarily in and along streams for fish and amphibians. Similar to two-striped garter snakes, the southern western pond turtle relies on streams and frequently occupy deep pools with low velocity for habitat. The proposed Project may result in temporal loss of habitat, injury or mortality, reduced population, and stifled reproducing capacity.

   a) Protection Status. Two-striped garter snake and southern western pond turtle are considered SSC and meet the CEQA definition of rare, threatened, or endangered species (CEQA Guidelines, § 15065). CDFW considers impacts to SSC a significant direct and cumulative adverse effect without implementing appropriate avoidance and/or mitigation measures. Take of SSC could require a mandatory finding of significance by the Lead Agency (CEQA Guidelines, § 15065).

   b) Analysis and Disclosure. The EIR should analyze and discuss the Project's potential impact and cumulative impact on both SSC species. Impacts on behavior, reproductive viability, and overall survival success should be analyzed and discussed in the EIR. In addition, the EIR should analyze use of herbicides, pesticides, and rodenticides. Lastly, the EIR should discuss the Project's potential effect on SSC population for both species on a local and regional scale.

   c) Surveys. In preparation of an EIR, the CDPR should retain a qualified biologist(s) to conduct species-specific and season appropriate surveys where suitable habitat occurs in the Project site. Surveys for southern western pond turtles and potential habitat should follow the United States Geological Survey's 2006 Western Pond Turtle Visual Survey Protocol for the Southcoast Ecoregion (USGS 2006). Surveys for two-striped garter snake should be conducted when this species is most likely to be encountered, usually conducted between June and July, and during the warm days of summer afternoons. In addition, all potential refugia should be searched including but not limited to holes, mammal burrows, crevices, under rotting logs, woodpiles, boards, and other surface debris. Positive detections of SSC and suitable habitat at the detection location should be mapped and a summary report should be disclosed in the EIR.

9) Impacts to Bats. Bats have the potential to forage and roost in trees and natural areas throughout the Project site. Bats and roost may be impacted by removal of trees, vegetation, and/or structures supporting roosting bats. Bats and roosts may also be adversely impacted by increased noise, human activity, dust, and ground vibration.

   a) Protection Status. Bats are considered non-game mammals and are afforded protection by State law from take and/or harassment (Fish & G. Code, § 4150; Cal. Code of Regs., § 251.1). In addition, some bats are considered a California Species of Special Concern (SSC). CEQA provides protection not only for CESA-listed species, but for any species including but not limited to SSC which can be shown to meet the criteria for State listing. These SSC meet the CEQA definition of endangered, rare, or threatened species (CEQA Guidelines, § 15380). Take of SSC could require a mandatory finding of

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significance (CEQA Guidelines, § 15065).

b) Analysis and Disclosure. CDFW recommends the EIR should discuss the Project's potential impact on bats and habitat supporting roosting bats. A discussion of potential impacts should include impacts that may occur during ground-disturbing activities and vegetation removal.

c) Surveys. In preparation of the EIR, CDFW recommends the CDPR retain a qualified bat specialist identify potential daytime, nighttime, wintering, and hibernation roost sites and conduct bat surveys within these areas (plus a 100-foot buffer as access allows) to identify roosting bats and any maternity roosts. CDFW recommends using acoustic recognition technology to maximize detection of bats. Positive detections of bats and roost locations should be mapped, and a summary report should be disclosed in the EIR.

10) Impacts to Rare Plants. According to the California Natural Diversity Database (CNDDB), Braunton's milkvetch (*Astragalus brauntonii*), Santa Monica mountains dudleya (*Dudleya cymosa* ssp. *ovatifolia*), and white-veined monardella (*Monardella hypoleuca* ssp. *hypoleuca*) have been observed and recorded within the Project site (CDFW 2022b).

a) Protection Status. Braunton's milkvetch is designated as an ESA-listed endangered species. Santa Monica mountains dudleya is designated as an ESA-listed threatened species. White-veined monardella has a California Rare Plant Rank (CRPR) of 1B.3. Plants with a CRPR of 1B are rare throughout their range with most of them endemic to California. Most of the plants that are ranked 1B have declined significantly over the last century (CNPS 2022). Plants with a CRPR of 1B meet the definition of endangered, rare, or threatened species pursuant to CEQA Guidelines section 15380.

b) Surveys. CDPR should retain a qualified biologist to conduct focused rare plant surveys in order to analyze the Project impacts on rare plants for Alternative 2 through Alternative 4. The survey area should include all areas subject to Project-related ground-disturbance activities (e.g., mobilization, parking, staging, and access) and vegetation removal during Project construction and over the Project's lifetime. The survey area should also include areas subject to Project-related herbicide application, spread of invasive species, altered hydrology, and altered habitat conditions (e.g., recontouring, soils, slope, and pollinators) supporting rare plants which are habitat specialists. Per established protocol, botanical field surveys should be conducted in the field at the times of year when plants will be both evident and identifiable. Botanical field surveys should be spaced throughout the growing season (e.g., early, mid, and late season) to capture the floristic diversity at a level necessary to determine if special status plants are present (CDFW 2018).

11) Impact on Sensitive Natural Communities. There are various riparian communities throughout the Santa Monica Mountains. These riparian communities provide high biological value and typically occur along canyon and valley bottoms where streams, such as Topanga Creek, exist. According to CNDDB, Southern Sycamore Alder Riparian Woodland (*Platanus racemosa - Alnus rhombifolia*) occurs within the Project site. This sensitive natural community has a state rarity ranking of S3. There may also be additional sensitive natural communities within the Project site that are not identified within the NOP.

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a) Protection Status. Natural communities with ranks of S1, S2, and S3 are considered sensitive natural communities to be addressed in the environmental review process of CEQA [CEQA Guidelines, §15125(c)]. Many sensitive vegetation communities are associated with perennial or ephemeral sources of water, including groundwater dependent ecosystems. These sensitive communities are deteriorating or have been significantly degraded at local, regional, and state levels. Without identifying the alliance/association vegetation community or their state ranking, the Project may impact sensitive vegetation communities or wildlife species that depend on these communities. The Project may result in substantial adverse direct effect on any S1, S2, or S3 sensitive vegetation communities.

b) Analysis and Disclosure. CDFW recommends the EIR discuss the Project's potential impacts on sensitive plant communities. To analyze the Project's impacts on natural communities within the Project site, the CDPR should retain a qualified biologist to identify and map the natural communities. The qualified biologist should adhere to established protocols for mapping natural communities listed in General Comment #1. Association level mapping is recommended for alliances that have some associations that are designated as sensitive. CDFW recommends the CDPR avoid and minimize development and encroachment onto sensitive trees and woodlands. If avoidance is not feasible, CDFW recommends the EIR include a measure to provide sufficient replacement for the number of impacted trees and acres of impacted woodland. The number of replacement trees and woodland habitat should be higher if the Project would impact large mature trees; impact a woodland supporting rare, sensitive, or special status plants and wildlife; or impact a woodland with a State Rarity Ranking of S1, S2, or S3.

12) Impacts to Nesting Birds. Riparian woodlands are located within the Project site and are known to provide significant habitat for nesting birds. The proposed Project may impact nesting birds through grading activities and removal of vegetation and trees within riparian, transitional, and upland habitat. Furthermore, Project activities occurring during the nesting bird season, especially in areas providing suitable nesting habitat, could result in the incidental loss of fertile eggs or nestlings, or nest abandonment.

a) Protection Status. Migratory nongame native bird species are protected by international treaty under the Federal Migratory Bird Treaty Act (MBTA) of 1918 (Code of Federal Regulations, Title 50, § 10.13). Sections 3503, 3503.5, and 3513 of the California Fish and Game Code prohibit take of all birds and their active nests including raptors and other migratory nongame birds (as listed under the Federal MBTA). It is unlawful to take, possess, or needlessly destroy the nest or eggs of any raptor.

b) Analysis and Disclosure. CDFW recommends the EIR discuss the Project's potential impact on nesting birds and raptors within the Project site. A discussion of potential impacts should include impacts that may occur during ground-disturbing activities and vegetation removal. The EIR should analyze and discuss the Project's impact on bird and raptor nesting and breeding habitat for Alternative 2 through Alternative 4. Edge effects and temporal loss should also be analyzed and discussed. The EIR should also disclose the acreage of bird and raptor nesting and breeding habitat that could be impacted and lost as a result of the proposed Project.

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c) Avoidance. CDFW recommends the EIR include a measure to fully avoid impacts to nesting birds and raptors. To the extent feasible, no construction, ground-disturbing activities (e.g., mobilizing, staging, drilling, and excavating), and vegetation removal during the avian breeding season which generally runs from February 15 through September 15 (as early as January 1 for some raptors) to avoid take of birds, raptors, or their eggs.

If impacts to nesting birds and raptors cannot be avoided, CDFW recommends the EIR include measures to minimize impacts on nesting birds and raptors. Prior to starting ground-disturbing activities and vegetation removal, a qualified biologist should conduct nesting bird and raptor surveys to identify nests. The qualified biologist should establish no-disturbance buffers to minimize impacts on those nests. CDFW recommends a minimum 300-foot no disturbance buffer around active bird nests. For raptors, the no disturbance buffer should be expanded to 500 feet and 0.5 mile for special status species, if feasible. Personnel working on the Project, including all contractors working on site, should be instructed on the presence of nesting birds, area sensitivity, and adherence to no-disturbance buffers. Reductions in the buffer distance may be appropriate depending on the avian species involved, ambient levels of human activity, screening vegetation, or possibly other factors determined by a qualified biologist.

13) Landscaping. The proposed Project involves restoration activities that entail removal and replacement of vegetation and trees. CDFW recommends the CDPR only use native species found in naturally occurring vegetation communities within or adjacent to the Project site. The proposed Project should not plant, seed, or otherwise introduce non-native, invasive plant species to areas that are adjacent to and/or near native habitat areas. Accordingly, CDFW recommends the CDPR restrict use of any species, particularly 'Moderate' or 'High' listed by the California Invasive Plant Council (Cal-IPC 2022). These species are documented to have substantial and severe ecological impacts on physical processes, plant and animal communities, and vegetation structure.

14) Pest Management. The proposed Project may have the potential to spread tree pests and diseases throughout the Project site and into adjacent natural habitat not currently exposed to these stressors. This could result in expediting the loss of native trees. As such, CDFW recommends the EIR provide measures to develop and implement an infectious tree disease management plan or provide mitigation measures. The infectious tree disease management plan or mitigation measures should be developed in consultation with an arborist and describe how the plan or mitigation measures will avoid or reduce the spread of tree insect pests and diseases.

15) Use of Rodenticides. If the Project results in enhanced landscaping, vegetation may need to be managed via chemical methods. Herbicides, pesticides, and rodenticides may impact wildlife. Second generation anticoagulant rodenticides are known to have harmful effects on the ecosystem and wildlife. Assembly Bill 1788 prohibits the use of any second-generation anticoagulant rodenticides because second generation anticoagulant rodenticides have a higher toxicity and are more dangerous to nontarget wildlife (California Legislative Information 2020). CDFW recommends the EIR include a discussion as to the Project's use of herbicides, pesticides, and second-generation anticoagulant rodenticides to maintain the restored areas within the Project site in perpetuity. CDFW recommends the CDPR include measures that would prohibit the use of any second-generation anticoagulant rodenticides

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throughout the Project.

General Comments

1) Biological Baseline Assessment. The EIR should provide an adequate biological resources assessment, including a complete assessment and impact analysis of the flora and fauna within and adjacent to the Project site and where the Project may result in ground disturbance. The assessment and analysis should place emphasis upon identifying endangered, threatened, sensitive, regionally, and locally unique species, and sensitive habitats. Impact analysis will aid in determining any direct, indirect, and cumulative biological impacts, as well as specific mitigation or avoidance measures necessary to offset those impacts. CDFW recommends avoiding any sensitive natural communities found on or adjacent to the Project site. CDFW also considers impacts to SSC a significant direct and cumulative adverse effect without implementing appropriate avoidance and/or mitigation measures. An environmental document should include the following information:

   a) Information on the regional setting that is critical to an assessment of environmental impacts, with special emphasis on resources that are rare or unique to the region [CEQA Guidelines, § 15125(c)]. The EIR should include measures to fully avoid and otherwise protect Sensitive Natural Communities from Project-related impacts. CDFW considers these communities as threatened habitats having both regional and local significance. Plant communities, alliances, and associations with a state-wide ranking of S1, S2, and S3 should be considered sensitive and declining at the local and regional level. These ranks can be obtained by visiting the Vegetation Classification and Mapping Program - Natural Communities webpage (CDFW 2022c).

   b) A thorough, recent, floristic-based assessment of special status plants and natural communities following CDFW's Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Sensitive Natural Communities (CDFW 2018). Adjoining habitat areas should be included where Project construction and activities could lead to direct or indirect impacts off site.

   c) Floristic, alliance- and/or association-based mapping and vegetation impact assessments conducted at a Project site and within the neighboring vicinity. The Manual of California Vegetation (MCV), second edition, should also be used to inform this mapping and assessment (Sawyer et al. 2009). Adjoining habitat areas should be included in this assessment the Project could lead to direct or indirect impacts off site. Habitat mapping at the alliance level will help establish baseline vegetation conditions.

   d) A complete, recent, assessment of the biological resources associated with each habitat type on site and within adjacent areas that could also be affected by a Project. California Natural Diversity Database in Sacramento should be contacted to obtain current information on any previously reported sensitive species and habitat. An assessment should include a nine-quadrangle search of the CNDDB to determine a list of species potentially present at a Project site. A lack of records in the CNDDB does not mean that rare, threatened, or endangered plants and wildlife do not occur in the Project site. Field verification for the presence or absence of sensitive species is necessary to provide a complete biological assessment for adequate CEQA review [CEQA Guidelines, § 15003(i)].

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e) A complete, recent, assessment of rare, threatened, and endangered, and other sensitive species on site and within the area of potential effect, including California Species of Special Concern and California Fully Protected Species (Fish & G. Code, §§ 3511, 4700, 5050, and 5515). Species to be addressed should include all those which meet the CEQA definition of endangered, rare, or threatened species (CEQA Guidelines, § 15380). Seasonal variations in use of a Project site should also be addressed such as wintering, roosting, nesting, and foraging habitat. Focused species-specific surveys, conducted at the appropriate time of year and time of day when the sensitive species are active or otherwise identifiable, may be required if suitable habitat is present. See CDFW's Survey and Monitoring Protocols and Guidelines for established survey protocol for select species (CDFW 2022e). Acceptable species-specific survey procedures may be developed in consultation with CDFW and the USFWS; and

f) A recent wildlife and rare plant survey. CDFW generally considers biological field assessments for wildlife to be valid for a one-year period, and assessments for rare plants may be considered valid for a period of up to three years. Some aspects of a proposed Project may warrant periodic updated surveys for certain sensitive taxa, particularly if build out could occur over a protracted time frame or in phases.

2) Scientific Collecting Permit. Pursuant to the California Code of Regulations, title 14, section 650, qualified biologist(s) must obtain appropriate handling permits to capture, temporarily possess, and relocated wildlife to avoid harm or mortality in connection with Project-related activities. CDFW has the authority to issue permits for the take or possession of wildlife, including mammals; birds, nests, and eggs; reptiles, amphibians, fish, plants; and invertebrates (Fish & G. Code, §§ 1002, 1002.5, 1003). Effective October 1, 2018, a Scientific Collecting Permit is required to monitor project impacts on wildlife resources, as required by environmental documents, permits, or other legal authorizations; and, to capture, temporarily possess, and relocate wildlife to avoid harm or mortality in connection with otherwise lawful activities (Cal. Code Regs., tit. 14, § 650). Please visit CDFW's Scientific Collection Permits webpage for information (CDFW 2022h).

3) Translocation/Salvage of Plants and Animal Species. Translocation and transplantation are the process of removing plants and wildlife from one location and permanently moving it to a new location. CDFW generally does not support the use of translocation or transplantation as the primary mitigation strategy for unavoidable impacts to endangered, rare, or threatened plants and animals. Studies have shown that these efforts are experimental and the outcome unreliable. CDFW has found that permanent preservation and management of habitat capable of supporting these species is often a more effective long-term strategy for conserving plants and animals and their habitats.

4) Disclosure. A EIR should provide an adequate, complete, and detailed disclosure about the effect which a proposed Project is likely to have on the environment (Pub. Resources Code, § 20161; CEQA Guidelines, §15151). Adequate disclosure is necessary so CDFW may provide comments on the adequacy of proposed avoidance, minimization, or mitigation measures, as well as to assess the significance of the specific impact relative to plant and wildlife species impacted (e.g., current range, distribution, population trends, and connectivity).

5) Mitigation Measures. Public agencies have a duty under CEQA to prevent significant,

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avoidable damage to the environment by requiring changes in projects through the use of feasible alternatives or mitigation measures [CEQA Guidelines, §§ 15002(a)(3), 15021]. Pursuant to CEQA Guidelines section 15126.4, an environmental document "shall describe feasible measures which could mitigate for impacts below a significant level under CEQA."

a) Level of Detail. Mitigation measures must be feasible, effective, implemented, and fully enforceable/imposed by the Lead Agency through permit conditions, agreements, or other legally binding instruments (Pub. Resources Code, § 21081.6(b); CEQA Guidelines, § 15126.4). A public agency "shall provide the measures that are fully enforceable through permit conditions, agreements, or other measures" (Pub. Resources Code, § 21081.6). CDFW recommends the CDPR provide mitigation measures that are specific, detailed (i.e., responsible party, timing, specific actions, location), and clear in order for a measure to be fully enforceable and implemented successfully via a mitigation monitoring and/or reporting program (Pub. Resources Code, § 21081.6; CEQA Guidelines, § 15097). Adequate disclosure is necessary so CDFW may provide comments on the adequacy and feasibility of proposed mitigation measures.

b) Disclosure of Impacts. If a proposed mitigation measure would cause one or more significant effects, in addition to impacts caused by the Project as proposed, the EIR should include a discussion of the effects of proposed mitigation measures [CEQA Guidelines, § 15126.4(a)(1)]. In that regard, the EIR should provide an adequate, complete, and detailed disclosure about a project's proposed mitigation measure(s). Adequate disclosure is necessary so CDFW may assess the potential impacts of proposed mitigation measures.

6) Data. CEQA requires that information developed in environmental impact reports be incorporated into a database which may be used to make subsequent or supplemental environmental determinations [Pub. Resources Code, § 21003, subd. (e)]. Accordingly, please report any special status species and natural communities detected by completing and submitting CNDDB Field Survey Forms (CDFW 2022f). The CDPR should ensure data collected for the preparation of the EIR be properly submitted, with all data fields applicable filled out. The data entry should also list pending development as a threat and then update this occurrence after impacts have occurred.

7) Biological Direct, Indirect, and Cumulative Impacts. CDFW recommends providing a thorough discussion of direct, indirect, and cumulative impacts expected to adversely affect biological resources, with specific measures to offset such impacts. The EIR should address the following:

a) A discussion regarding Project-related indirect impacts on biological resources, including resources in nearby public lands, open space, adjacent natural habitats, riparian ecosystems, and any designated and/or proposed or existing reserve lands [e.g., preserve lands associated with a Natural Community Conservation Plan (Fish & G. Code, § 2800 et. seq.)]. Impacts on, and maintenance of, wildlife corridor/movement areas, including access to undisturbed habitats in adjacent areas, should be fully evaluated in the EIR.

b) A discussion of both the short-term and long-term effects to species population

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distribution and concentration and alterations of the ecosystem supporting the species impacted [CEQA Guidelines, § 15126.2(a)].

c) A discussion of potential adverse impacts from lighting, noise, temporary and permanent human activity, and exotic species, and identification of any mitigation measures.

d) A discussion of Project-related changes on drainage patterns; the volume, velocity, and frequency of existing and post-Project surface flows; polluted runoff; soil erosion and/or sedimentation in streams and water bodies; and post-Project fate of runoff from the Project sites. The discussion should also address the potential water extraction activities and the potential resulting impacts on the habitat (if any) supported by the groundwater. Mitigation measures proposed to alleviate such Project impacts should be included.

e) An analysis of impacts from proposed changes to land use designations and zoning, and existing land use designation and zoning located nearby or adjacent to natural areas that may inadvertently contribute to wildlife-human interactions. A discussion of possible conflicts and mitigation measures to reduce these conflicts should be included in the EIR; and

f) A cumulative effects analysis, as described under CEQA Guidelines section 15130. General and specific plans, as well as past, present, and anticipated future projects, should be analyzed relative to their impacts on similar plant and wildlife species, habitat, and vegetation communities. If the CDPR determines that the Project would not have a cumulative impact, the EIR should indicate why the cumulative impact is not significant. The CDPR's conclusion should be supported by facts and analyses [CEQA Guidelines, § 15130(a)(2)].

8) Compensatory Mitigation. The EIR should include mitigation measures for adverse Project-related direct or indirect impacts to sensitive plants, animals, and habitats. Mitigation measures should emphasize avoidance and reduction of Project-related impacts. For unavoidable impacts, on-site habitat restoration or enhancement should be discussed in detail. If on-site mitigation is not feasible or would not be biologically viable and therefore not adequately mitigate the loss of biological functions and values, off-site mitigation through habitat creation and/or acquisition and preservation in perpetuity should be addressed. Areas proposed as mitigation lands should be protected in perpetuity with a conservation easement, financial assurance and dedicated to a qualified entity for long-term management and monitoring. Under Government Code, section 65967, the Lead Agency must exercise due diligence in reviewing the qualifications of a governmental entity, special district, or nonprofit organization to effectively manage and steward land, water, or natural resources on mitigation lands it approves.

9) Long-term Management of Mitigation Lands. For proposed preservation and/or restoration, an EIR should include measures to protect the targeted habitat values from direct and indirect negative impacts in perpetuity. The objective should be to offset the Project-induced qualitative and quantitative losses of wildlife habitat values. Issues that should be addressed include (but are not limited to) restrictions on access, proposed land dedications, monitoring and management programs, control of illegal dumping, water pollution, and increased human intrusion. An appropriate non-wasting endowment should be set aside to provide for long-term management of mitigation lands.

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Conclusion

We appreciate the opportunity to comment on the NOP for the Topanga Lagoon Restoration Project to assist the CDPR in identifying and mitigating Project impacts on biological resources. If you have any questions or comments regarding this letter, please contact Julisa Portugal, Environmental Scientist, at Julisa.Portugal@wildlife.ca.gov or (562) 330-7563.

Sincerely,

DocuSigned by:
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May 24, 2022

Governor's Office of Planning & Research

May 27 2022

STATE CLEARINGHOUSE

Danielle LeFer
California Department of Parks and Recreation
1925 Las Virgenes Road
Calabasas, CA 91302

Re: 2022050478, Topanga Restoration Project, Los Angeles County

Dear Mr. LeFer:

The Native American Heritage Commission (NAHC) has received the Notice of Preparation (NOP), Draft Environmental Impact Report (DEIR) or Early Consultation for the project referenced above. The California Environmental Quality Act (CEQA) (Pub. Resources Code §21000 et seq.), specifically Public Resources Code §21084.1, states that a project that may cause a substantial adverse change in the significance of a historical resource, is a project that may have a significant effect on the environment. (Pub. Resources Code § 21084.1; Cal. Code Regs., tit.14, §15064.5 (b) (CEQA Guidelines §15064.5 (b)). If there is substantial evidence, in light of the whole record before a lead agency, that a project may have a significant effect on the environment, an Environmental Impact Report (EIR) shall be prepared. (Pub. Resources Code §21080 (d); Cal. Code Regs., tit. 14, § 5064 subd.(a)(1) (CEQA Guidelines §15064 (a)(1)). In order to determine whether a project will cause a substantial adverse change in the significance of a historical resource, a lead agency will need to determine whether there are historical resources within the area of potential effect (APE).

CEQA was amended significantly in 2014. Assembly Bill 52 (Gatto, Chapter 532, Statutes of 2014) (AB 52) amended CEQA to create a separate category of cultural resources, "tribal cultural resources" (Pub. Resources Code §21074) and provides that a project with an effect that may cause a substantial adverse change in the significance of a tribal cultural resource is a project that may have a significant effect on the environment. (Pub. Resources Code §21084.2). Public agencies shall, when feasible, avoid damaging effects to any tribal cultural resource. (Pub. Resources Code §21084.3 (a)). **AB 52 applies to any project for which a notice of preparation, a notice of negative declaration, or a mitigated negative declaration is filed on or after July 1, 2015.** If your project involves the adoption of or amendment to a general plan or a specific plan, or the designation or proposed designation of open space, on or after March 1, 2005, it may also be subject to Senate Bill 18 (Burton, Chapter 905, Statutes of 2004) (SB 18). **Both SB 18 and AB 52 have tribal consultation requirements**. If your project is also subject to the federal National Environmental Policy Act (42 U.S.C. § 4321 et seq.) (NEPA), the tribal consultation requirements of Section 106 of the National Historic Preservation Act of 1966 (154 U.S.C. 300101, 36 C.F.R. §800 et seq.) may also apply.

The NAHC recommends consultation with California Native American tribes that are traditionally and culturally affiliated with the geographic area of your proposed project as early as possible in order to avoid inadvertent discoveries of Native American human remains and best protect tribal cultural resources. Below is a brief summary of portions of AB 52 and SB 18 as well as the NAHC's recommendations for conducting cultural resources assessments.

Consult your legal counsel about compliance with AB 52 and SB 18 as well as compliance with any other applicable laws.

AB 52

AB 52 has added to CEQA the additional requirements listed below, along with many other requirements:

1. Fourteen Day Period to Provide Notice of Completion of an Application/Decision to Undertake a Project: Within fourteen (14) days of determining that an application for a project is complete or of a decision by a public agency to undertake a project, a lead agency shall provide formal notification to a designated contact of, or tribal representative of, traditionally and culturally affiliated California Native American tribes that have requested notice, to be accomplished by at least one written notice that includes:

- **a.** A brief description of the project.
- **b.** The lead agency contact information.
- **c.** Notification that the California Native American tribe has 30 days to request consultation. (Pub. Resources Code §21080.3.1 (d)).
- **d.** A "California Native American tribe" is defined as a Native American tribe located in California that is on the contact list maintained by the NAHC for the purposes of Chapter 905 of Statutes of 2004 (SB 18). (Pub. Resources Code §21073).

2. Begin Consultation Within 30 Days of Receiving a Tribe's Request for Consultation and Before Releasing a Negative Declaration, Mitigated Negative Declaration, or Environmental Impact Report: A lead agency shall begin the consultation process within 30 days of receiving a request for consultation from a California Native American tribe that is traditionally and culturally affiliated with the geographic area of the proposed project. (Pub. Resources Code §21080.3.1, subds. (d) and (e)) and prior to the release of a negative declaration, mitigated negative declaration or Environmental Impact Report. (Pub. Resources Code §21080.3.1(b)).

- **a.** For purposes of AB 52, "consultation shall have the same meaning as provided in Gov. Code §65352.4 (SB 18). (Pub. Resources Code §21080.3.1 (b)).

3. Mandatory Topics of Consultation If Requested by a Tribe: The following topics of consultation, if a tribe requests to discuss them, are mandatory topics of consultation:

- **a.** Alternatives to the project.
- **b.** Recommended mitigation measures.
- **c.** Significant effects. (Pub. Resources Code §21080.3.2 (a)).

4. Discretionary Topics of Consultation: The following topics are discretionary topics of consultation:

- **a.** Type of environmental review necessary.
- **b.** Significance of the tribal cultural resources.
- **c.** Significance of the project's impacts on tribal cultural resources.
- **d.** If necessary, project alternatives or appropriate measures for preservation or mitigation that the tribe may recommend to the lead agency. (Pub. Resources Code §21080.3.2 (a)).

5. Confidentiality of Information Submitted by a Tribe During the Environmental Review Process: With some exceptions, any information, including but not limited to, the location, description, and use of tribal cultural resources submitted by a California Native American tribe during the environmental review process shall not be included in the environmental document or otherwise disclosed by the lead agency or any other public agency to the public, consistent with Government Code §6254 (r) and §6254.10. Any information submitted by a California Native American tribe during the consultation or environmental review process shall be published in a confidential appendix to the environmental document unless the tribe that provided the information consents, in writing, to the disclosure of some or all of the information to the public. (Pub. Resources Code §21082.3 (c)(1)).

6. Discussion of Impacts to Tribal Cultural Resources in the Environmental Document: If a project may have a significant impact on a tribal cultural resource, the lead agency's environmental document shall discuss both of the following:

- **a.** Whether the proposed project has a significant impact on an identified tribal cultural resource.
- **b.** Whether feasible alternatives or mitigation measures, including those measures that may be agreed to pursuant to Public Resources Code §21082.3, subdivision (a), avoid or substantially lessen the impact on the identified tribal cultural resource. (Pub. Resources Code §21082.3 (b)).

7. Conclusion of Consultation: Consultation with a tribe shall be considered concluded when either of the following occurs:

a. The parties agree to measures to mitigate or avoid a significant effect, if a significant effect exists, on a tribal cultural resource; or

b. A party, acting in good faith and after reasonable effort, concludes that mutual agreement cannot be reached. (Pub. Resources Code §21080.3.2 (b)).

8. Recommending Mitigation Measures Agreed Upon in Consultation in the Environmental Document: Any mitigation measures agreed upon in the consultation conducted pursuant to Public Resources Code §21080.3.2 shall be recommended for inclusion in the environmental document and in an adopted mitigation monitoring and reporting program, if determined to avoid or lessen the impact pursuant to Public Resources Code §21082.3, subdivision (b), paragraph 2, and shall be fully enforceable. (Pub. Resources Code §21082.3 (a)).

9. Required Consideration of Feasible Mitigation: If mitigation measures recommended by the staff of the lead agency as a result of the consultation process are not included in the environmental document or if there are no agreed upon mitigation measures at the conclusion of consultation, or if consultation does not occur, and if substantial evidence demonstrates that a project will cause a significant effect to a tribal cultural resource, the lead agency shall consider feasible mitigation pursuant to Public Resources Code §21084.3 (b). (Pub. Resources Code §21082.3 (e)).

10. Examples of Mitigation Measures That, If Feasible, May Be Considered to Avoid or Minimize Significant Adverse Impacts to Tribal Cultural Resources:

a. Avoidance and preservation of the resources in place, including, but not limited to:

i. Planning and construction to avoid the resources and protect the cultural and natural context.

ii. Planning greenspace, parks, or other open space, to incorporate the resources with culturally appropriate protection and management criteria.

b. Treating the resource with culturally appropriate dignity, taking into account the tribal cultural values and meaning of the resource, including, but not limited to, the following:

i. Protecting the cultural character and integrity of the resource.

ii. Protecting the traditional use of the resource.

iii. Protecting the confidentiality of the resource.

c. Permanent conservation easements or other interests in real property, with culturally appropriate management criteria for the purposes of preserving or utilizing the resources or places.

d. Protecting the resource. (Pub. Resource Code §21084.3 (b)).

e. Please note that a federally recognized California Native American tribe or a non-federally recognized California Native American tribe that is on the contact list maintained by the NAHC to protect a California prehistoric, archaeological, cultural, spiritual, or ceremonial place may acquire and hold conservation easements if the conservation easement is voluntarily conveyed. (Civ. Code §815.3 (c)).

f. Please note that it is the policy of the state that Native American remains and associated grave artifacts shall be repatriated. (Pub. Resources Code §5097.991).

11. Prerequisites for Certifying an Environmental Impact Report or Adopting a Mitigated Negative Declaration or Negative Declaration with a Significant Impact on an Identified Tribal Cultural Resource: An Environmental Impact Report may not be certified, nor may a mitigated negative declaration or a negative declaration be adopted unless one of the following occurs:

a. The consultation process between the tribes and the lead agency has occurred as provided in Public Resources Code §21080.3.1 and §21080.3.2 and concluded pursuant to Public Resources Code §21080.3.2.

b. The tribe that requested consultation failed to provide comments to the lead agency or otherwise failed to engage in the consultation process.

c. The lead agency provided notice of the project to the tribe in compliance with Public Resources Code §21080.3.1 (d) and the tribe failed to request consultation within 30 days. (Pub. Resources Code §21082.3 (d)).

The NAHC's PowerPoint presentation titled, "Tribal Consultation Under AB 52: Requirements and Best Practices" may be found online at: http://nahc.ca.gov/wp-content/uploads/2015/10/AB52TribalConsultation_CalEPAPDF.pdf

SB 18

SB 18 applies to local governments and requires local governments to contact, provide notice to, refer plans to, and consult with tribes prior to the adoption or amendment of a general plan or a specific plan, or the designation of open space. (Gov. Code §65352.3). Local governments should consult the Governor's Office of Planning and Research's "Tribal Consultation Guidelines," which can be found online at: https://www.opr.ca.gov/docs/09_14_05_Updated_Guidelines_922.pdf.

Some of SB 18's provisions include:

1. Tribal Consultation: If a local government considers a proposal to adopt or amend a general plan or a specific plan, or to designate open space it is required to contact the appropriate tribes identified by the NAHC by requesting a "Tribal Consultation List." If a tribe, once contacted, requests consultation the local government must consult with the tribe on the plan proposal. **A tribe has 90 days from the date of receipt of notification to request consultation unless a shorter timeframe has been agreed to by the tribe.** (Gov. Code §65352.3 (a)(2)).

2. No Statutory Time Limit on SB 18 Tribal Consultation. There is no statutory time limit on SB 18 tribal consultation.

3. Confidentiality: Consistent with the guidelines developed and adopted by the Office of Planning and Research pursuant to Gov. Code §65040.2, the city or county shall protect the confidentiality of the information concerning the specific identity, location, character, and use of places, features and objects described in Public Resources Code §5097.9 and §5097.993 that are within the city's or county's jurisdiction. (Gov. Code §65352.3 (b)).

4. Conclusion of SB 18 Tribal Consultation: Consultation should be concluded at the point in which:

- **a.** The parties to the consultation come to a mutual agreement concerning the appropriate measures for preservation or mitigation; or
- **b.** Either the local government or the tribe, acting in good faith and after reasonable effort, concludes that mutual agreement cannot be reached concerning the appropriate measures of preservation or mitigation. (Tribal Consultation Guidelines, Governor's Office of Planning and Research (2005) at p. 18).

Agencies should be aware that neither AB 52 nor SB 18 precludes agencies from initiating tribal consultation with tribes that are traditionally and culturally affiliated with their jurisdictions before the timeframes provided in AB 52 and SB 18. For that reason, we urge you to continue to request Native American Tribal Contact Lists and "Sacred Lands File" searches from the NAHC. The request forms can be found online at: http://nahc.ca.gov/resources/forms/.

NAHC Recommendations for Cultural Resources Assessments

To adequately assess the existence and significance of tribal cultural resources and plan for avoidance, preservation in place, or barring both, mitigation of project-related impacts to tribal cultural resources, the NAHC recommends the following actions:

1. Contact the appropriate regional California Historical Research Information System (CHRIS) Center (https://ohp.parks.ca.gov/?page_id=30331) for an archaeological records search. The records search will determine:

- **a.** If part or all of the APE has been previously surveyed for cultural resources.
- **b.** If any known cultural resources have already been recorded on or adjacent to the APE.
- **c.** If the probability is low, moderate, or high that cultural resources are located in the APE.
- **d.** If a survey is required to determine whether previously unrecorded cultural resources are present.

2. If an archaeological inventory survey is required, the final stage is the preparation of a professional report detailing the findings and recommendations of the records search and field survey.

- **a.** The final report containing site forms, site significance, and mitigation measures should be submitted immediately to the planning department. All information regarding site locations, Native American human remains, and associated funerary objects should be in a separate confidential addendum and not be made available for public disclosure.
- **b.** The final written report should be submitted within 3 months after work has been completed to the appropriate regional CHRIS center.

3. Contact the NAHC for:

a. A Sacred Lands File search. Remember that tribes do not always record their sacred sites in the Sacred Lands File, nor are they required to do so. A Sacred Lands File search is not a substitute for consultation with tribes that are traditionally and culturally affiliated with the geographic area of the project's APE.

b. A Native American Tribal Consultation List of appropriate tribes for consultation concerning the project site and to assist in planning for avoidance, preservation in place, or, failing both, mitigation measures.

4. Remember that the lack of surface evidence of archaeological resources (including tribal cultural resources) does not preclude their subsurface existence.

a. Lead agencies should include in their mitigation and monitoring reporting program plan provisions for the identification and evaluation of inadvertently discovered archaeological resources per Cal. Code Regs., tit. 14, §15064.5(f) (CEQA Guidelines §15064.5(f)). In areas of identified archaeological sensitivity, a certified archaeologist and a culturally affiliated Native American with knowledge of cultural resources should monitor all ground-disturbing activities.

b. Lead agencies should include in their mitigation and monitoring reporting program plans provisions for the disposition of recovered cultural items that are not burial associated in consultation with culturally affiliated Native Americans.

c. Lead agencies should include in their mitigation and monitoring reporting program plans provisions for the treatment and disposition of inadvertently discovered Native American human remains. Health and Safety Code §7050.5, Public Resources Code §5097.98, and Cal. Code Regs., tit. 14, §15064.5, subdivisions (d) and (e) (CEQA Guidelines §15064.5, subds. (d) and (e)) address the processes to be followed in the event of an inadvertent discovery of any Native American human remains and associated grave goods in a location other than a dedicated cemetery.

If you have any questions or need additional information, please contact me at my email address: Andrew.Green@nahc.ca.gov.

Sincerely,

Andrew Green

Andrew Green
Cultural Resources Analyst

cc: State Clearinghouse

(424) 526-7777 • 13837 Fiji Way, Marina del Rey, CA 90292 • beaches.lacounty.gov

Caring for Our Coast

Gary Jones
Director

Amy M. Caves
Deputy Director

Carol Baker
Deputy Director

June 23, 2022

VIA E-MAIL

Craig Sap, Interim District Superintendent
Angeles District, California Department of Parks and Recreation
1925 Las Virgenes Road
Calabasas, California 91302

SUBJECT: TOPANGA LAGOON RESTORATION PROJECT NOTICE OF PREPARATION RESPONSE LETTER

Dear Mr. Sap,

On May 23, 2022, the Department of Beaches and Harbors (DBH or Department) received a Notice of Preparation (NOP) notifying the Department that the California Department of Parks and Recreation (CDPR) will be the Lead Agency under the California Environmental Quality Act (CEQA) and will prepare an Environmental Impact Report (EIR) for the Topanga Lagoon Restoration Project (Project). Per the notice, agencies were requested to review the proposed project description in the NOP and provide comments on environmental issues related to the statutory responsibilities of each responsible or trustee agency. After reviewing the available information for each alternative with the intent to ensure continued public access to the coast, including parking and recreational beach area, DBH recommends that the EIR analyze impacts of the Project related to recreational resources, access, parking, traffic and circulation.

Recreational Resources and Access

With over a mile of ocean frontage and 21.5 acres of land, Topanga Beach is the eastern most beach in the Malibu area that is owned and operated by DBH. Topanga Beach is a popular location for surfing, scuba diving, fishing, and sunbathing. There are also restrooms, a lifeguard building, a picnic area, and showers on site. The proposed Project should seek to improve visitor services and coastal access to the beach going public, in addition to protecting existing recreational resources. DBH suggests that the EIR analyze the breaching patterns of a widened lagoon, and how this may impact beach supporting facilities and sandy beach area in the future. In addition, the EIR should analyze ADA access from the parking lot to the beach, beach wheelchair access, and vehicle access from Pacific Coast Highway (PCH) to the beach for emergency and maintenance operations.

Traffic and Circulation

Since Pacific Coast Highway serves as both the main artery and a major access point between Malibu, Santa Monica, nearby inland cities, and our coast, DBH recommends that the EIR contain an analysis of traffic and circulation impacts related to the Project. In addition, the EIR should analyze potential impacts the project's construction phase may have on traffic flow and access to points along the coast. The Department suggests that the project include striped right-turn-out lanes along southbound PCH to provide safe access to the main parking lot entrance and to Topanga Beach Drive. The Department also suggests coordination with emergency response agencies and the City of Malibu's Mass Evacuation Plan.

Parking

The County owns two parking lots along Pacific Coast Highway (PCH), west of the Topanga Canyon Boulevard intersection. Topanga Beach West Parking Lot (unpaved) has enough area to accommodate approximately 140 parking spaces, in addition to the helipad area, and Topanga Beach East Parking Lot (paved) has 91 parking spaces. There are also free parking spaces along PCH adjacent to the parking lot. DBH recommends that the EIR analyze impacts related to changes in the number and location of parking spaces.

Thank you for the opportunity to provide feedback on the proposed Project. Please note that as this project affects County owned property and the public's access to the beach, a commitment to any alternative would potentially require action by the Board of Supervisors and the comments provided within this letter are not intended to suggest approval by the County. Should you have any questions or concerns with the information within this letter, please feel free to contact Porsche White at (424) 526-7755 or PWhite@bh.lacounty.gov.

Very truly yours,

Warren Ontiveros

Digitally signed by Warren Ontiveros
Date: 2022.06.23 08:10:33 -07'00'

Warren Ontiveros, Planning Division Chief

WO:pw

c: Rosi Dagit, Senior Conservation Biologist, RCD of the Santa Monica Mountains
Dannielle LeFer, Senior Environmental Scientist, California Department of Parks and Recreation

From: Aaron Clark
To: Topanga Lagoon Restoration Project
Subject: Topanga Lagoon Restoration Project - NOP comment
Date: Wednesday, June 22, 2022 4:53:27 PM

To whom it may concern:

My friends and I (and countless others) have surfed Topanga point religiously for years. Whatever ends up being done to restore the lagoon, please do no harm to our cherished point break at Topanga. Please include me on the interested parties list so that I get future emails you send regarding the project's environmental processing.

Many thanks!
Aaron Clark

From:	Andrea Ehrgott
To:	Topanga Lagoon Restoration Project
Subject:	feedback
Date:	Thursday, June 16, 2022 5:21:28 PM

To whom it may concern,

If this isn't too late, I wanted to add to the public comments regarding the Topanga Lagoon Restoration Project.
I strongly support any project that restores features to their original natural condition. I hope the lagoon is restored for the sake of wildlife and the ocean-creek dynamics, but also so that the public can enjoy and appreciate the value of natural wetlands.

Andrea Ehrgott
Topanga resident

From: Andy Leonard
To: Topanga Lagoon Restoration Project
Cc: Fred Gaines
Subject: Reel Inn/Lower Topanga
Date: Monday, June 6, 2022 2:53:24 PM

Hello,

Would you please link us so we may attend the video meeting on 6/11? We'll be out of town but very much want to participate.

Andy and Teddy Leonard
310 745 7504m
jaleonard8@gmail.com

The Reel Inn has been in operation since 1986 and during that time has battled LAACO, eviction notices from State Parks, wildfires, various County agencies, Covid, and now we are facing - it seems - an additionally unknown future.

During these 36 years we believe we have collected, in addition to rent, assorted taxes, and fees, between $10-15 million dollars in sales tax for the State, provided jobs for up to 25 people, some of whom are retiring now but started as busboys and dishwashers, and along the way have provided - 363 days a year - a center for the Lower Topanga Community.

During the "Eviction Notice period", we collected 11 cartons of 20-to-a-page signed petitions protesting that decision. We have them if you'd like.

We found our menu printed in a Turkish travel guide, so we are, in fact, "World-Famous", which is why it is so troubling to us to be swept aside as a nameless "concession" or a "lease holder" in the proposed redevelopment plans for 1 acre of lagoon, which may or may not be taking place at some time in the future. It makes business planning very difficult and badly confuses the customers and employees. And we very seriously question the "millions of beach visitors" across the street. If this were even partly true, we'd be rich.

We see in Proposal #3 of your most recent letter dated 5/23/22 that "an existing concession would be remodeled and continue operation in place." Are you referring to the Reel? Or another concession? We don't know.

We see in proposal #4 that "A remodeled restaurant lessee would continue to operate." Assuming from the location that this is us, the last we heard from CalTrans, curving PCH would run it through our patio and dining room. Could you please advise?

Please understand our confusion here and perhaps our reluctance to engage in the “800 pound gorilla” planning process. Given the amount of time, manpower and consulting fees already expended, it seems quite unlikely “option 1” will prevail.

All that said, the Reel Inn wants to continue serving Park and Beach visitors as long as we are allowed to do so. We are flexible and creative people and would be pleased to be included in any meaningful way in planning for the future of Lower Topanga.

Very sincerely,

Andy and Teddy Leonard for The Reel Inn of Malibu

From: Anne Ready
To: Stephanie Breeden
Subject: Lagoon comments
Date: Wednesday, June 22, 2022 8:34:46 AM

Begin forwarded message:

From: Anne <annewritestoyou@icloud.com>
Subject: Topanga Lagoon
Date: June 16, 2022 at 9:04:28 AM PDT
To: TopangaLagoonRestorationProject@esassoc.com
Cc: LeFer Danielle <Danielle.LeFer@parks.ca.gov>

Greetings,

I appreciated being able to attend your Public Scoping Meeting Zoom presentation last Saturday morning, June 11 at 10 am. As the landowner(s) were introduced and the maps were shown, a comment was made that the "private properties are not affected." As landowners also, whose private properties line Topanga Beach, my neighbors and I believe we will be very much affected.

From your presentation, I believe we are coming late to the discussion, hearing only the proposed solutions but not an explanation of the specific problems that require change re: impact of sea level rise and coastal erosion. Please explain and help us understand how widening the lagoon when we are and are likely to stay in a significant drought, making a longer and wider bridge and eliminating favorite small businesses will help. We have noticed that the sand has been "out" for many months, leaving both our private and public beaches very rocky. Have you addressed sand erosion?

Not living in such proximity to PCH as we do, it's perhaps impossible for you to know what the traffic is like currently. And when there is any obstruction, accidental or otherwise, the traffic is at a standstill on PCH for miles on both sides of Topanga Canyon."Maintaining traffic flow" will be a greater challenge than you know.

Topanga Lagoon is truly the eye of the needle between Malibu and Santa Monica, Beverly Hills and all of Los Angeles. From all of your suggested Alternatives, we are very concerned about the traffic impact to all of Malibu with at least 24 months of construction and no alternate routes. Exactly how do you intend to mitigate the disruption.

Many of us jumped to the hopeful conclusion that the "disruption of utilities" (which most recently happened when SCE intentionally left us without power on Thanksgiving Day 2021 due to high winds and low humidity) meant that you plan to put the power and telephone lines underground and remove the unsightly poles, etc. Is this included in your proposal? Exactly how expensive, how disruptive and for how long will your/SCE's power outages/reconfiguration take?

We want to work with you and restoring wetlands and riparian bank habitats and improved fish migration seems environmentally sound. But you must not jeopardize our rural quality of life by pouring even more concrete and making our beachfront a tourist attraction with buses and visitor services and a hotel!

Please confirm receipt of this correspondence well in advance of your June 22 deadline. We all look forward to continuing the dialogue that addresses these concerns.

Kind regards,

Anne Ready
18842 Topanga Beach Drive, Malibu 90265 (310) 266-1251

From: britz@ucla.edu
To: Topanga Lagoon Restoration Project
Subject: Support of Topanga Lagoon restoration
Date: Tuesday, June 14, 2022 8:43:31 AM

I am writing as a Topanga resident and Professor of Environmental Health Sciences at UCLA to express my strong support of the efforts to restore the Topanga Lagoon. I believe that this is an important project that will help our eco-system and allow it to regenerate and survive. Thank you for your attention!

Beate Ritz, MD, PhD
Professor of Epidemiology, Environmental Health Sciences, and Neurology
UCLA, FSPH and DGSOM

From:	Bradford Kelley
To:	Topanga Lagoon Restoration Project
Subject:	Topanga Point Proposed Restoration Project
Date:	Wednesday, June 22, 2022 7:05:29 PM

To whom it may concern:

I am a Los Angeles surfer who frequently surfs at Topanga point.

It has come to my attention that several iterations of a restoration project are being considered for the immediate area around Topanga Point (some more drastic than others). I've reviewed these different proposed options that were submitted for public comment recently and have concerns about the potential negative impact that each of them may have on the conditions and quality of the adjacent surf break and wonder if this aspect is being fully considered as a factor in the environmental impact assessment that the project may have.

Topanga Point is a very particular and limited resource for the surfing community in the Los Angeles area, steeped in Southern California surfing history, and so preservation of its best natural attributes is very important to a large community of recreational watermen and women frequenting the point on a daily basis.

I strongly urge those behind the proposed redevelopment as well as those tasked with reviewing and possibly approving the project to further alter this natural resource to critically consider all potential impacts to the coastline including the adjacent surf conditions that may be directly impacted by the work.

Please include me on the interested parties list so that I can be included on any future information, correspondence, or decided actions regarding the project.

Thank you for your kind consideration of our concerns.

Sincerely,

Bradford Kelley
(310)435-3740
Bradfordkelley@gmail.com

From: Cami Colbert
To: Topanga Lagoon Restoration Project
Cc: Bob Colbert
Subject: Concerns from 18830 Topanga Beach Drive
Date: Wednesday, June 22, 2022 6:50:32 PM

To Whom it May Concern,

I have lived in Malibu on Topanga Beach Drive for 50 years this month. There are many things that needs renovating around Topanga Beach but the proposal to widen/lengthen the bridge to accommodate trout especially when there is no water in the creek makes no sense to me. We have many, many issues that should take priority like dealing with the homeless, to the beach erosion to traffic issues not to mention the dilapidated Topanga Ranch Motel. Believe me, if you have a lot of money and nowhere to put it let's start prioritizing.

I would like to be sent the EIR as well as all of the renderings that are proposed and the costs associated with them.

Thank you,

Cami Colbert
310-420-1400

From: Catherine Tirr
To: Topanga Lagoon Restoration Project
Subject: Topanga Lagoon
Date: Monday, June 13, 2022 10:09:41 AM

To Whom it may concern,
I am a Topanga resident who enjoys the local beach and lagoon area regularly. I am a painter who is interested in seeing the environment sustainably restored. The lagoon itself will be a wonderful feature which will attract and support wildlife, while at the same time will restore the beauty of the area.
I strongly support the RCD restoration of the Topanga Lagoon.
Thank you

Catherine Tirr

From: Donna Brown
To: Topanga Lagoon Restoration Project
Cc: Donna Brown
Subject: Topanga Lagoon Project
Date: Thursday, May 26, 2022 11:40:34 AM

I am in receipt of the certified letter regarding the Notice of Preparation and Scoping Meeting of an Environmental Impact Report for the Topanga Lagoon Restoration Project. I am a home owner at 3740 Malibu Vista Dr. In Malibu. This home has been in my family for over 50 years.

In the letter there are 4 alternative projects listed. Of the alternatives provided, my feeling that #1 is the best choice- No Project Alternative. This must be a very expensive endeavor. We are over taxed, insurance premiums have more than doubled and business are just beginning to recuperate from the effects of Covid and the Governor's continued emergency powers that leave uncertainty and closings on the table. Add to that the high costs of good and inflation and survival is a struggle for all of us. Those business need a chance to get back on their feet. And I can only image the traffic issues this would all create. There is so much money in the California budget from this over taxation and the profits from Prop.19 passing last year. So unfair and unjust to stick it to more people. Let's not make it any harder for people to live here and be able to afford it.

That's my feeling. I assume we are able to give our opinion. I am not able to attend the meeting. Alternative #1 makes the most sense to me. Leave it alone.

Donna Brown

From: Ed and Susan Klenner
To: Topanga Lagoon Restoration Project
Subject: Regret
Date: Saturday, June 11, 2022 10:39:31 AM

Good morning,

I regret that neither Ed nor I can attend the zoom meeting this morning. We have out of town guests who are keeping us busy. As you know, I, have a long history with the Lagoon area, and I do want to stay informed as to any information that comes out of today's meeting.

My best to you,

Susan

From: Eileen Delehanty Pearkes
To: Topanga Lagoon Restoration Project
Subject: thank you!
Date: Tuesday, May 24, 2022 9:48:46 AM

---

thank you for reaching out to me about the Topanga Lagoon Restoration Project.

I walk 3 times/week minimum at the lagoon and on the beach. I would love to see this project and the entire retrofit of the Topanga State Beach area on either side of PCH give back to the natural world and improve conditions for non-human creatures.

When the big rain event came, the creek opened up again and it was amazing to watch all the lively activity there.

Please add me to your list for the meeting on the 11th.

Eileen Delehanty Pearkes
edpearkes.com
Coming in July 2022 from Rocky Mountain Books

From:	Jeffrey Morris
To:	Topanga Lagoon Restoration Project
Subject:	Re: Comment on Notice of Preparation of Environmental Impact Report for Topanga Lagoon Restoration Project
Date:	Wednesday, June 22, 2022 6:50:28 PM

My friends and I (and countless others) have surfed Topanga point religiously for years. Whatever you end up doing to restore the lagoon, please do no harm to our cherished surf break at Topanga. Regarding the draft EIR, please evaluate and disclose impacts each of the project alternatives may have on the surfing waves at Topanga. This is essential for the public to comment on the alternatives, and for the agencies to mitigate any adverse impacts. Finally, please include me on the interested parties list so that I get emails you send regarding the project.

Sincerely

--
Jeffrey Morris
Facility Companies, LLC

facility
www.facilitybrand.com

From:	Jeffrey Morris
To:	Topanga Lagoon Restoration Project
Subject:	Comments on Project
Date:	Monday, June 20, 2022 7:19:07 AM

Hello:
There is not enough consideration for maintaining, exactly as it is today, the surf break. Topanga is a world class break and visited by thousands every year. There is a large and dedicated group of "locals" who surf here every morning. While your plan says to maintain surf break there are no real plans to do that. It feels like lip service. Please dedicate more of your presentation to how you will maintain the break.

--

Jeffrey Morris
Facility Companies, LLC

facility
www.facilitybrand.com

From: Ken Wheeland
To: Topanga Lagoon Restoration Project
Subject: Comment for Topanga Lagoon Scoping meeting
Date: Saturday, June 18, 2022 1:32:13 PM

Ken Wheeland
21026 Hillside Dr.
Topanga Ca. 90290

I am a 35 year resident of Topanga and a member of the Topanga Stream Team.
I have hiked the Topanga creek from the start of the lagoon, the berm, to the top of the Steelhead habitat many times with the stream team, doing research to help protect them.
I would like to see the restoration of the Topanga Lagoon to be as large as possible.
In my view the lagoon is a major element in the health of the surrounding ecosystem.
The purpose should be to increase the natural flora and fauna in the area around the lagoon.
The other factors of buildings and infrastructure should not change the main goal of restoring the lagoon to its original structure and function.

The functions of a lagoon is to filter the flow of water to the ocean and to build up an ecosystem to protect and provide food and shelter to the many fish and animals and birds that inhabit the area.

The more infrastructure that is near the lagoon will increase the amount of non nature visitors to the immediate area of the lagoon. Which results in more disturbance of the resident birds and animals.
Please think of the lagoon and native inhabitants first before bringing in infrastructure other than signage, restrooms, trails, and parking.
Parking could all be on the Topanga Canyon Blvd. side except for along the beach on both sides of the new bridge.

Thanks for the opportunity to comment. Ken Wheeland

From: Kino, Russell J
To: Kino, Russell J; Topanga Lagoon Restoration Project
Subject: Topanga lagoon restoration project
Date: Wednesday, June 22, 2022 8:06:37 PM

Re: Comment on Notice of Preparation of Environmental Impact Report for Topanga Lagoon Restoration Project

I have surfed Topanga point regularly for many years. Whatever you end up doing to restore the lagoon, please do no harm to our cherished surf break at Topanga. Regarding the draft EIR, please evaluate and disclose impacts each of the project alternatives may have on the surfing waves at Topanga. This is essential for the public to comment on the alternatives, and for the agencies to mitigate any adverse impacts. Finally, please include me on the interested parties list so that I get emails you send regarding the project.

Sincerely
Russ

Russ Kino MD FACEP FACEM
Medical Director, Emergency Services
Chief Medical Informatics Officer
Saint John's Health Center
Santa Monica, CA
Cell: 310 6135466
Ofc: 310 5827154

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From: mmc18700pch@gmail.com
To: Topanga Lagoon Restoration Project
Subject: Topanga Lagoon Restoration Project - Comments
Date: Tuesday, June 21, 2022 4:11:44 PM

Dear California Department of Parks and Recreation,

Thank you for the opportunity to submit comments regarding the Topanga Lagoon Restoration Project. I was born in Santa Monica and have lived in Southern California, and enjoyed the local beaches for the entirety of my 68 years.

Of all the beaches in the Los Angeles area, Topanga beach is a favorite, and to me it is a very special place.

I support restoration of the Topanga Lagoon to the greatest extent possible, provided the plan necessarily include the following elements and considerations.

- Preservation of beach access for the enjoyment of the sand, surf, and water access for swimming and kayaking.
- Preservation (and possible improvement) of the surf break, which would include design elements that would promote sand replenishment/deposit from inland via the lagoon.
- Preserve, but not increase, the current amount of parking available on the south side of PCH.
- Preserve the current amount of free parking along PCH.
- Environmental and habitat preservation and improvements:
    - Maintain/improve goby habitat, and improve steelhead fish passage.
    - Protection nesting and beach habitat.
    - Improve water quality.
    - Increase wetland and transitional upland habitat.
- Relocation of the lifeguard headquarters, restroom, and helipad to a location that would protect them from future coastal erosion. NOTE: A helipad on the roof of the lifeguard headquarters sounds like a space saving design, but would this create difficulty and add to precious transit time related to loading seriously injured or unconscious people into the helicopter?
- Anticipate and incorporate plan elements that will mitigate a probable rise in sea level and coastal erosion.

- Maintain and improve disabled access to the beach and bathrooms.

- Increase public transportation accessibility.

- Maintain, or incorporate in any new bridge construction, the under-bridge pedestrian walkway across PCH.

- Preservation of the existing locations of the area small businesses such as Reel Inn, Cholada, and Wylie's Bait Shop. However, I do not feel that preservation of the Topanga Ranch Motel is essential. As much as I like the kitschy atmosphere created by the nonoperational "Motel", I am against its rehabilitation for use as a day or overnight accommodation, or for any visitor or recreational use whatsoever. It is troubling to see that 3 out of the 4 plans preserve the Motel, while only the 'do nothing' Plan 1 preserves local small businesses such as the Reel Inn, Cholada, and Wylie's Bait Shop. If additional area is required to expand the lagoon, it should come from the removal of the Motel and a portion of the parking area on the north side of PCH, while preserving some parking to accommodate Reel Inn customers.

- The plan should not include any new construction for food concessions, stores, shops, visitor's center, or other such project elements that would require additional structures other than that to replace/relocate the lifeguard headquarters, helipad, and restroom.

One last thought.

My dear departed dad has two favorite sayings; "People do what they want to do." and "If it seems too good to be true, then it is." Both come to mind when thinking about the Topanga Lagoon Restoration Project.

The main goal of this project is to improve habitat for the endangered species. This then necessarily involves a whole lot of other stuff, most of which is people and machines demolishing, terraforming and building. But all of this depends upon one thing that is not in our control, water.

Photo documentation has shown that there were very few breaches of the lagoon in 2020, and none at all in 2021. Its hard to not think climate change. Is all this too little too late? The more I thought about this the more I wondered if this whole project (for which will no doubt cost many millions of dollars) is nothing more that a cover for making human improvements that will pave the way for, and only provide benefit to, well-connected contractors and land developers. It's been done before. Cui bono; fish or the rich?

Will these words, and all the words of those who truly Love this beach and the local environment be heard? Or is this just a necessary part of the con to give it an air of legitimacy? I guess it is the not knowing the real genesis of this project that troubles me. I know. Harsh words from a cynical old beach bum. But I'm a beach bum that has lived long enough to know that all too often the "right thing' does not get done.

I believe that there are a lot of well-intentioned people involved with this project, and I truly hope that this will all end with a better place for all (animals and humans alike).

Offering my apologies if I have offended.

Again, thank you for this opportunity to weigh-in on this process.

Sincerely,
Michael A. McNamara
818-426-2443

"Fides quaerens intellectum"
Augustine of Hippo

From:	Michael Bedner
To:	Topanga Lagoon Restoration Project
Cc:	Richard Luskin
Subject:	Comments/Questions
Date:	Monday, June 20, 2022 4:38:09 PM

Topanga Lagoon Restoration Project Team:

The first topic of conversation was about the fish that we are saving with no thought for the people that live here. There are 6 houses on Topanga Beach Drive that will be affected deeply by what is done to the adjacent property and four homeowners called in at the recent Zoom meeting, Anne Ready, Gil Dembo, Cami Colbert and myself (Michael Bedner). We haven't been consulted with other than that and I feel this is a huge mistake. Our taxes alone are much heavier than anyone in Topanga Canyon and we are paying for this through our tax base and I think we deserve a great deal of consideration.

1. Why are we discussing widening the bridge when there is virtually no water in the creek anymore? It is virtually empty as we have no rainfall and have been in a severe draught for decades so this makes no sense. Maybe we should be discussing whether to make it smaller?

2. There has been no real discussion of the cost of this endeavor starting with the bridge, road, and continuing with the relocation of the lifeguard station and the helipad as well as the renovation of the Topanga Ranch Motel which hasn't been maintained in decades and is in total disrepair which makes it a terrible eye sore.

3. We would like to know more about the bridge being so long to create more waterflow beneath it and the added costs of doing so.

4. We are concerned about the Visitor Center and busloads of people being off loaded there onto Topanga Beach.

5. Our prime concern is for the beach itself. How do we maintain the beach and eliminate the erosion of sand? The groins that were put in during the development of the Topanga Beach area were taken out by the city because they did not want to maintain them or absorb the liability. I would strongly urge that you consider reinstating the groins to help protect the beach erosion or other methodology that would achieve the same outcome.

6. I strongly believe that putting power lines underground would help mitigate many problems as well as removing the ugliness of the power poles along PCH as was previously done along Carbon Beach.

7. I have not seen the palm tree I mentioned during my call indicted as preserved because according to your drawings that will become the middle of the lagoon. That has been a very special tree to me during my 60 years living on this beach.

8. There has been no mention of how the pedestrian issue is going to be addressed moving forward. There is currently a bridge with poor signage/lighting and if a new bridge is constructed we need to consider how many undercrossings there will be and how to make better signage and will be no way to cross it unless we go under the bridge to access the amenities on the other side.

9. There has been no mention of how to address the homeless situation that we have all lived with for years.

To recap we are concerned about the cost, the timeframe (I don't believe that the 18-24 month timeline is doable) as well as a more comprehensive understanding about the utility disruption to the residents.

Please email us the renderings that were shown during the presentation so we can review them in detail. I have copied my attorney Rick Luskin and would like to be advised as to when we will be receiving a response to my comments/questions within the timeframe to make proper adjustments to come up with a plan that works for everyone.

Thank you for your time and attention. I eagerly look forward to your response.

Michael Bedner

310-488-7444

From: Natasha Roit
To: Topanga Lagoon Restoration Project
Subject: Lagoon meeting
Date: Saturday, June 11, 2022 9:46:50 AM

I would like to follow up on a sewer line being put in on the corner of PCH and Topanga Canyon, especially with the visitor center and other things that should not be on septic. It is my understanding that the State owns the Red Barn and would like to have that connect to a sewer line as well. Seems like a good opportunity to accomplish both.

Thank you.

Natasha Roit
(310) 883 3111

From: PETER GREENWALD
To: Topanga Lagoon Restoration Project
Subject: Public Comment on NOP for Topanga Lagoon Restoration
Date: Tuesday, June 21, 2022 6:18:19 PM

To: California State Parks; Craig Sap, Danielle LeFer

Thank you for the opportunity to comment on the Notice of Preparation for the Environmental Impact Report for the Topanga Lagoon Restoration project. I generally support restoring the lagoon to a more natural state with improved species habitat. I am writing to urge you to craft the Environmental Impact Report to include information that will allow the public to knowledgeably comment on a key potential impact of the project: effect on the quality of surfing waves at Topanga Point.

Due to its high-quality waves, Topanga Point has long been a unique and valuable resource for countless beachgoers. I have regularly surfed Topanga for over 30 years. During that time, I have seen the substantial impacts that changes in location of stream outflows can create at surf breaks. Malibu is an example where changes in the location of lagoon outflows over the decades have have been followed by significant degradation in the quality of waves at one or more of the three points at that break.

The Notice of Preparation for the Topanga Lagoon Restoration project states generally that the project may have an impact on "recreation," and a PowerPoint presentation by the implementing agencies lists "Protect existing surf break" among "Additional Project Elements." What I have not seen in the written materials, however, is a specific commitment to evaluate and consider impacts on the surf that could be caused by each potential project alternative. Without this information, the public will not be able to knowledgeably comment on the alternatives, and the lead agency will be unable to adequately mitigate potential adverse impacts.

I therefore urge that the environmental impact report include expert analysis of potential changes to the surf break under each alternative. These analyses should to the extent possible include projections regarding (1) the location and strength of stream outflows, and (2) associated impacts on location and amount of sand deposition and shape of the cobblestone point.

Finally, I urge you to make preservation of the value of Topanga Point as a surfing break an explicit "Project Objective" rather than just an "Additional Element" of the project. This will emphasize the importance of fashioning the project to mitigate impacts to this key recreational value of the site.

Thank you for considering my views. I wish you success in this project.

Sincerely

Peter Greenwald

From:	rochelle
To:	danielle.lefer@parks.ca.gov; Topanga Lagoon Restoration Project
Subject:	Your letter dated 05/23/22
Date:	Monday, June 6, 2022 11:17:41 AM

Hi Danielle.

As a resident of this vicinity my entire life, I have seen the transformation of that area just west of Topanga Canyon Boulevard. It was super nice when I was a very small girl to have the hotel and the market there. Then for whatever reason, the market was torn down and the Reel Inn and other restaurants emerged. Something's Fishy was a great place to go for dinner. We were very upset when it was demolished for a parking lot for the city workers that is never used. And the hotel sits there un used.....

Then the threats to get rid of Cholada and the fish bait store emerged. And the fish bait lady's house was demolished for no reason..... Why? The lot just sits there doing nothing. The state took away an elderly lady's house for again a parking lot that was never constructed?????

The state has no idea what it's doing and needs to leave those businesses alone! The restaurants serve all the community and all the visitors to Malibu, Topanga and Los Angeles County. Everything the state has done with that property has been wrong. So just LEAVE IT ALONE! Find something that really needs help, the the homeless crisis in Los Angeles? The huge surge in crime in Los Angeles? There are serious issues in Los Angeles right now and those resources should be directed to fixing the issues and not destroying jobs and lovely restaurants that people enjoy going to visit.

If Parks and Rec has so much money in it's coffers and is looking to do something with it, look around Los Angeles and fixs what's broken! Don't break what's not broken!

Best Regards,

Rochelle Conroy
310.433.2826

From:	Ron Kurstin
To:	Topanga Lagoon Restoration Project
Cc:	DanielleLeFer@parks.ca.gov
Subject:	neighborhood concern regarding Topanga Lagoon project
Date:	Wednesday, June 22, 2022 12:37:58 PM

Thank you for reaching out to us on this important issue.

I am a local homeowner adjacent to the beach and lagoon. I don't understand the priority of enlarging the lagoon, building a bridge and removing or rebuilding the motels and losing our local restaurants.

I believe these funds would be better used to address the erosion of the beaches at Topanga Beach. I have seen the beach erode over the last several years and it is alarming. This should be our number one priority.

Currently, Pacific Coast Highway is a nightmare to drive with constant heavy traffic, accidents and deaths. To try and bring more people to Topanga beach would enhance the problem. Pacific coast Highway is our only avenue for emergency vehicles like fire trucks, police and ambulances. I hear the sirens on PCH every day. More congestion will just increase the problem.

I hope you reconsider this project and direct the funds to better use like improving the beaches.

Regards,

Ron Kurstin
18824 Topanga Beach Drive
Malibu, Ca 90265

310-739-2121 cell

From: STEPHANIE RAMER
To: Topanga Lagoon Restoration Project
Subject: Topanga Lagoon Restoration Project-comments/ concerns
Date: Tuesday, June 21, 2022 5:00:18 PM

To California Department of Parks and Recreation,

Thank you for the opportunity to submit comments regarding the The Topanga Lagoon Restoration Project.

I was born and grew up here in Los Angeles and began surfing Topanga around 23 years ago. It is my local “home" surf break and
one of my favorite beaches. I surf there year round, in all kinds of conditions and weather. Surfers, as a group, are the people who most often and most consistently visit Topanga Beach, second only to those who live or work in the immediate area..
Understandably we are concerned about how The Topanga Lagoon Restoration project will affect our beloved surf break and beach.

I can support the Topanga Lagoon Restoration Project provided the plan includes the following:

* Preservation of easy beach and water access.

* Preservation (possible improvement?) of the surf break, which would include design elements that promote sand replenishment/deposit
from inland via the lagoon.

* Preserve, but not increase, the current amount of parking available on the beach side of PCH.

* Preserve the current amount of free parking along PCH.

* Relocation of the lifeguard headquarters, restroom and helipad to a location that will protect them from future coastal erosion.
NOTE: A helipad on the roof of the lifeguard headquarters sounds like a space saving design, but also like it would create difficulty and add to precious transit time related to loading seriously injured or unconscious people into the helicopter…

* Anticipate and incorporate plan elements that will mitigate a likely rise in sea level and coastal erosion.

* Maintain and improve disabled access to the beach and bathrooms.

* Increase public transportation accessibility.

* Maintain or incorporate in any new bridge construction, the under-bridge pedestrian walkway across PCH.

* Preservation of the existing locations of the area small businesses such as Reel Inn, Cholada, and Wylie’s Bait Shop. I do not, however, feel that preservation of the Topanga

Ranch Motel is essential. I am against its rehabilitation for use as a day or overnight accommodation or for any visitor or recreational use. It is troubling to see that 3 out of the 4 plans preserve the long ago abandoned Motel, while only the "do nothing" Plan #1 preserves the active local small businesses such as the Reel Inn, Cholada and Wylie's Bait Shop. If additional area is required to expand the lagoon, it should come from the removal of the Motel and a portion of the parking area on that side of PCH, while preserving some parking to accommodate Reel Inn customers..

* The plan should not include any new construction for food concessions, stores, visitors center nor other such project elements that would require additional structures other than that to replace/ relocate the lifeguard headquarters, helipad and restrooms.

* I do not want Topanga to become an overdeveloped tourist spot.
That would not in any way help the natural habitat.

* I generally support habitat preservation and protection as well as environmental improvements.
I support improving water quality.
I have no particular resistance to increasing the wetland and transitional upland habitat.

* I do however have serious question about an aspect of your proposal — and that is the idea that you will "restore" an environment in which steelhead trout will be able to swim upstream again. I am not a scientist— and do not know the particulars of gobi habitat nor steelhead trout.
But I know this:
I have been observing the creek at Topanga for over two decades now. Years ago the creek would breech the beach after the first few rains in the Fall-Winter season and generally that breech would remain and the creek would be running through to the sea for most (or much) of the Winter. However I cannot now remember the last time the creek breeched the beach and remained that way for the whole Winter season. The creek breeches only for rather short periods of time these days— if at all. It seems our rainfalls have become woefully insufficient to sustain enough water consistently running downstream for long enough to create the kind of environment you say you intend to create for fish who are to swim up this "stream"..
This aspect of your plan strikes me as being disconnected from current reality at Topanga. I'd like to know how this has been studied or approved or determined? It seems potentially misguided to me.
Additionally, with expected continuation of water shortages in the Los Angeles/So Cal area, my understanding is that there is and will continue to be a greater push to capture rainwater further upstream in order to use it for a variety of purposes rather than let most of the freshwater run all the way to the sea. This represents much of the forward-looking thinking and planning going on in the bigger picture for Los Angeles.

What happens if there is little or no water running down into an "expanded" lagoon area?
Will it fester? Does it dry out? Breed mosquitoes? Become a homeless encampment?
What are the worst case scenarios if you get very little or no water flowing down through Topanga Creek?
And what might be the potential effects on the surf break?

Also, what kind of dangers will there be to the surfers in the water from pollution or runoff

during the construction and fill removal periods?
Most of your plans sound like they will take years— not weeks or even months.
Topanga surfers will be vulnerable to whatever is exposed and ends up in the water during that long period of time.

Please do keep me informed about all developments with regard to the Topanga Lagoon Restoration Project.
Thank you for reading and considering my comments and concerns.

Sincerely,

Stephanie Ramer

From: Tim Pattinson
To: Topanga Lagoon Restoration Project
Subject: Restoration
Date: Tuesday, June 21, 2022 4:46:02 PM

Hello,
I'm concerned this project is being pushed through because the money is there,spend it while you can.As I sat through the zoom meeting the other day, I heard all the people in charge of their expertise state the Malibu Lagoon project was a success. Well it was not.There is no fish life. with no flow of the creek the lagoon has died.No oxygen. We as surfers warned this would happen and it did. So I am having a hard time believing you have thought this all out.
Thank you for letting us speak up
Sincerely Yours
Tim Pattinson.

From: Tim Robinson
To: Topanga Lagoon Restoration Project
Subject: Topanga Lagoon Restoration Project - letter of support
Date: Thursday, June 16, 2022 3:35:17 PM

To whom it may concern,

I'm writing to express my support of the Topanga Lagoon Restoration Project. This is an ambitious but important restoration effort that will make a vast improvement to the general area, public access and enjoyment and most importantly for the migratory fish that inhabit Topanga Creek, the lagoon and ocean beyond. The RCD of the Santa Monica Mountains is well equipped to spearhead and implement this project given their history and professional experience with fisheries biology research and restoration in the area, specifically the magnitude and success of the restoration effort they directed on the Malibu Creek lagoon. I have been working on southern California Steelhead recovery in the Santa Ynez River watershed for several decades and I am very familiar with the life history strategies and challenges of that fishery. The lagoon of these coastal streams plays a critical role in maintaining and providing habitat for this iconic and endangered species in that precarious zone of transition from freshwater to saltwater. I highly support the effort and the assembled team to successfully design and implement the project.

Thank you for considering my comments.

Sincerely,

Tim Robinson, PhD

Senior Resource Scientist

Santa Ynez River Steelhead Monitoring and Restoration

Santa Barbara County Resident

Stephanie Breeden

From: Jamie King <jamiekingrcd@gmail.com>
Sent: Wednesday, May 25, 2022 4:23 PM
To: Stephanie Breeden
Cc: Rosi Dagit
Subject: NOP response, new contact

Hi Stephanie-

We received the following comment on the Topanga project via an RCD weblink. For your official "NOP response" file, and a contact to add to the master contact list please.

I want to avoid spamming you so let me know if you want us to forward these as they come or consolidate to send once a week, or..? Also do these go just to you or to other team members?

Jamie

From: Topanga Lagoon Restoration Comments/Questions <outreach@rcdsmm.org>
Sent: Tuesday, May 24, 2022 12:49 PM
To: akahler@rcdsmm.org
Subject: Topanga Lagoon Restoration Comments/Questions

First and Last Name

Joseph Soleiman

Email Address

hjsoleiman@gmail.com

Comments / Questions

I am concerned as to the ongoing congestion from traffic, cars and RV parking that blocks site lines and views of the beach.

--
Jamie King, Conservation Biologist

Resource Conservation District of the Santa Monica Mountains
jking@rcdsmm.org
(818) 597-8627 ext. 106

--

Jamie King, Conservation Biologist
Resource Conservation District of the Santa Monica Mountains
540 S. Topanga Canyon Blvd.
Topanga, CA 90290

jking@rcdsmm.org
(818) 597-8627 ext. 106

Appendix B

Topanga Lagoon Restoration Technical Report for Shoreline Morphology Analyses (Moffatt & Nichol 2023)

The Appendices herein contain supporting information. These Appendices contain highly detailed figures and other graphic information, which are difficult to translate for screen reading software; therefore, the Appendices have not been translated into an auditory format. If you have a disability and/or have difficulty accessing any material in this document, please contact us by mail, email, or telephone, and we will work with you to make all reasonable accommodations. Please indicate 1) the nature of the accessibility need; 2) your preferred format; 3) the material you are trying to access and its location within this document; and 4) how to reach you if questions arise while fulfilling your request. You can direct your requests to:

John Ota
1925 Las Virgenes Rd.
Calabasas, CA 91302-1909
Phone: (310) 945-8512
Email: john.ota@parks.ca.gov

REPORT
Produced for Resource Conservation District of the Santa Monica Mountains
December 30, 2023

moffatt & nichol

TOPANGA LAGOON RESTORATION

Technical Report for Shoreline Morphology Analyses

Document Verification

Client	Resource Conservation District of the Santa Monica Mountains (RCDSMM)
Project name	Topanga Lagoon Restoration
Document title	Technical Report for Shoreline Morphology Analyses
Document sub-title	–
Status	
Date	12/30/2023
Project number	10812-03
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Revision	Description	Issued by	Date	Checked
00	Draft Report	Z. Wang/Q. Wang	11/16/2023	W. Jin//C. O'day
01	Final Report	Z. Wang/Q. Wang	12/15/2023	W. Jin
02	Final Report	Q. Wang	12/30/2023	W. Jin

Produced by:

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Table of Contents

1 Introduction 1
2 Scope of Work 4
3 Model Developments 6
3.1 Delft3D FM 6
3.2 Flow Model Mesh 6
3.3 Wave Model Grids 8
3.4 Model Topography and Bathymetry 8
3.5 Flow and Wave Model Calibration 9
3.5.1 Boundary Conditions and Model Parameters 11
3.5.2 Hydrodynamic Calibration Results 11
3.5.3 Wave Calibration Results 13
3.6 Morphology Model Calibration 18
3.6.1 Initial Topobathy Condition 18
3.6.2 Flow Model Boundary Conditions 18
3.6.3 Wave Boundary Conditions 18
3.6.4 Winds 24
3.6.5 Morphological Time Scale Factor (morfac) 24
3.6.6 Sediments 24
3.6.7 Model Parameters 27
3.6.8 Annual Potential Longshore Sediment Transports 28
3.6.9 Morphology Calibration Results 29
4 Morphological Modeling – Alternatives 35
4.1 Topanga Lagoon Restoration Alternatives 35
4.1.1 Channel Breach Scenario 35
4.1.2 SLR Condition 35
4.1.3 Initial Bathymetry 35
4.1.4 Sediments 35
4.2 Topanga Creek Inputs 36
4.3 Morphological Modeling Results 38
4.3.1 Dry Weather Condition 38
4.3.2 10-yr Return Period Fluvial Storm Condition 39
4.3.3 100-Year Return Period Fluvial Storm Condition 42
4.4 Summary of Findings 44
5 Historical Shoreline Changes 46
5.1 Aerial Imagery 46
5.2 Historical Beach Profiles and Widths 50
6 Questions and Responses 52
6.1 Morphology Related Questions 52
6.2 Surf Quality Related Questions 52
6.3 Water Quality Related Question 53
6.4 Sea Level Rise Impact Questions 54
6.5 Beneficial Reuse of Excavated Materials Questions 54
7 References 56
8 Appendix A: COAST Long-term Shoreline Change Analysis 58
9 Appendix B: Topanga Surf Quality Impact Assessment Report 59

List of Figures

Figure 1.1: Topanga Lagoon Restoration Location and Extent 1
Figure 1.2: Topanga Lagoon Project Site With Key Features Labeled 3
Figure 2.1: Topanga Lagoon Restoration Grading Plans of Alternatives 5
Figure 3.1: Model Domain and Flexible Mesh of Delft3D FM Flow Model 7
Figure 3.2: Flexible Mesh of Zoomed in Lagoon Area 7
Figure 3.3: Structured Model Grids of Delft3D FM Wave Model 8
Figure 3.4: Model Topobathy for Morphology Calibration 9
Figure 3.5: Sheet Pile Groin West of Helipad 9
Figure 3.6: Map of Data Locations Used in Flow and Wave Model Calibration 10
Figure 3.7: Comparison of Modeled and Measured Currents at NDBC46268 12
Figure 3.8: Event 1 - Comparison of Modeled and Measured Significant Waves at NDBC46268 14
Figure 3.9: Event 1 - Comparison of Modeled and CDIP Hindcast Significant Waves at MOP L0808 15
Figure 3.10: Event 2 - Comparison of Modeled and Measured Significant Waves at NDBC46268 16
Figure 3.11: Event 2 - Comparison of Modeled and CDIP Hindcast Significant Waves at MOP L0808 17
Figure 3.12: Tidal Boundary Conditions at Offshore 18
Figure 3.13: Wave Height Rose at WIS Station 84072 19
Figure 3.14: Overview of Opti-Method Procedure Modified from Van Rijn (2012) 21
Figure 3.15: Delft3D Grid and Target Area for Wave Schematization 21
Figure 3.16: Representative Wave Boundary Conditions in a Typical Year at Offshore 24
Figure 3.17: Sediment Sampling Locations 25
Figure 3.18: Marine Habitat Types (CRM, 2023) 26
Figure 3.19: Initial Sediment Thickness Map 27
Figure 3.20: Potential Net Annual Longshore Sediment Transport Rates 29
Figure 3.21: Profile Stations in the Project Area 30
Figure 3.22: Elevation Differences Between 2009 and Original 2014 LIDAR 31
Figure 3.23: Elevation Differences Between 2009 and Lowered 2014 LIDAR 31
Figure 3.24: Example Profile Comparisons between Surveys 32
Figure 3.25: Modeled Morphology Changes After 1 Year 33
Figure 3.26: Modeled Morphology Changes After 5 Years 33
Figure 3.27: Cross-shore Transects – Model Cross-shore Grid Lines 34
Figure 3.28: Volume Changes Near Topanga Lagoon Above -24 ft-NAVD (Modeled vs LIDAR) 34
Figure 4.1: Model Bathymetry for Alternatives 36
Figure 4.2: Topanga Creek Flows for Alternatives 37
Figure 4.3: Topanga Creek Sediment Inputs for Alternatives – 10-yr Event 37
Figure 4.4: Topanga Creek Sediment Inputs for Alternatives – 100-yr Event 37
Figure 4.5: Model Predicted Bathymetry of Alternative 1 Under Dry Weather Conditions: 1 yrs and 5 yrs 38
Figure 4.6: Model Predicted Post-1-yr Bathymetry of Alternative 2 and Difference From Alternative 1 Under Dry Weather Conditions 38
Figure 4.7: Model Predicted Post-5yr Bathymetry of Alternative 2 and Difference from Alternative 1 Under Dry Weather Conditions 39
Figure 4.8: Model Predicted Bathymetry of Alternative 1 After 10-yr RP Fluvial Storm: 1yr and 5yr 39
Figure 4.9: Model Predicted Post-1yr Bathymetry of Alternative 2 and Difference from Alternative 1 after 10-yr RP Fluvial Storm 40
Figure 4.10: Model Predicted Post-5yr Bathymetry of Alternative 2 and Difference from Alternative 1 after 10-yr RP Fluvial Storm 40
Figure 4.11: Model Predicted Post-1yr Bathymetry of Alternative 3 and Difference from Alternative 1 after 10-yr RP Fluvial Storm 40
Figure 4.12: Model Predicted Post-5yr Bathymetry of Alternative 3 and Difference from Alternative 1 after 10-yr RP Fluvial Storm 41

Figure 4.13: Model Predicted Post-1yr Bathymetry of Alternative 4 and Difference from Alternative 1 after 10-yr RP Fluvial Storm 41
Figure 4.14: Model Predicted Post-5yr Bathymetry of Alternative 4 and Difference from Alternative 1 after 10-yr RP Fluvial Storm 41
Figure 4.15: Model Predicted Bathymetry of Alternative 1 After 100-yr RP Fluvial Storm: 1yr and 5yr 42
Figure 4.16: Model Predicted Post-1yr Bathymetry of Alternative 2 and Difference from Alternative 1 after 100-yr RP Fluvial Storm 42
Figure 4.17: Model Predicted Post-5yr Bathymetry of Alternative 2 and Difference from Alternative 1 after 100-yr RP Fluvial Storm 43
Figure 4.18: Model Predicted Post-1yr Bathymetry of Alternative 3 and Difference from Alternative 1 after 100-yr RP Fluvial Storm 43
Figure 4.19: Model Predicted Post-5yr Bathymetry of Alternative 3 and Difference from Alternative 1 after 100-yr RP Fluvial Storm 43
Figure 4.20: Model Predicted Post-1yr Bathymetry of Alternative 4 and Difference from Alternative 1 after 100-yr RP Fluvial Storm 44
Figure 4.21: Model Predicted Post-5yr Bathymetry of Alternative 4 and Difference from Alternative 1 after 100-yr RP Fluvial Storm 44
Figure 5.1 1928 Imagery of the Topanga Point (Old PCH ALignment) 47
Figure 5.2 1940 Imagery of the Topanga Point (New PCH ALignment) 47
Figure 5.3 1947 Imagery of the Topanga Point (New Helipad) 48
Figure 5.4 1976 Imagery of the Topanga Point (After Helipad before Lifeguard Buildings) 48
Figure 5.5 1980 Imagery of the Topanga Point (New Lifeguard Tower) 49
Figure 5.6 2001 Imagery of the Topanga Point (New Sheetpile Groin) 49
Figure 5.7 2023 July Imagery of the Topanga Point (Present Condition) 50
Figure 5.8 Historical Shoreline Changes Within the Study Area (CoastSat, 2023) 51

List of Tables

Table 3.1: TopoBathy Data Sources 9
Table 3.2: Data Used in Flow and Wave Model Calibration 10
Table 3.3: Model Parameters of Flow and Wave Coupled Model 11
Table 3.4: Full Wave Climate Classes at Model Offshore Boundary 22
Table 3.5: Wave Schematization Results From OPTI-Method and Morfac 23
Table 3.6: Morphological Model Parameters and Values Used in Delft3D FM 28
Table 4.1: Modeled Channel Breach Scenarios 35

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Glossary

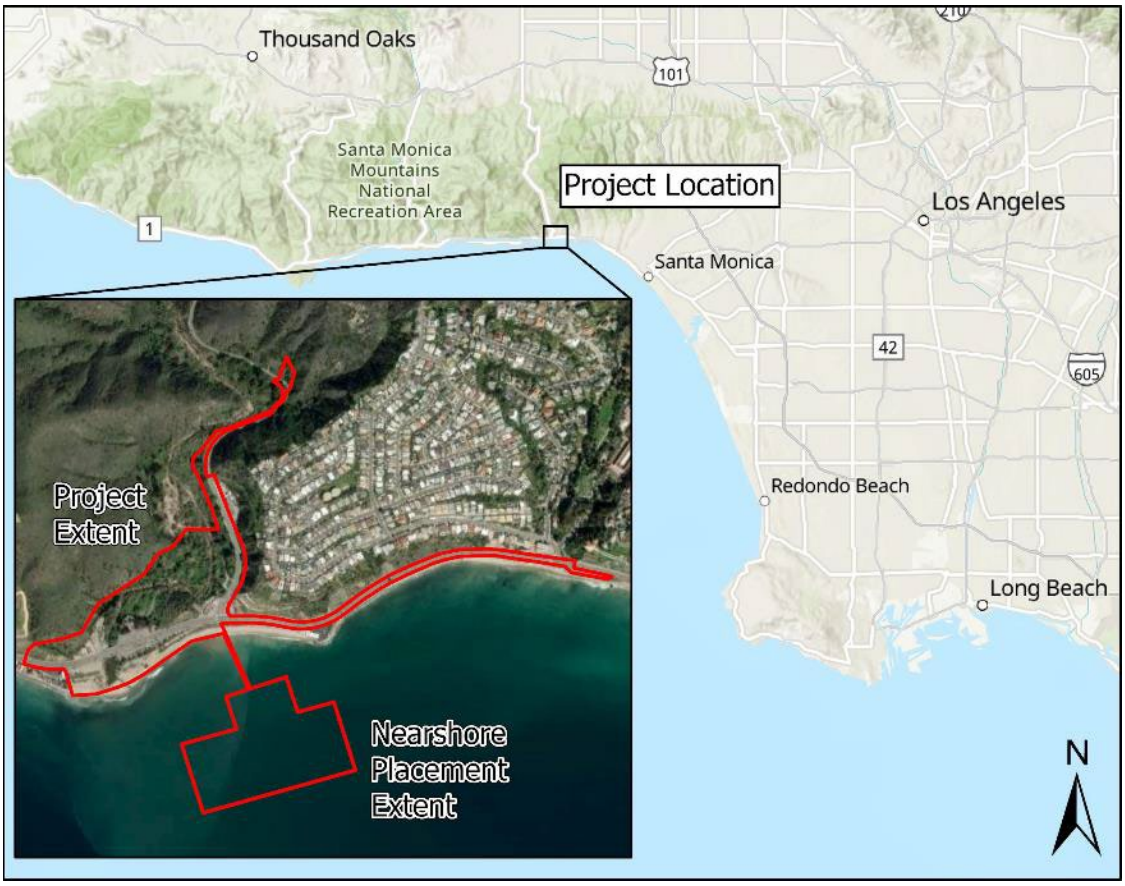
2D	Two-dimensional
3D	Three-dimensional
CDIP	Coastal Data Information Program
CRM	Coastal Resources Management, Inc.
cy	Cubic yards
DHB	Los Angeles County Department of Beaches and Harbors
FM	Flexible Mesh
ft	Feet
Lidar	Light Detection and Ranging
m	Meters
mm	Millimeters
MHHW	Mean Higher High Water
M&N	Moffatt & Nichol
MOP	Monitoring and Prediction (MOP)
morfac	Morphological Time Scale Factor
NAVD88	North American Vertical Datum of 1988
NDBC	National Data Buoy Center
NOAA	National Oceanic and Atmospheric Administration
PCH	Pacific Coast Highway
RCDSMM	Resource Conservation District of the Santa Monica Mountains
RP	Return Period
s	Seconds
SC-DMMT	Southern California Dredge Material Management Team
SLR	Sea Level Rise
TAC	Technical Advisory Committee
TCB	Topanga Canyon Boulevard
Topobathy	Topographic and bathymetric
USACE	U.S. Army Corps of Engineers
USGS	United States Geological Survey
WIS	Wave Information Study
yr	Year

1 Introduction

Moffatt & Nichol (M&N) is contracted with Resource Conservation District of the Santa Monica Mountains (RCDSMM) to provide professional services to restore estuarine lagoon habitat at Topanga Lagoon. Topanga Lagoon is the lagoon of lower Topanga Creek where it empties into the Pacific Ocean in Los Angeles County, California. The focused area of the Topanga Lagoon Restoration project is the lagoon and riparian areas between Topanga State Beach and approximately 2,300 feet (ft) upstream of Pacific Coast Highway (PCH) Bridge. Figure 1.1 illustrates the lagoon restoration planning area. The Proposed Project area is entirely publicly owned and consists of 30 acres within parcels acquired by CDPR in 2001 as part of the Lower Topanga Acquisition, approximately 10 acres within Topanga Beach operated by DBH, and approximately 10 acres of Caltrans right-of-way (ROW) along PCH and TCB.

The tributary to Topanga Lagoon, Topanga Creek drains an 18-square-mile watershed in the Santa Monica Mountains to the Pacific Ocean. It conveys flood flows to the lagoon during rain events and low flows during non-rain events. A beach berm, which typically develops during summer wave conditions, restricts direct flow into the Pacific Ocean. The beach berm is breached during fluvial storms with sufficient flow volumes and velocities, and during combined large coastal storm wave and king tide events. This allows seawater to inflow into the lagoon, thus creating a connection, and provides fish passage opportunities. The restoration priority for endangered tidewater gobies and southern steelhead trout in Topanga Lagoon and its tributary was identified by the Santa Monica Mountains Steelhead Habitat Assessment (CalTrout 2006) and the Santa Monica Mountains National Recreation Area General Management Plan (National Park Service, 2002).

FIGURE 1.1: TOPANGA LAGOON RESTORATION LOCATION AND EXTENT



The Topanga Lagoon Restoration project aims to expand the current Topanga Lagoon habitat area and return the lagoon toward its historic footprint. There are three action design alternatives that are currently being considered for the project in which the Pacific Coast Highway (PCH) bridge is lengthened, material is excavated from the lagoon, and the existing Lifeguard building and Helipad are relocated farther inland to allow the site to be more resilient to sea level rise (SLR). The objectives of this project are to restore lagoon habitat and species, improve estuarine hydrologic function and water quality, enhance SLR and coastal erosion resilience, and integrate public and emergency access while not negatively affecting the quality of the Topanga Point surf break. Although the overall objectives of this project align well with those of the local surf community, beachgoers, and fellow conservationists, unintended negative consequences to the surrounding shoreline caused by the restoration efforts are of concern. To avoid these consequences, a shoreline morphology study is requested to further understand the effects of several action items of the project.

Currently, the beach areas surrounding the Topanga Lagoon inlet have experienced erosional issues that have negatively impacted the beach and infrastructure. The Lifeguard building requires berming and armoring to prevent further erosion from high tides and wave storm events. The beach to the east of the Lifeguard building has narrowed to the point where lifeguards cannot drive to the cove beach and launch water vehicles for rescues. The primary concern is that removing the current Lifeguard and Helipad may cause an unintended increase in coastal erosion during storm events, eliminating the beach west of the Helipad and the Topanga cove beach. The public has voiced that this infrastructure may be acting as an anchor for the surrounding beaches; therefore, its removal could be detrimental to what is left of the beach. Another concern is the expansion of the lagoon footprint and lengthening of the PCH bridge could lead to the creek moving farther east thus negatively affecting the beach and surf quality. The restoration design alternatives will regrade the areas surrounding the lagoon and excavate material to increase the overall habitat area, making the area south of PCH lower in elevation overall, but still resilient to the SLR and above the beach berm elevation. Although this creates valuable lagoon habitat and returns the lagoon closer to the historical conditions, the concern was that it may unintentionally decrease the erosional protection of the point and change the way the lagoon breaches into the ocean during a high rainfall event. The frequency and direction of lagoon breaching is important for the quality of the surf break. Anecdotally, a more easterly breach direction temporarily decreases the water quality of the surf at Topanga Point and is ideally to be as far west as possible. Another concern was that the redesign of the lagoon may affect how the lagoon breaches and migrates once it breaches.

In summary, the main concerns (as labeled in Figure 1.2) are that the combined effects of removing (a) the Lifeguard building and (b) the Helipad west of the lagoon, (c) lengthening the PCH bridge, and reconfiguring the lagoon may negatively affect recreational activities at Topanga beach and the surf at the Topanga Point. The main features (labeled in Figure 1.2) of concern are as follows:

1) The Topanga cove beach
2) The beach west of Helipad
3) More easterly lagoon inlet breaches
4) The quality of the surf at the Point

Comprehensive technical analyses on waves, hydrodynamics, sediment transport, and beach morphology were conducted for both existing and proposed alternatives to investigate these concerns. These analyses are discussed in detail in the following sections.

FIGURE 1.2: TOPANGA LAGOON PROJECT SITE WITH KEY FEATURES LABELED

2 Scope of Work

The engineering scope of work is composed of the following tasks:

- Task 1 – Collect and Review Available Data and Studies and Determine Current Shoreline Position
- Task 2 – Long Term Shoreline Morphology Modeling with and Without the Proposed Project
    - a – Delft3D Wave/Hydro/Sed/Cobble Transport Model
    - b – Dispersion of lagoon sediment supply to the ocean
    - c – Long term shoreline and beach position
- Task 3 – Surf Impact Analysis
    - a – Surfability Analysis
    - b – Accessibility
    - c – Water Quality Analysis
    - d – Contingent Behavior Focus Group Analysis
- Task 4 – Local Outreach & Meetings
- Task 5 – Reporting

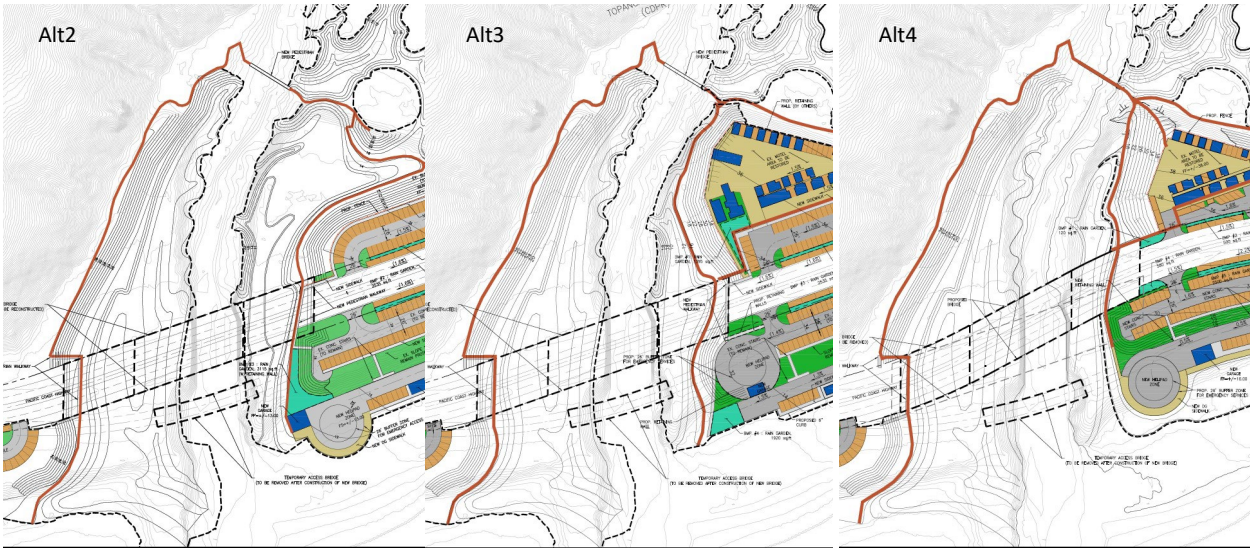
This report mainly focuses on the analyses and findings of Task 2a and Task 2b.

Task 2a consists of developing a numerical model using Delft3D model suite to simulate wave, hydrodynamics, sediment transport and morphology changes at Topanga Lagoon mouth and Topanga Point. The model is capable of simulating grain sizes from fine sand to cobble/gravel and the sorting and armoring process. The modeling results are used to quantify bathymetry and beach profile changes due to the proposed project and to assess potential impacts to the surf break. In Task 2b, the sediment supply from the lagoon to the ocean will be dispersed and its pathway and fate predicted using the model developed in Task 2a. The model will route sediment delivered to the shoreline during stormflows to the surf zone and predict its spread and deposition over time and space. The sediment input from Topanga lagoon is based on the sediment delivery predicted from three lagoon alternatives from a prior lagoon sediment transport study that used Mike11 model. The three proposed alternatives as shown in Figure 2.1 and further described below were developed based on the Topanga State Park General Plan approved by the State Park and Recreation Commission in 2012, and feedback from the public and project's TAC during 2019-2021:

- Alternative 1 is (no action) existing conditions.
- Alternative 2 (maximum lagoon habitat expansion) involves the most significant change to the lagoon and allows slightly more sediment deposition from the watershed in the lagoon; hence, delivers less sediment to the beach due to its larger lagoon footprint.
- Alternative 3 (limited lagoon habitat expansion) is a more limited west side only lagoon habitat expansion alternative and the closest alternative to the existing conditions.
- Alternative 4 (maximum managed retreat) expands the area for managed retreat by moving the highway northward and expands lagoon habitat primarily on the west side.

For all proposed alternatives, there is no grading in the current wet lagoon footprint below elevation +10 ft and no grading south of the current beach berm. All proposed gradings are above elevation +14 ft, except a proposed pilot channel along a historical thalweg under the proposed PCH bridge. Therefore, no morphological impacts are expected for all alternatives under the current sea level and dry weather conditions.

FIGURE 2.1: TOPANGA LAGOON RESTORATION GRADING PLANS OF ALTERNATIVES



Source: California State Parks 2020

3 Model Developments

The Topanga Lagoon hydraulic system is a shallow lagoon with a thalweg elevation of +4 ft NAVD88. The lagoon is usually closed, but breaches open under large discharge events from the watershed and remains open for a short period of time. When the lagoon is open, it is a well-mixed hydraulic system in a way that seawater gets in during high tide and freshwater runoff drains from the upstream Topanga Creek watershed. Two-dimensional (2D) hydrodynamics, waves, sediment transports, and morphological change numerical modeling was performed to investigate potential impacts on adjacent beaches and surf quality. Modeling results between Alternative 1 (the Existing Condition) and three proposed alternatives were compared to understand the these impacts due to the restoration of Topanga Lagoon. This section describes the selected Delft3D Flexible Mesh Model suite (Delft3D FM), the model domain, setup, and model calibration results.

The model horizontal coordinates are in California State Plane Zone 5 (meters), and the model vertical datum is the North American Vertical Datum of 1988 (NAVD88).

3.1 Delft3D FM

The open-source Delft3D FM model suite developed by Deltares, Netherlands was selected to study hydrodynamics, wave transformation, sediment transports and morphological changes in Topanga Point and its adjacent beaches. It is the successor of the Delft3D Suite. Like Delft3D, the Delft3D FM suite can simulate storm surges, hurricanes, tsunamis, detailed flows and water levels, waves, sediment transport and morphology, water quality and ecology in coastal, estuarine and river environments, and can handle the interactions between these processes. Unlike structured grids used in Delft3D, Delft3D FM applies flexible meshes which can vary in mesh size and shape.

The FLOW module of Delft3D FM is a multi-dimensional (2D or 3D) hydrodynamic and transport simulation program that calculates non-steady flow and transport phenomena resulting from tidal and meteorological forcings (Deltares, 2023a). The WAVE module is used to simulate wave transformation, wave generation by wind, non-linear wave-wave interaction and dissipation for a given bottom topography, wind field, water level and current field in waters of deep, intermediate, and finite depth (Deltares, 2023b). The standard option within Delft3D FM is the third-generation SWAN wave model (Booij et al., 1999; Ris et al., 1999). The FLOW and WAVE modules are fully coupled for the automatic transfer of relevant data back and forth between them. The MOR module (Deltares, 2023c) computes sediment transport (both suspended load and bedload) and morphological changes for an arbitrary number of cohesive and non-cohesive fractions. Both currents and waves act as driving forces, and a wide variety of transport formulae have been incorporated. An essential feature of the MOR module is the dynamic feedback with the FLOW and WAVE modules.

3.2 Flow Model Mesh

In Delft3D FM, the flexible meshes can include both orthogonal curvilinear and triangle elements. Figure 3.1 shows the flow model mesh, which starts from Big Rock Beach in the west and ends at Gladstones Beach in the east. The model lateral boundaries are taken far away from the project area to eliminate potential boundary condition-induced effects to model results in the interested area. The model domain is extended 1.4 miles offshore of Topanga Lagoon. The upstream boundary is at the current PCH bridge location. The flexible meshes adjacent to the Topanga Lagoon are presented in Figure 3.2.

Most of the model mesh consists of orthogonal curvilinear elements (rectangle is a special case of curvilinear element), triangle elements are only applied when connecting different resolutions of curvilinear elements. The mesh sizes range from 20 m (66 ft) in the offshore and 2.5 m (8 ft) in the nearshore.

FIGURE 3.1: MODEL DOMAIN AND FLEXIBLE MESH OF DELFT3D FM FLOW MODEL

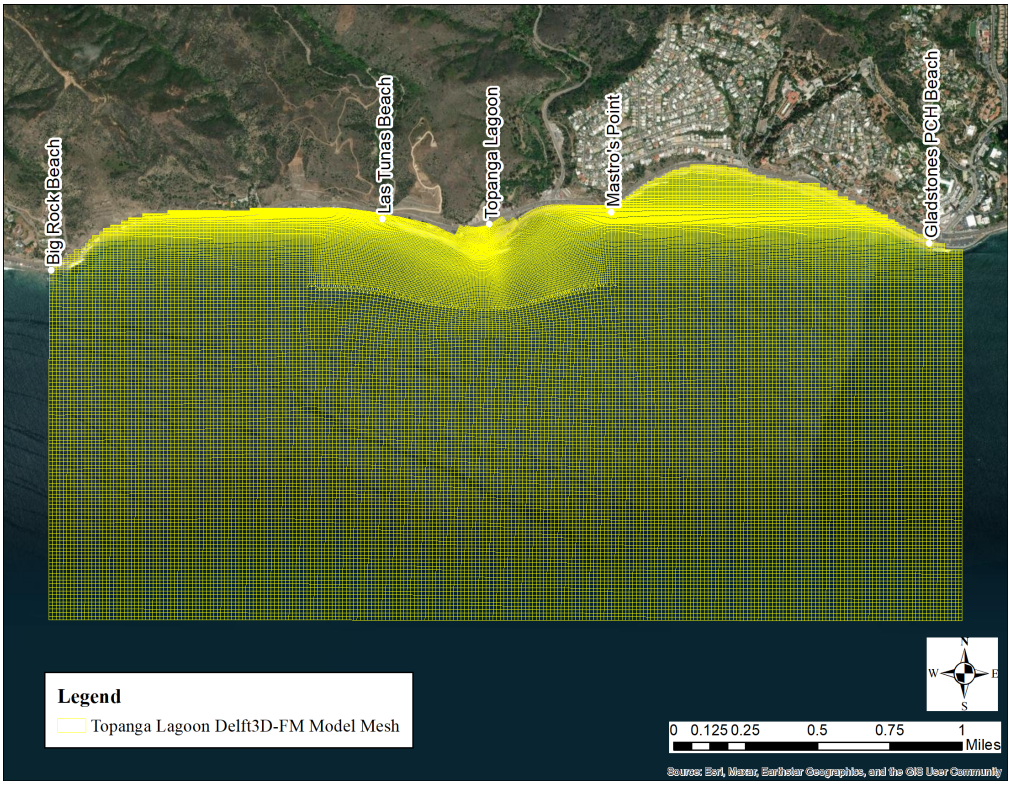


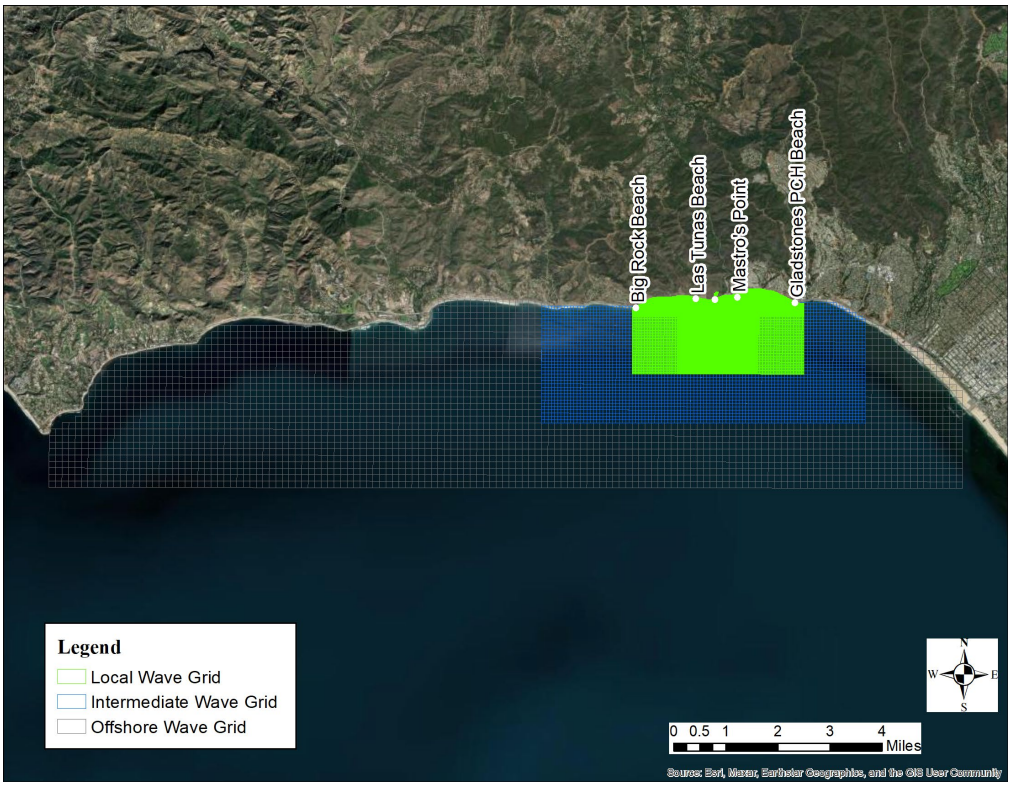
FIGURE 3.2: FLEXIBLE MESH OF ZOOMED IN LAGOON AREA

3.3 Wave Model Grids

In the current stage of Delft3D FM development, curvilinear structured grids are still used for the Wave module.

Figure 3.3 presents the wave model grids developed for this project. A nested grid approach is selected in order to save computation time. The offshore wave grid has a resolution of 200 m (656 ft), covering Santa Monica Bay from Point Dume in the west to Santa Monica in the east with offshore boundary aligned with USACE Wave Information Study (WIS) hindcast wave stations. The local wave grid has an identical extent as the Flow model mesh, with finer resolutions in the middle section of the model domain alongshore wise and nearshore region cross-shore wise. An intermediate wave grid with a resolution of 100 m (328 ft) is added between the coarse offshore wave grid and the fine local wave grid.

FIGURE 3.3: STRUCTURED MODEL GRIDS OF DELFT3D FM WAVE MODEL



3.4 Model Topography and Bathymetry

Topographic and bathymetric (Topobathy) data from several sources were compiled and processed to cover the entire computational domains. All datasets were adjusted to NAVD88 vertical datum. The data sources used in the model developments are listed in Table 3.1. The bathymetry of the lagoon was based on the existing conditions for Alternative 1 and proposed grading conditions for Alternatives 2 through 4. The morphological model calibration was focused on the measured morphological changes in the nearshore ocean calculated based on 2009 and 2014 Lidar surveys. Thus, the 2009 USACE Topobathy Lidar DEM was used to develop the initial bathymetry for the morphology model calibration. The 2014 USACE Topobathy Lidar DEM was applied when developing model topobathy for alternative analyses to represent the current beach states. In the offshore region where the Lidar DEMs are absent, the Santa Monica 1/3 arc-second DEM was used. Partial model initial topobathy for morphology calibration is presented in Figure 3.4 for the Topanga Lagoon neighborhood.

The existing sheet pile "groin" at the west end of the beach west of Helipad (as shown in Figure 3.5) was included in the model as a "thin dam" which is a sub grid feature blocking the flow exchange.

TABLE 3.1: TOPOBATHY DATA SOURCES FOR THE NEARSHORE OCEAN

Dataset	Source
2014 USACE NCMP Topobathy Lidar DEM: California	NOAA NCEI
2009 USACE NCMP Topobathy Lidar DEM: California	NOAA NCEI
Santa Monica, California 1/3 arc-second MHW Coastal Digital Elevation Model, 2010	NOAA NCEI

FIGURE 3.4: MODEL TOPOBATHY FOR MORPHOLOGY CALIBRATION

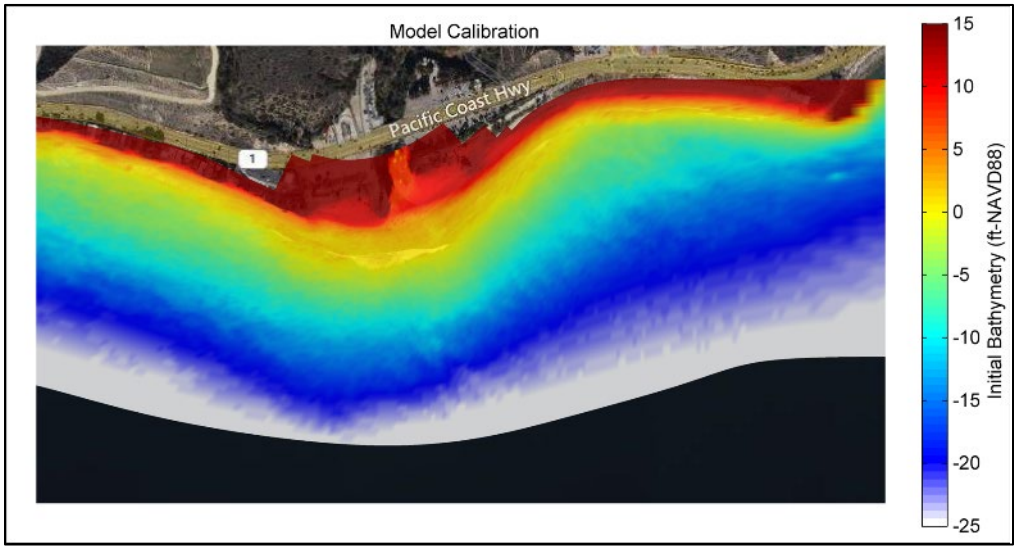


FIGURE 3.5: SHEET PILE GROIN WEST OF HELIPAD

3.5 Flow and Wave Model Calibration

This section describes the calibration of the Delft3D FM flow and wave coupled model. Two historical storm events were selected for the calibration. The calibration event needs to be within the period when the

measurements at NDBC buoy for calibration and USACE's WIS hindcast waves to force the model overlap. The overlap period covers 2020 and 2021 winter storms; thus, one representative storm event was selected in each winter as listed below:

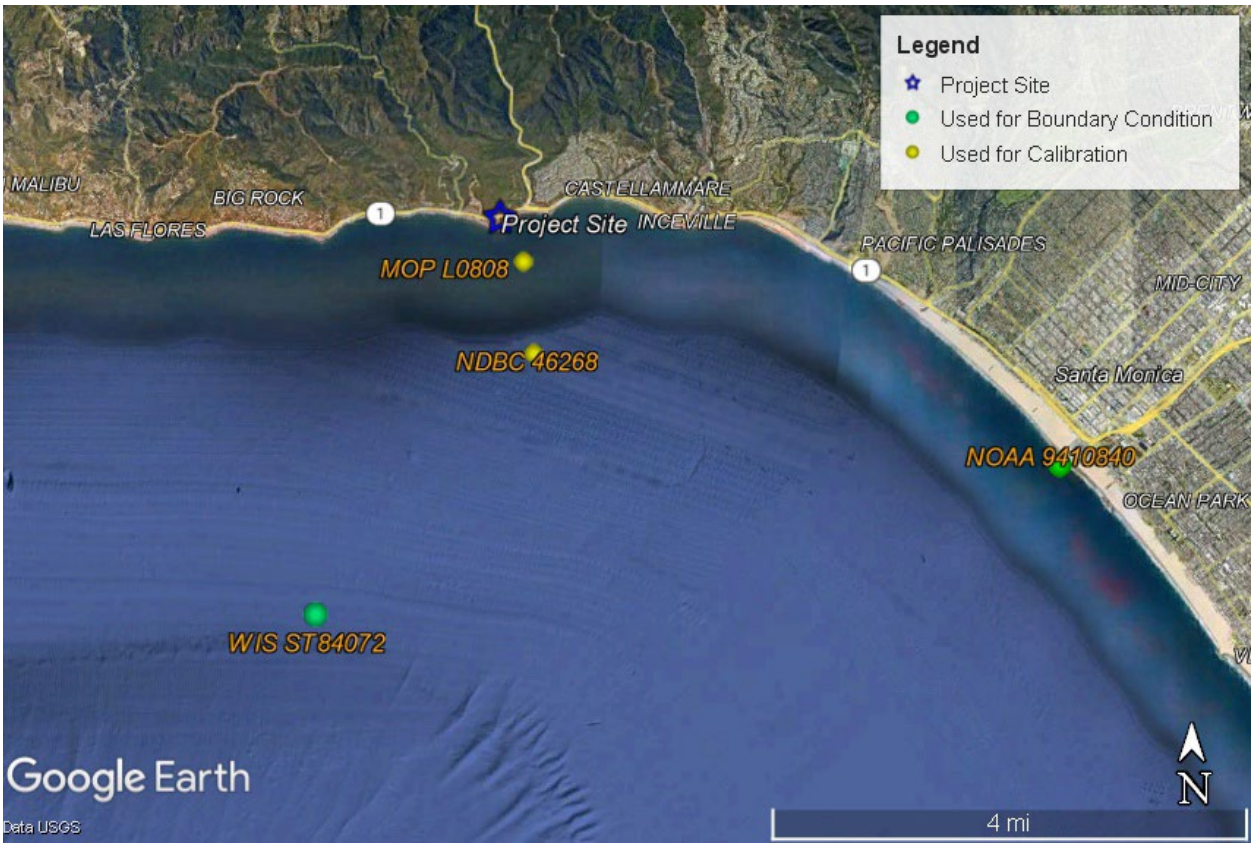
- Event 1: December 28, 2020 to December 30, 2020
- Event 2: December 14, 2021 to December 16, 2021

The water level, currents and wave measurements used in the calibration are summarized in Table 3.2. Figure 3.6 illustrates the location of these measurements.

TABLE 3.2: DATA USED IN FLOW AND WAVE MODEL CALIBRATION

Station Name	Location	Data Period	Data Type	Purpose
NOAA Station 9410840 Santa Monica	118°30' W 34°0.5' N	04/2009 to current	Wind and water level measurements	Boundary Condition
USACE WIS Station 84072	118°36.6' W 33°59.4' N	02/1980 to 12/2021	Wave hindcast data	Boundary Condition
NDBC Station 46268 Topanga Nearshore	118°34.7' W 34°1.3' N	08/2020 to current	Wave and ocean current measurements	Calibration
CDIP MOP Site L0808 Topanga at 10m depth	118°34.77' W 34°2.01' N	01/2000 to current	Wave hindcast data	Calibration

FIGURE 3.6: MAP OF DATA LOCATIONS USED IN FLOW AND WAVE MODEL CALIBRATION



3.5.1 Boundary Conditions and Model Parameters

The flow module was forced by water level time series applied on the offshore boundary on south. The water level time series was based on the NOAA tide gauge measurements at Santa Monica (Station 9410840). The east and west boundaries (cross-shore boundaries) were applied as Neumann boundary. Neumann boundary helps to avoid unrealistic high or low velocities on the open boundary.

The wave model was forced by wave hindcast data from US Army Corps of Engineers Wave Information Study (WIS) Station ST84072 along the offshore wave grid's south boundary (described in Section 3.3). Time varying wind from NOAA gauge 941080 Santa Monica was applied in the entire domain. As a flow and wave coupled model, the wind, water level and velocity from the smallest nested domain (local wave domain) interact with the flow model during the simulation. Table 3.3 lists the key parameters that were used in the flow and wave model calibration. These variables were selected either based on model recommendations or through model calibration.

TABLE 3.3: MODEL PARAMETERS OF FLOW AND WAVE COUPLED MODEL

Flow Model Parameter	**Value**
Manning Bottom Friction Coefficient	0.02 s/m1/3
Water Density	1025 kg/m3
Horizontal Eddy Viscosity	1 m2/s
Horizontal Eddy Diffusivity	1 m2/s
Wind Drag Coefficient	0.001255 (wind speed<7m/s); 0.002425 (wind speed>25m/s); linear variation between the two wind speeds
Wave Model Parameters	**Value**
Wave Spectral Discretization	24 direction bins, 24 frequency bins, from 0.03 to 1Hz
Bed Friction	JONSWAP (1973), bed friction coefficient = 0.067 m^2/s^3
Depth-induced Breaking	Battjes and Janssen (1978), breaker parameters Alpha = 0.05, Gamma = 0.73
White Capping	Komen et al. (1984)

3.5.2 Hydrodynamic Calibration Results

As listed in Table 3.2, the measured currents at NDBC Buoy 46268 were used to calibrate the flow model. Figure 3.7 presents the comparisons of current speeds and directions at the NDBC Buoy 46268 for the two selected events. Measured currents are shown in black dots and the modeled currents from Delft3D FM model are in red dots.

- **Event 1: December 28, 2020 to December 30, 2020**

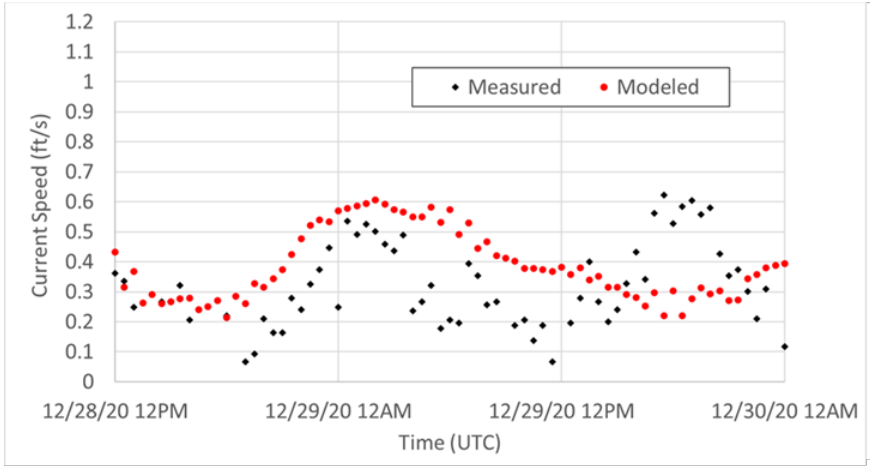
The modeled currents capture the first peak flow just past December 29, 2020, 12 AM, with the current direction towards the east. The second peak flow in the afternoon of December 29, 2020, was under-predicted by 0.2ft/s. This could be due to the limitation of wind data. Local wind variations or gusts at the NDBC gauge may be different than those measured winds at Santa Monica's NOAA station. Overall, the modeled currents calibrated well with the measurements. The current speed does not exceed 0.5ft/s during Event 1, mostly from west to east.

- **Event 2: December 14, 2021 to December 16, 2021**

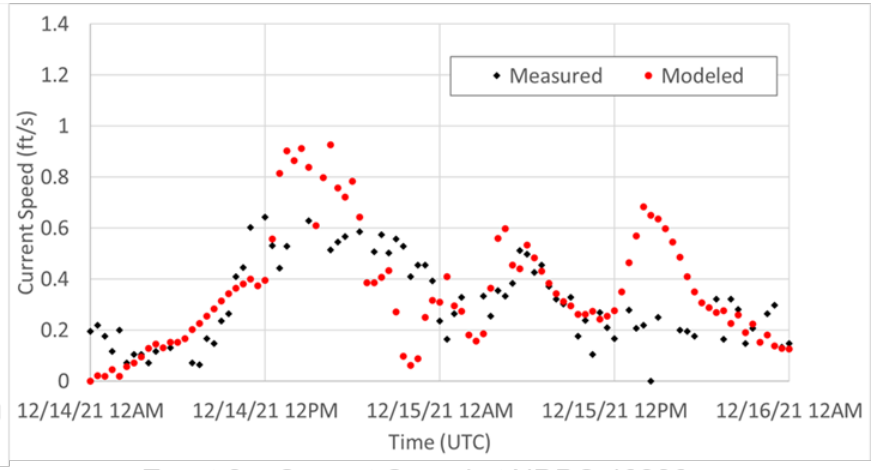
The modeled current speed generally follows the trend of measured data. The peak current that occurred on December 14, 2021, 2 PM is 0.3ft/s lower than the modeled current. The modeled current direction matches the measurements for the first half of the event, but it rotates more from the south and east, while the measurements are mostly from west. The discrepancies in currents are likely because the uniformly applied wind field in the model domain may not represent the localized wind variations and conditions.

Overall, the current speed at NDBC 46268 does not exceed 1 ft/s during storm events. And the Delft3D FM flow model produces reasonable currents at NDBC 46268. During the time of model calibration, there are no nearshore current measurements available that is close to the project site.

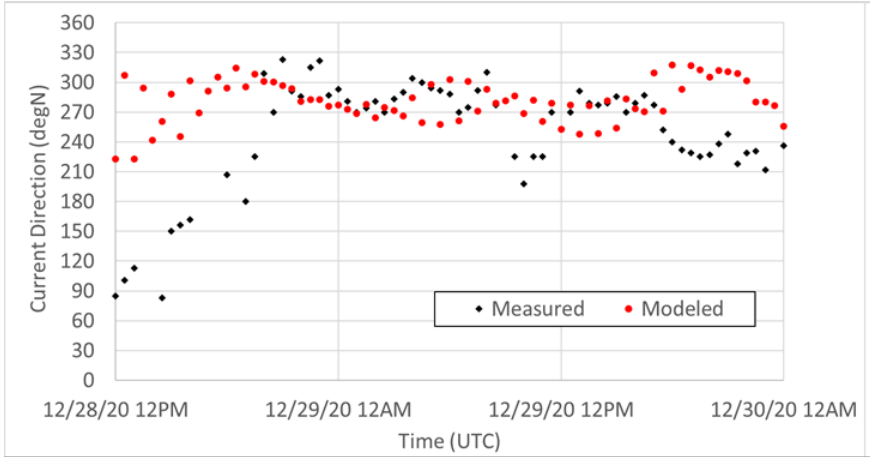
FIGURE 3.7: COMPARISON OF MODELED AND MEASURED CURRENTS AT NDBC46268



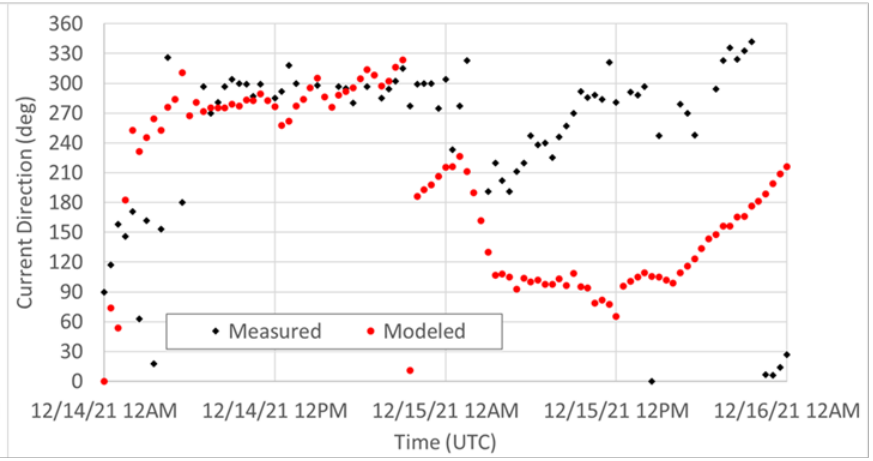
Event 1 – Current Speed at NDBC 46286



Event 2 – Current Speed at NDBC 46286



Event 1 – Current Direction at NDBC 46286



Event 2 – Current Direction at NDBC 46286

3.5.3 Wave Calibration Results

The modeled wave conditions during the two selected storm events are compared at two locations: NDBC Buoy 46268 and CDIP's MOP hindcast wave output station L0808. The NDBC buoy is at a water depth of 67ft, and the MOP station is at a depth of 33ft.

- **Event 1: December 28, 2020 to December 30, 2020**

Figure 3.8 plots the comparisons of significant wave height, peak wave period and mean wave direction at NDBC 46268 during Event 1. The Delft3D FM model captures the wave height increases and decreases during the event with slightly under-estimation of the peak, by 0.5ft lower than the measurements. The modeled wave period and direction at NDBC 46268 are close to the measurements.

Figure 3.9 presents the comparisons of the same wave parameters hindcasted by CDIP at MOP L0808. Note this is a comparison between two models, CDIP model and Delft3D model for the project. The Delft3D modeled significant wave height at MOP L0808 overall matches with the hindcast data. The Delft3D model predicted slightly lower peaks in significant wave height at both locations. This is likely due to the discrepancy between buoy measurements and the hindcast WIS database during the event since the Delft3D model is forced by the hindcast WIS data. The wave period and directions at MOP L0808 show less variation than Delft3D FM results. Delft3D model predicted wave periods are closer to the measurements than CDIP hindcast at MOP L0808 as shown in Figure 3.8. This could be due to the coarser resolution of the CDIP model, as its model domain covers the entire state of California.

FIGURE 3.8: EVENT 1 - COMPARISON OF MODELED AND MEASURED SIGNIFICANT WAVES AT NDBC46268

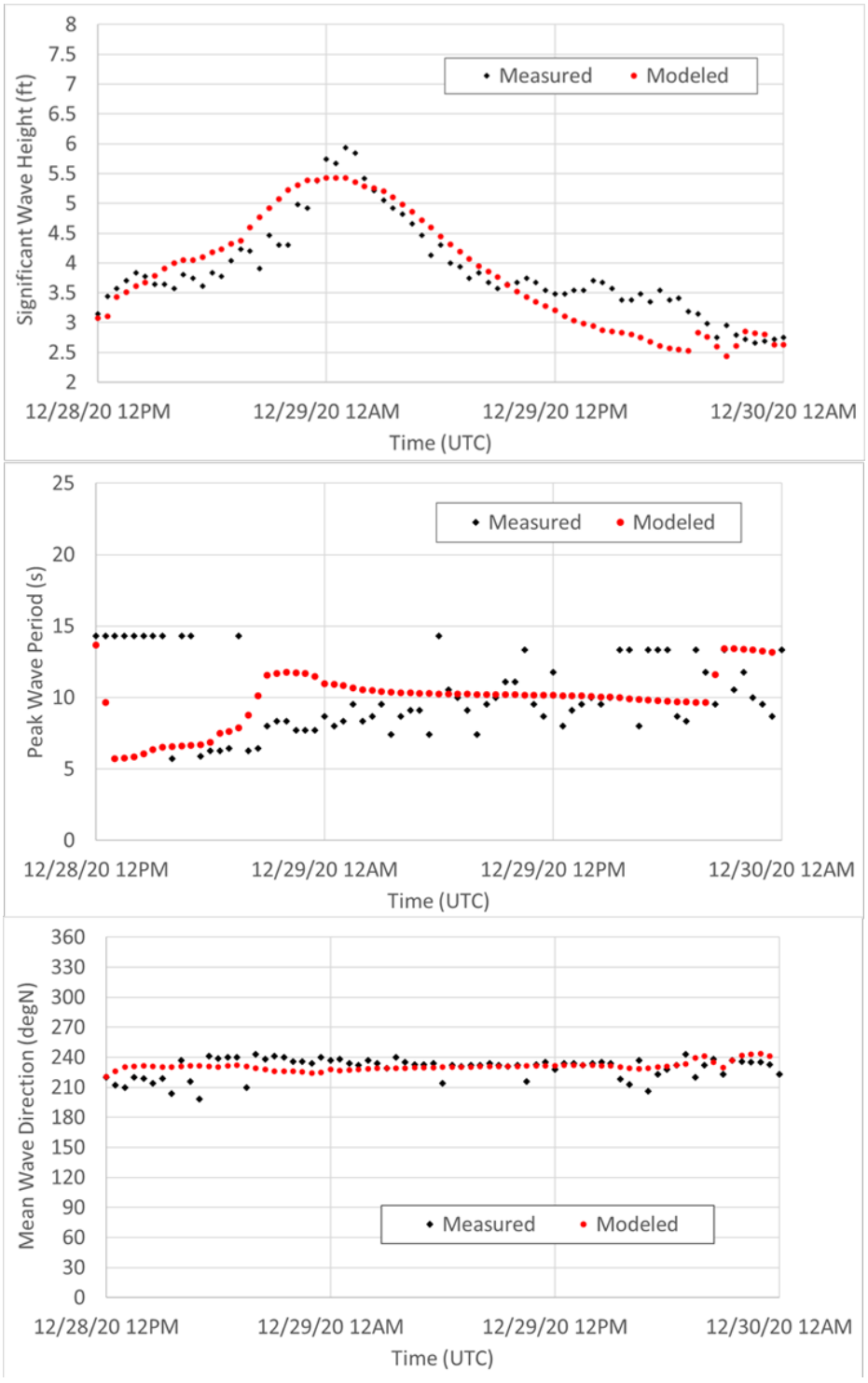
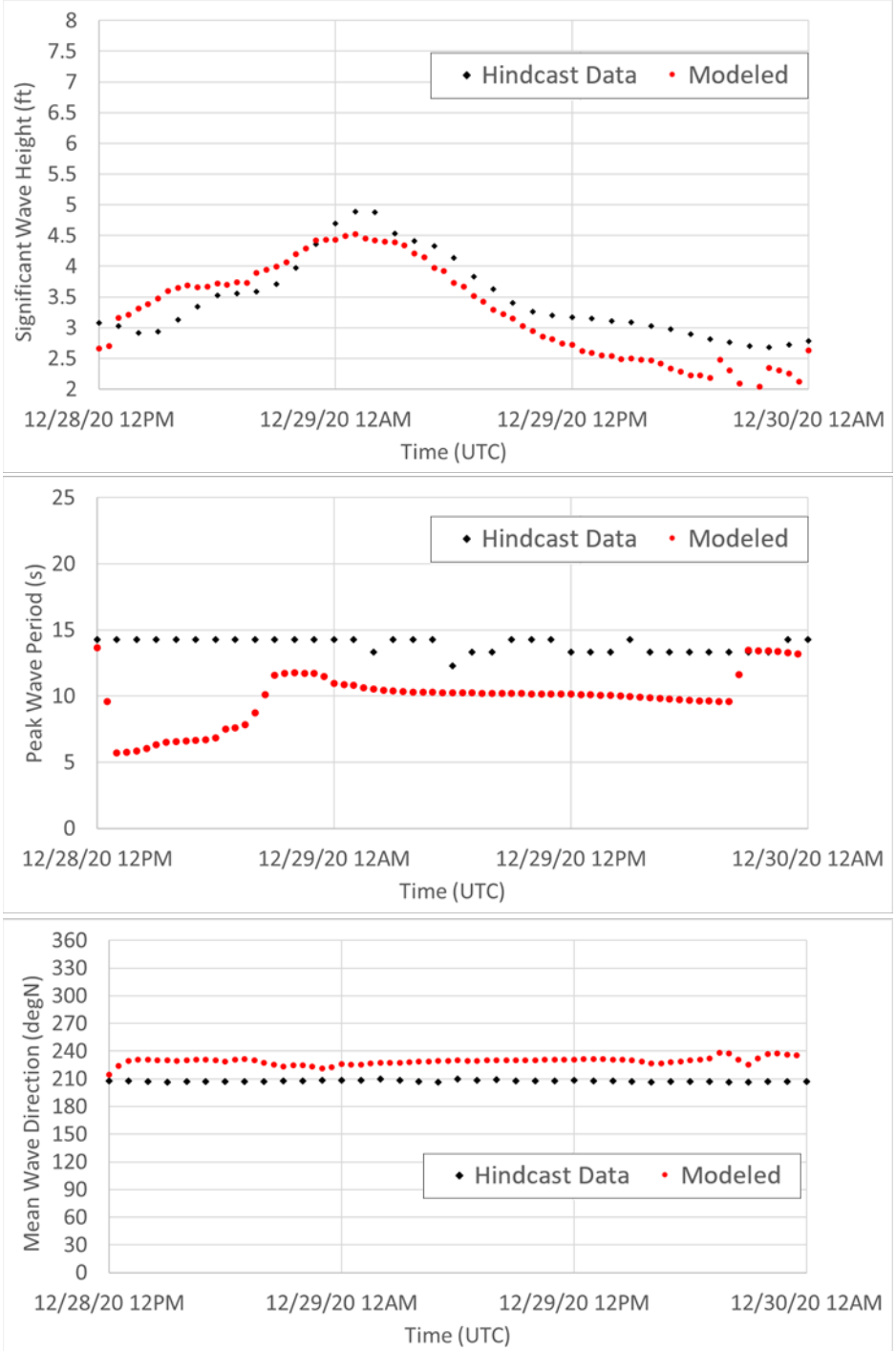


FIGURE 3.9: EVENT 1 - COMPARISON OF MODELED AND CDIP HINDCAST SIGNIFICANT WAVES AT MOP L0808



- **Event 2: December 14, 2021 to December 16, 2021**

Figure 3.10 presents the comparisons of significant wave height, peak wave period and mean wave direction at NDBC 46268 during Event 2. Figure 3.11 shows the comparisons of the same wave parameters at MOP L0808. The modeled significant wave height, peak wave period and mean wave direction match very well with the measurements at NDBC 46268 as well as the hindcast data at MOP L0808.

In summary, the Delft3D FM wave model simulates the wave conditions at the two calibration locations with water depths at 67ft and 33ft. The comparison plots illustrate good agreement between the Delft3D FM model and the measurements/hindcast data for both events.

FIGURE 3.10: EVENT 2 - COMPARISON OF MODELED AND MEASURED SIGNIFICANT WAVES AT NDBC46268

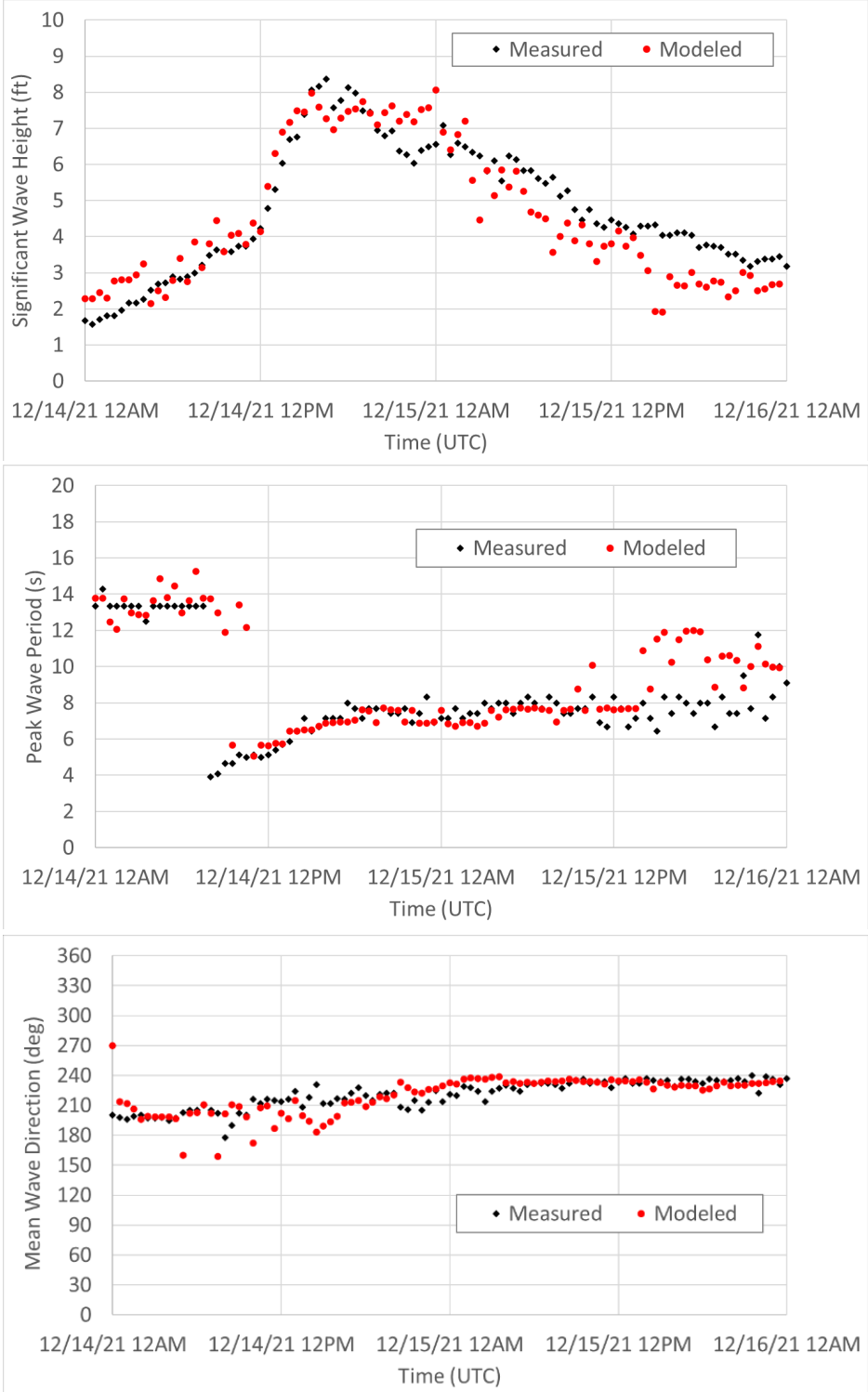
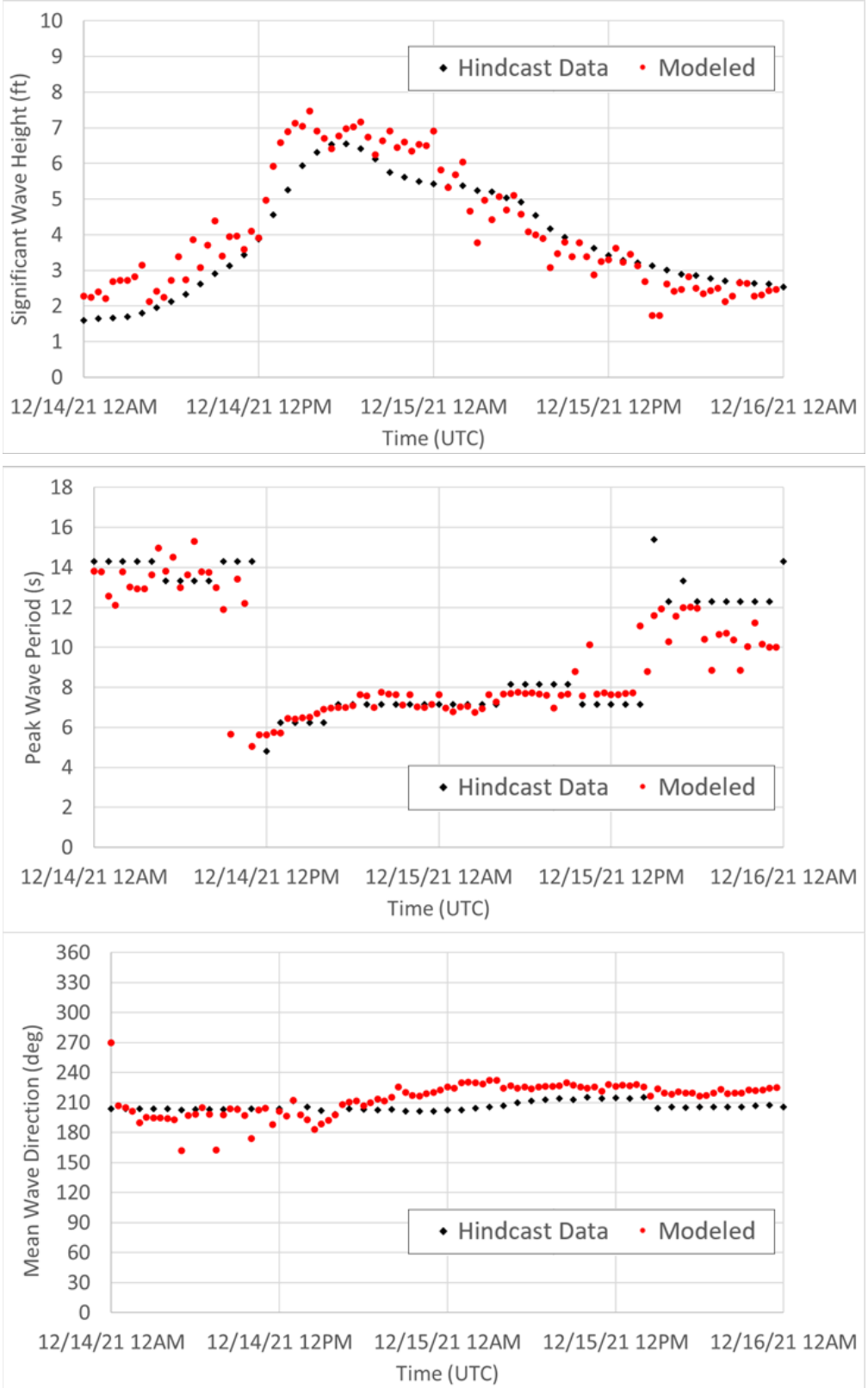


FIGURE 3.11: EVENT 2 - COMPARISON OF MODELED AND CDIP HINDCAST SIGNIFICANT WAVES AT MOP L0808



3.6 Morphology Model Calibration

For the morphology model calibration, the model predicted beach volumetric changes were compared against volumetric changes estimated from historical profile surveys (Noble, 2010) and lidar surveys.

3.6.1 Initial Topobathy Condition

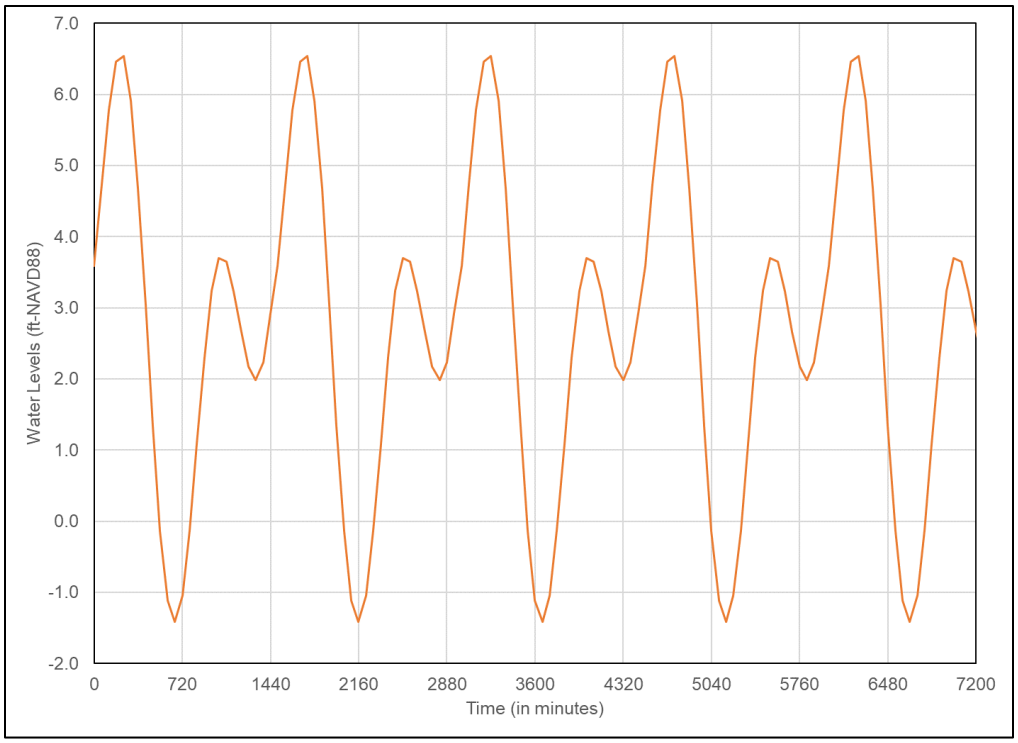
The focus of the morphological model calibration was the beach volumetric changes between 2009 and 2014 lidars. The 2009 USACE NCMP Topobathy Lidar DEM was used to develop the initial model topobathy in the nearshore region as shown in Figure 3.4.

3.6.2 Flow Model Boundary Conditions

Along the west and east lateral open boundaries of the flow model, Newmann boundary conditions were applied. For the morphology model calibration, it was assumed no inflow from Topanga Creek since the Creek is mostly dry and the creek sediment contribution is very limited except during large fluvial storm events.

At the south offshore open boundary, tidal water level boundary conditions were used. A one-day peak average spring tidal cycle was selected and repeated as illustrated in Figure 3.12. This is a conservative approach for morphology modeling due to the largest tidal range captured in this peak spring tidal cycle.

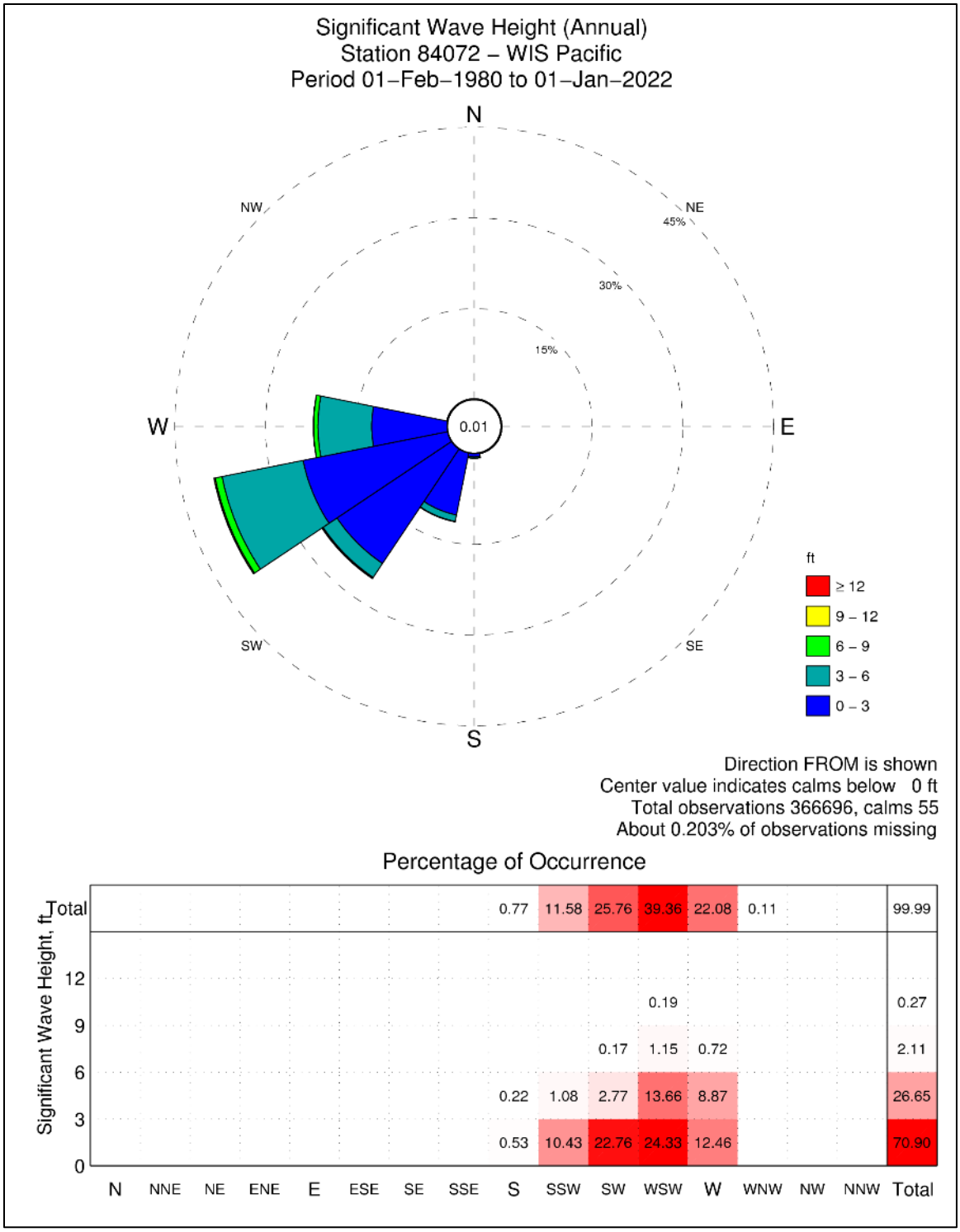
FIGURE 3.12: TIDAL BOUNDARY CONDITIONS AT OFFSHORE



3.6.3 Wave Boundary Conditions

The USACE WIS hindcast data at station 84072 were used to develop the wave boundary conditions for the morphology modeling. The available WIS data are from 1980 to 2021. Figure 3.13 shows the wave height rose at WIS station 84072. Most of the offshore waves come from directions between Southwest and West.

FIGURE 3.13: WAVE HEIGHT ROSE AT WIS STATION 84072



Modeling long term sediment transport and the resulting coastal morphology with Delft3D FM model using a real-time series of waves as input would lead to unsustainably long run times. To avoid this problem, the wave data at the model boundary were numerically analyzed to derive a limited but representative set of wave conditions to be used as input into the morphological model. The goal is to reduce the wave classes as much as possible without losing much accuracy in the morphological development of these waves compared to the full wave time series.

To select the best combinations of wave classes, two frequently used approaches exist (Van Rijn, 2012):

- The first approach is to manually determine the wave classes based on the wave height, direction, and morphological impact. The morphological impact is assumed to be proportional to the wave height to some power and is derived from the CERC formula for longshore sediment transport at a uniform coastline.
- The second approach uses a “target” dataset. This target dataset is created by short morphological simulations of all wave height-direction combinations and are weighted afterwards based on their percentage of occurrence. After the weighting, this target dataset is assumed to be representative for the morphological development of the full wave climate. The approach can be further divided into the so-called “optimum selection” (OPTI-method), or the method of correlation. The OPTI-method is more suited when several wave classes must be determined.

In this study, the wave class selection for the wave climate schematization with multiple classes was based on the OPTI-method (Mol, 2007). The overall procedure of the OPTI-method is visualized in Figure 3.14. The offshore wave data were divided into 1-m magnitude and 10-degree directional classes, which resulted in 64 totally different combinations of wave height and direction. The mean wave height, mean wave period and mean wave direction were calculated and used as the representative wave condition for each wave class. All wave classes are listed in Table 3.4.

The OPTI tool can only work with model outputs from Delft3D. Thus, a separate structured curvilinear grid (as shown in Figure 3.15) covering the same domain as the Delft3D FM (flexible mesh) was developed for this purpose. For each wave class, a coupled flow and wave model run with sediment transport but without morphology updating was conducted for one diurnal tidal cycle in Delft3D. Thus, a total of 64 individual runs were made. A grain size of 0.4 mm was considered for wave schematization model runs, and plenty of bed sediment was assumed available for the process of determining the potential sediment transport. The “target” dataset used for the OPT-method was total sediment transport rates at each grid points inside the nearshore area surrounding Topanga Lagoon as shown in Figure 3.15. After conducting the OPTI analysis, the final selected 9 wave classes are listed in Table 3.5. These wave classes were used for the morphological model calibration. Figure 3.16 presents the offshore boundary wave sequences constructed from these representative waves mimicking seasonal wave variations in a typical year.

FIGURE 3.14: OVERVIEW OF OPTI-METHOD PROCEDURE MODIFIED FROM VAN RIJN (2012)

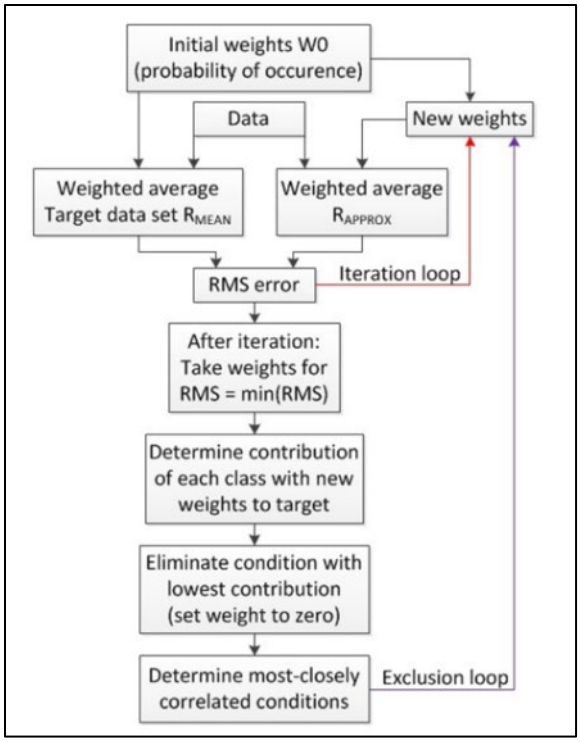


FIGURE 3.15: DELFT3D GRID AND TARGET AREA FOR WAVE SCHEMATIZATION

TABLE 3.4: FULL WAVE CLIMATE CLASSES AT MODEL OFFSHORE BOUNDARY

No. wave class	Significant wave height (ft)	Peak wave period (s)	Mean wave direction (°N)	Joint Probability of Occurrence (%)
1	2.3	14.2	91.1	0.01369
2	2.1	12.5	100.3	0.01369
3	2.1	13.7	111.1	0.01369
4	2.1	14.0	121.0	0.01173
5	2.1	13.5	129.4	0.01062
6	2.1	12.5	139.9	0.00671
7	4.5	6.5	141.9	0.00307
8	6.8	6.3	143.2	0.00084
9	2.0	11.8	150.1	0.01090
10	4.9	6.5	152.8	0.00419
11	7.4	6.7	150.4	0.00056
12	2.1	11.8	160.0	0.01118
13	4.7	6.6	160.8	0.00950
14	8.2	6.9	161.0	0.00028
15	2.4	10.5	171.6	0.03073
16	4.4	8.2	170.6	0.02067
17	7.0	7.4	173.1	0.00447
18	2.5	11.1	180.8	0.14276
19	4.3	8.7	180.1	0.04889
20	7.2	7.3	178.3	0.00643
21	2.4	13.1	191.4	0.75321
22	4.0	11.5	190.3	0.10421
23	7.3	7.5	190.7	0.00866
24	10.1	10.7	190.5	0.00028
25	2.1	14.1	201.1	3.84707
26	3.8	13.4	199.9	0.21289
27	7.8	8.7	199.7	0.02151
28	11.8	9.6	200.8	0.00335
29	2.0	14.6	210.4	7.81315
30	3.9	13.6	210.4	0.31095
31	7.8	9.1	210.8	0.02235
32	11.1	9.7	210.9	0.00335
33	14.2	11.0	209.1	0.00112
34	2.0	14.6	220.1	10.21806
35	4.0	13.1	220.4	0.50763
36	7.9	9.8	220.1	0.05448
37	10.9	11.7	220.6	0.01146
38	14.2	11.2	221.5	0.00196
39	2.1	14.5	230.0	11.14225

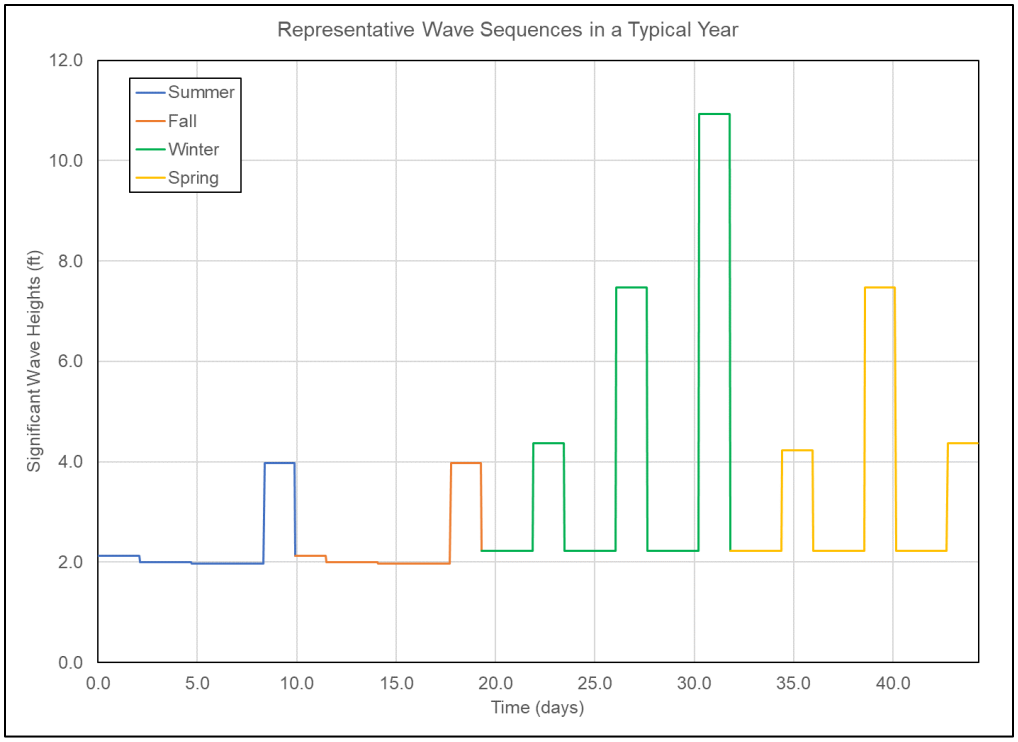
No. wave class	Significant wave height (ft)	Peak wave period (s)	Mean wave direction (°N)	Joint Probability of Occurrence (%)
40	4.0	13.6	230.7	0.88452
41	7.9	10.6	230.4	0.06593
42	10.8	12.2	230.7	0.01341
43	14.1	15.6	231.7	0.00810
44	2.2	13.9	240.0	12.00805
45	4.0	12.1	240.8	2.53314
46	8.0	11.3	240.7	0.15031
47	10.9	13.4	240.8	0.04330
48	14.1	14.1	240.1	0.01118
49	2.2	13.4	250.0	12.50618
50	4.2	11.1	250.6	5.93264
51	7.7	12.5	250.9	0.43835
52	11.0	13.8	248.8	0.05420
53	14.1	16.1	246.8	0.00782
54	18.0	14.7	249.7	0.00112
55	2.3	13.2	259.8	10.65668
56	4.4	10.8	259.9	7.20410
57	7.5	10.3	259.3	0.59760
58	10.6	11.7	258.9	0.03213
59	14.8	16.0	261.2	0.00084
60	18.3	16.6	260.4	0.00251
61	19.7	17.1	258.5	0.00056
62	2.3	12.8	269.3	7.28820
63	4.1	12.2	268.1	3.08687
64	7.4	8.9	268.1	0.08689

TABLE 3.5: WAVE SCHEMATIZATION RESULTS FROM OPTI-METHOD AND MORFAC

Significant wave height (ft)	Peak wave period (s)	Mean wave direction (°N)	OPTI calculated weight (%)	Morfac*
2.1	14.1	201.1	5.96	10.4
2.0	14.6	210.4	14.58	12.8
2.0	14.6	220.1	21.76	12.7
4.0	13.6	230.7	3.09	5.4
2.2	13.4	250.0	42.59	12.4
4.2	11.1	250.6	1.41	4.9
11.0	13.6	244.8	0.35	1.2
4.4	10.8	259.9	3.01	5.3
7.5	10.3	259.3	3.55	8.3

Morfac: Morphological Time Scale Factor

FIGURE 3.16: REPRESENTATIVE WAVE BOUNDARY CONDITIONS IN A TYPICAL YEAR AT OFFSHORE



3.6.4 Winds

For this modeling study, due to the rather short distances from both flow and wave boundaries to the coastline, wind-generated currents and wind-wave growth were thus not considered. To compensate for the lack of wave growth due to winds, the bottom friction in the wave model was turned off.

3.6.5 Morphological Time Scale Factor (morfac)

Morphological developments take place on a time scale several times longer than typical flow changes. For example, tidal flows change significantly in a period of hours, whereas it may take weeks, months, or years for significant morphological changes of a coastline. Simulating long term morphological changes in real-time is simply not practical from a computational point of view. To address this problem, Delft3D FM adopted a technique called “morphological time scale factor” whereby the speed of the changes in the morphology is scaled up to a rate that it begins to have a significant impact on the hydrodynamic flows (Deltares, 2023c). The implementation of the morphological time scale factor (morfac) is achieved by simply multiplying the erosion and deposition fluxes to and from the bed by the morfac at each computational time-step. This allows accelerated bed-level changes to be incorporated dynamically into the morphological calculations.

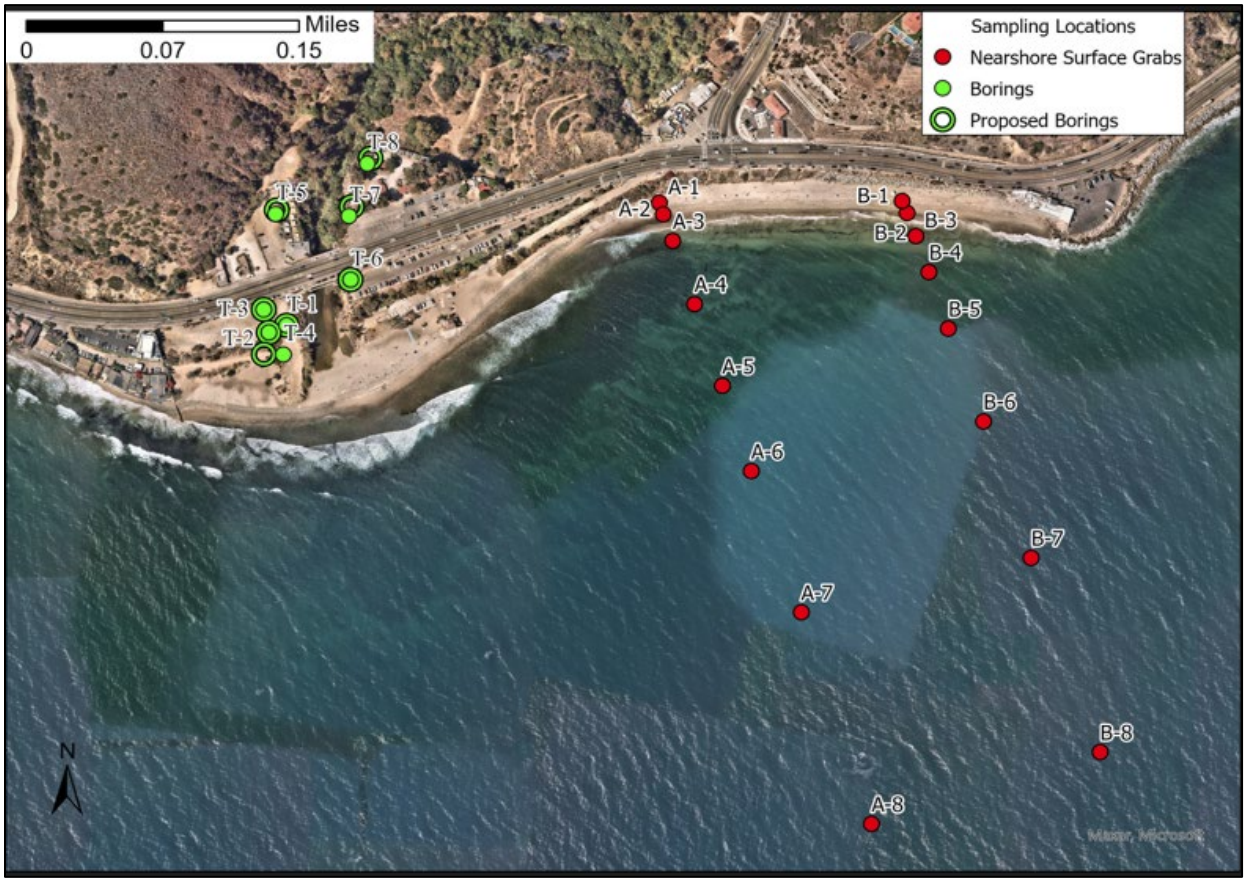
For this study, the time-varying morfac method was used. For each representative wave condition, the morfac applied was dependent on the percentage occurrence of that particular wave condition. The morfac applied to each wave condition is indicated in Table 3.5.

3.6.6 Sediments

Four different sediment classes were included in the current modeling efforts: sand (0.4 mm), fine pebble (3 mm), medium pebble (12.5 mm), and cobble (160 mm). These sediment sizes were selected based on the composition of nearshore surface grabs along two cross-sections at the Topanga Beach area and borings in the Topanga Lagoon restoration areas as shown in Figure 3.17. These sediments were sampled

in 2022 as part of a Sampling and Analysis Plan proposing to beneficially reuse excavated lagoon material. This plan was approved by the Southern California Dredge Material Management Team (SC-DMMT).

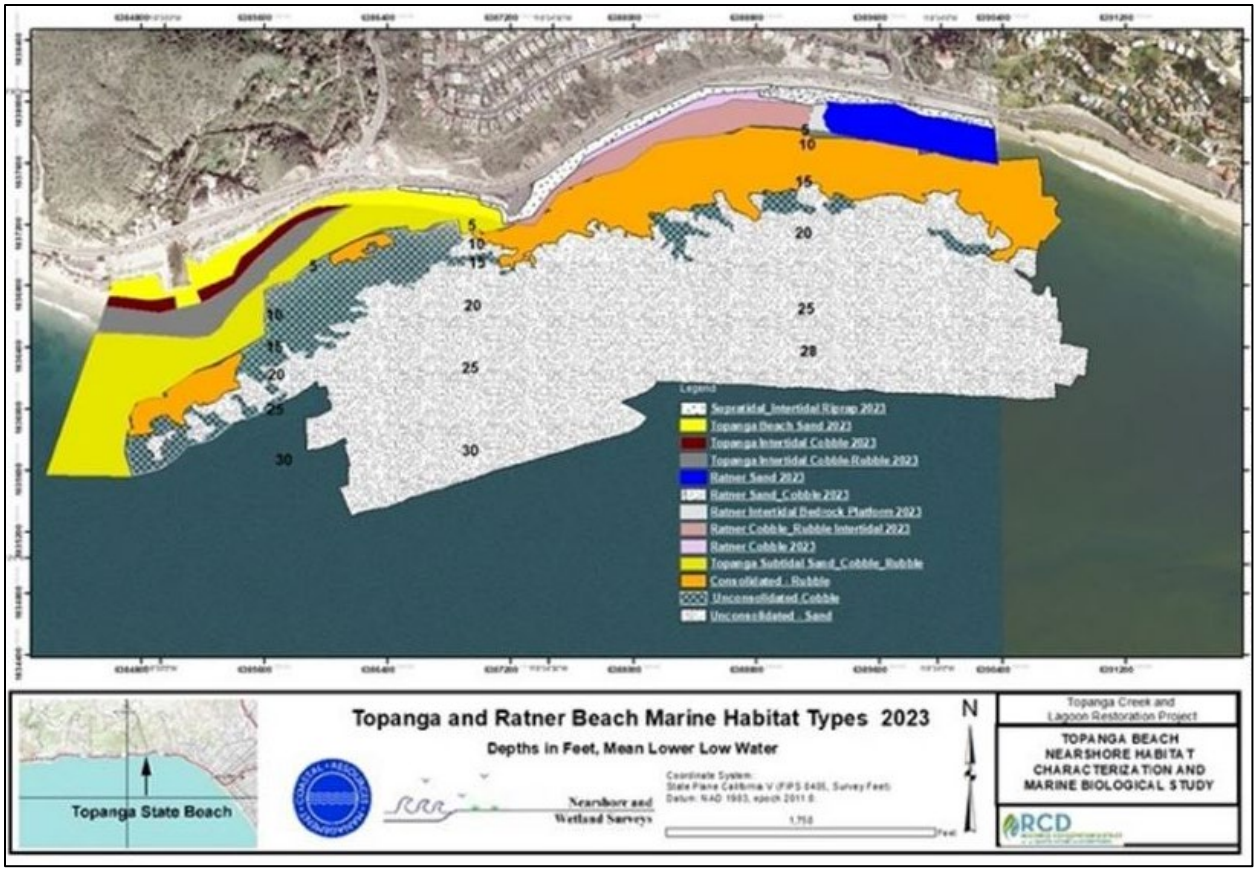
FIGURE 3.17: SEDIMENT SAMPLING LOCATIONS



Detailed information about initial sediment size distributions and their thickness on the seabed in the model domain are unavailable. They were developed based on the following available information and engineering judgements:

- Sediment distributions from nearshore surface grab samples as shown in Figure 3.17.
- Topanga State Park seafloor habitat characterization studies from Coastal Resources Management, Inc. (CRM, 2022 & 2023). Figure 3.18 presents the most recent seafloor characterization related to sediments in the study area (copied from CRM 2023 report Figure 10). However, the initial sediment thickness maps were developed based on earlier preliminary maps sent by CRM prior to the CRM 2023 report released to M&N, so there are slight differences in the seafloor characterizations used in the morphology model calibration.

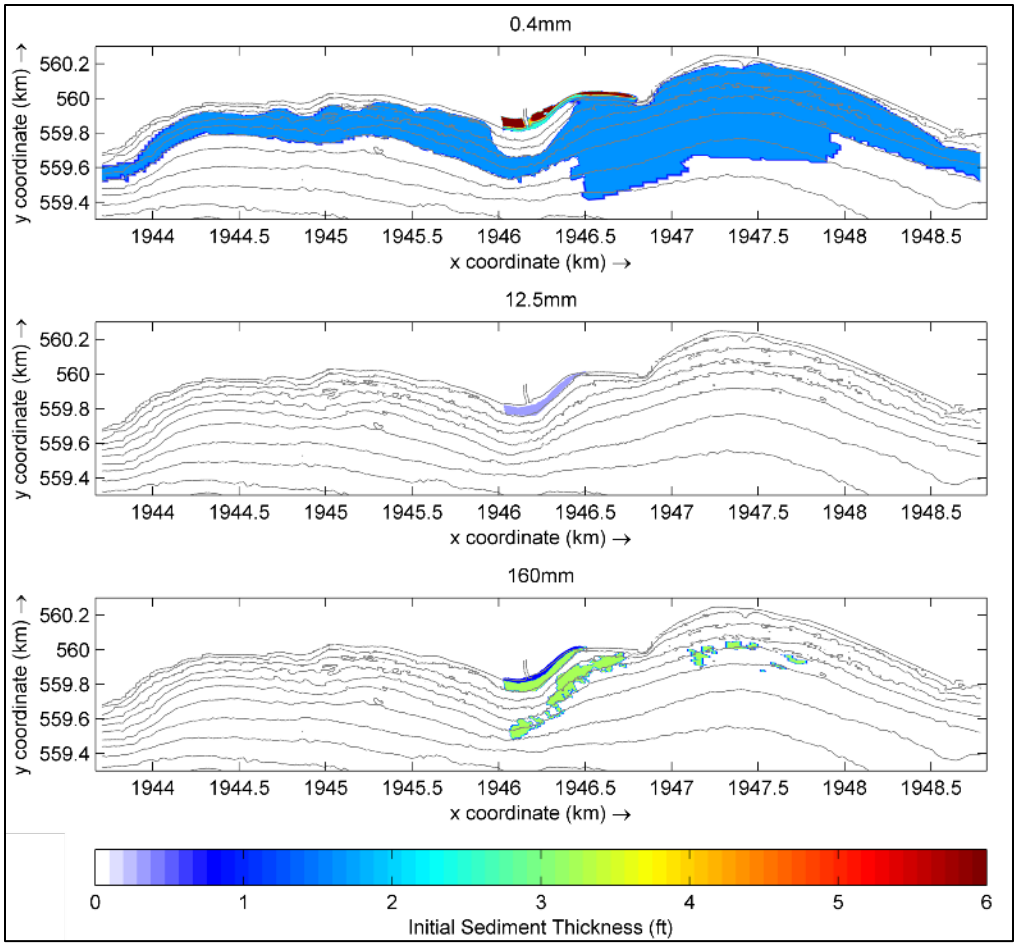
FIGURE 3.18: MARINE HABITAT TYPES (CRM, 2023)



Outside of the CRM study area, only sediment grain size of 0.4 mm was assumed available in limited nearshore area based on aerial photos in Google Earth. Otherwise, non-erodible hardbottom was assumed.

The initial thickness of each sediment class on the beaches and seafloor was not available. Engineering judgement together with discussions with CRM staff who performed the habitat survey was applied during the model calibration process with several trial-and-error iterations. In this coastal region, there is limited sediment supplies. Malibu Creek in the west and Topanga Creek during fluvial flood events are the two main sediment sources. Figure 3.19 shows the initial total sediment thickness map developed for the final morphology calibration.

FIGURE 3.19: INITIAL SEDIMENT THICKNESS MAP



3.6.7 Model Parameters

The calibration of the morphological model was an iterative process that included the testing and establishment of sediment transport parameters. After conducting model test runs with several different sediment transport formulas available in Delft3D, the sediment transport formula of van Rijn 2007 for the non-cohesive sediments was used for this study. Values of parameters not iteratively adjusted/calibrated during the calibration process were determined from the published literature and/or recommendations from Deltares, the developers of Delft3D. The primary sediment transport parameters adjusted in the calibration of the morphology model were:

- Sus – Multiplication factor for suspended sediment reference concentration
- Bed – Multiplication factor for bed-load transport vector magnitude
- SusW – Wave-related suspended sediment transport factor
- BedW – Wave-related bed-load sediment transport factor

Sus and Bed are parameters related to current induced sediment transport. The sediment transport magnitudes increase when Sus and Bed become larger. SusW and BedW are related to waves and were recommended to be close to zero for the Delft3D application by Deltares. Table 3.6 lists the final calibrated parameters related to the morphological model.

TABLE 3.6: MORPHOLOGICAL MODEL PARAMETERS AND VALUES USED IN DELFT3D FM

Parameter	Value [unit]	Description
MorFac	variable	Morphological scale factor
Thresh	0.05 [m]	Threshold sediment thickness for transport and erosion reduction
SedThr	0.1 [m]	Minimum water depth for sediment calculations
MorUpd	TRUE	Update bathymetry during FLOW simulation
DensIn	FALSE	Include effect of sediment concentration on fluid density
ISlope	2	Bed slope formulation (2 - Bagnold formulation)
AlfaBs	1.0	Longitudinal bed gradient factor for bedload transport
AlfaBn	1.5	Transverse bed gradient factor for bed load transport
IHidExp	2	Hiding and exposure formulation number (2 - Egiazaroff formulation)
Sus	1.0	Multiplication factor for suspended sediment reference concentration
Bed	1.0	Multiplication factor for bed-load transport vector magnitude
SusW	0.1	Wave-related suspended sed. transport factor
BedW	0.0	Wave-related bed-load sed. transport factor
SedThr	0.1 [m]	Minimum water depth for sediment computations
ThetSD	0.5	Global / maximum dry cell erosion factor
HMaxTH	0.05 [m]	Max depth for variable THETSD. Set < SEDTHR to use global value only

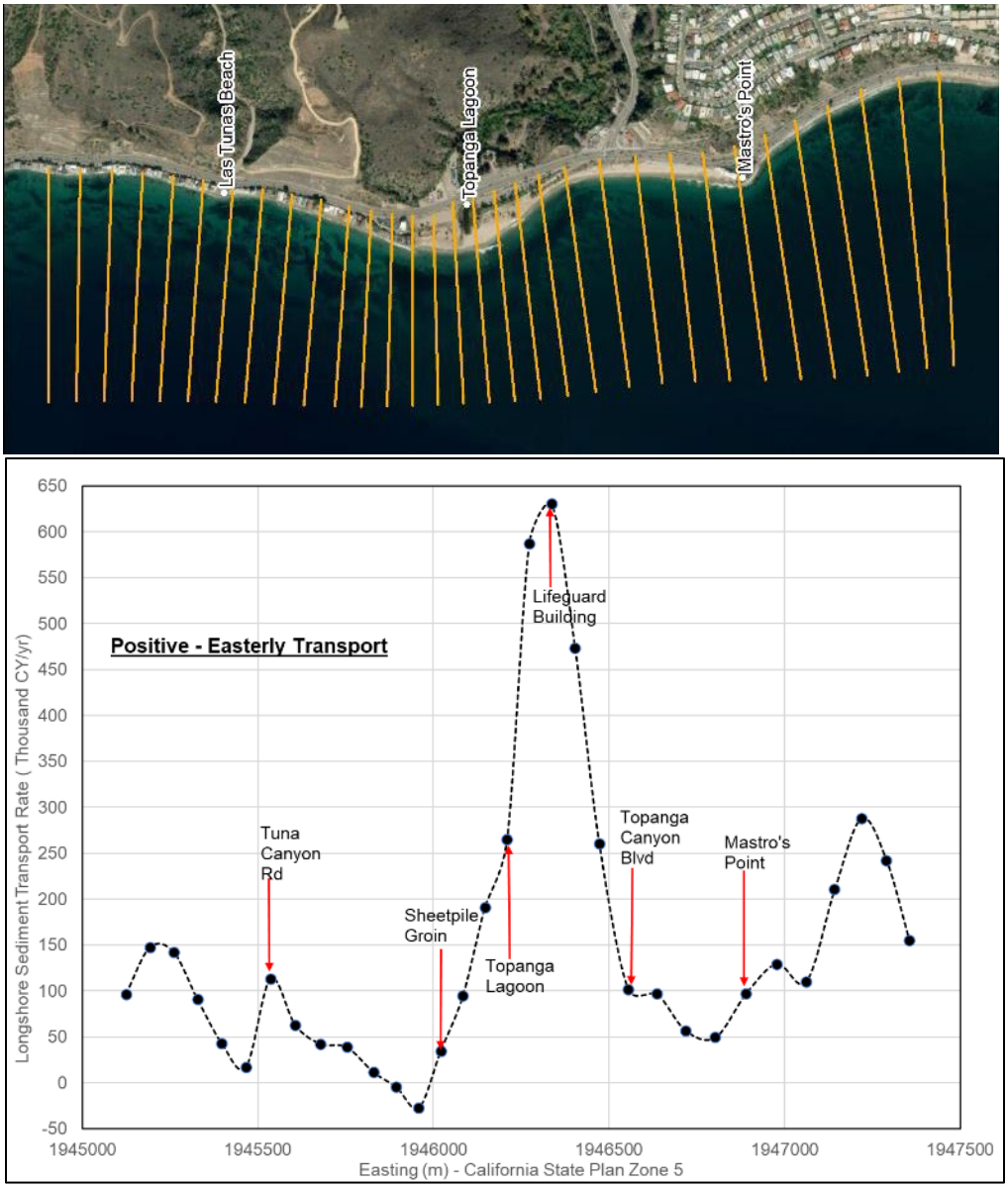
3.6.8 Annual Potential Longshore Sediment Transports

During the wave schematization process discussed in Section 3.6.3, potential net annual longshore sediment transport rates were calculated along several cross-shore transects using “Detran,” a MATLAB toolbox from OpenEarthTools. It’s worth to be pointed out again that: (1) There was no morphology update in those short time Delft3D runs; (2) Only one sediment grain size of 0.4 mm was used with unlimited availability due to limited budget, short turnaround time and long computer simulation time for each model run; (3) The morphological model parameters applied were mostly default values, not the fully calibrated values as shown in Table 3.6.

Figure 3.20 presents the potential net annual longshore transport rates along the cross-shore transects shown. The upper plot shows the transect location where the longshore sediment transport rate is calculated. The lower plot shows the rate. In general, the predicted net longshore transport direction is eastward. The transport rates are the largest along the shoreline section east of Topanga Lagoon, indicating that sediment starving water after passing the cobble delta of the Topanga Point is very erosive and threatening the lifeguard building. However, most of the shoreline in this section is covered by pebbles/cobbles instead of sands, thus the actual sediment transport rates are generally considerably less than these values due to their larger sizes thus harder to be mobilized than sands.

The net longshore sediment transport rates calculated are in a similar order of magnitude to what USACE estimated using the shoreline model GENESIS with a median grain size of 0.48 mm in the Topanga Beach Reach (Noble, 2010). The potential net easterly transport rate was estimated ranging from 109,000 cy/yr to 149,000 cy/yr for shoreline orientations of 45 deg and 90 deg, respectively.

FIGURE 3.20: POTENTIAL NET ANNUAL LONGSHORE SEDIMENT TRANSPORT RATES



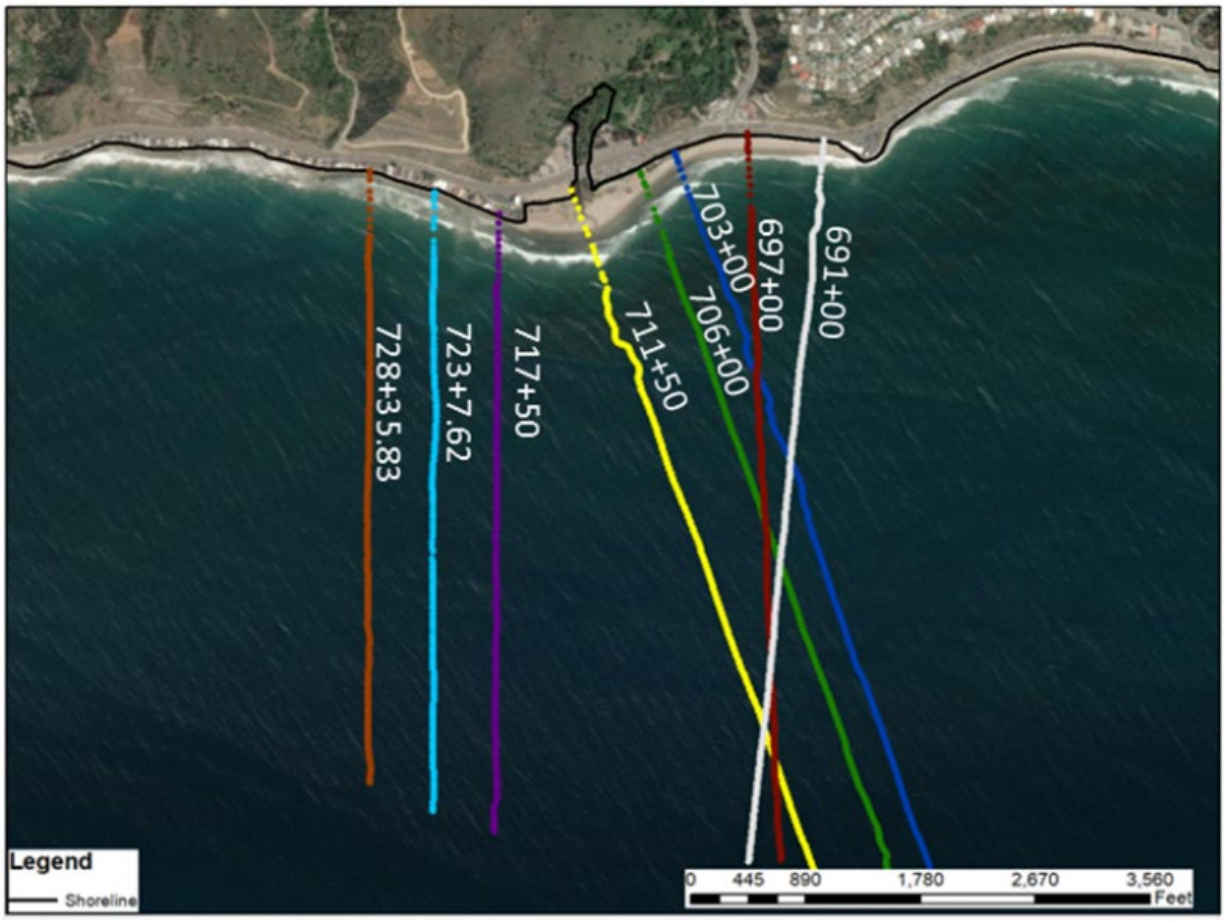
3.6.9 Morphology Calibration Results

This part of the coast is mostly sand-limited narrow to non-existent pocket sandy beaches littered with boulders, cobbles, and other debris except a wider beach at the Topanga Canyon Creek mouth. Because of the limited information about the extent of existing sandy materials both horizontally and vertically, the initial state of beach conditions for morphology calibration is unknown. It is also a challenge to numerically simulate sediment transport and long-term morphological changes on beaches with mixed sandy and rocky materials.

There are 2009 and 2014 USACE NCMP topobathy lidar data available from NOAA's digital coast database in the project area. In addition, profile surveys have been conducted periodically from 1935 to 2005 along the Los Angeles County coastline (Noble, 2010). As stated in the Coast of California Storm and Tidal Waves Study (CCSTWS) for Los Angeles region (Noble, 2010), these historic surveys were conducted at

a variety of locations and orientations relative to different baselines and transect bearings as well as using different survey technologies. Thus, it was impossible for direct comparison of successive profiles at fixed locations for all the historic surveys. The profile stations used in this report are based on the 2002-2005 survey program under the CCSTWS. Figure 3.21 shows the profile stations adjacent to Topanga Lagoon based on the 2002-2005 survey data.

FIGURE 3.21: PROFILE STATIONS IN THE PROJECT AREA



It is an advantage to use good quality lidar data for morphological model calibration because of the continuous coverage. However, after carefully examined the lidar data, it seems as if the 2014 lidar bathymetric data has some issues as shown by the elevation differences between 2009 and 2014 lidar in Figure 3.22. The bed elevations in 2014 lidar are mostly higher than 2009 lidar below MHHW line (1 – 1.5 ft on average). In reality, it is not expected that the seafloor would change that much in areas deeper than 20 feet. Figure 3.23 presents the elevation differences between 2009 and revised 2014 lidar after lowering the 2014 lidar elevations by 1.3 ft. Most of the areas show slight erosion in this case, within 0.4 feet in deep water. The 1.3-ft adjustment of 2014 lidar was determined after comparing the profile data along the survey transects shown in Figure 3.21 between 2009 and 2014 lidar data along with available profile surveys in 2002 and 2005. Figure 3.24 presents examples of the profile comparisons at 703+00 and 711+50. After lowering the 2014 lidar by 1.3 ft, the profiles are better matched in the offshore area deeper than 20 ft. It demonstrates the importance of good quality data. These two lidar datasets were used for the morphology calibration but need to be interpreted with caution as no other data are available.

FIGURE 3.22: ELEVATION DIFFERENCES BETWEEN 2009 AND ORIGINAL 2014 LIDAR

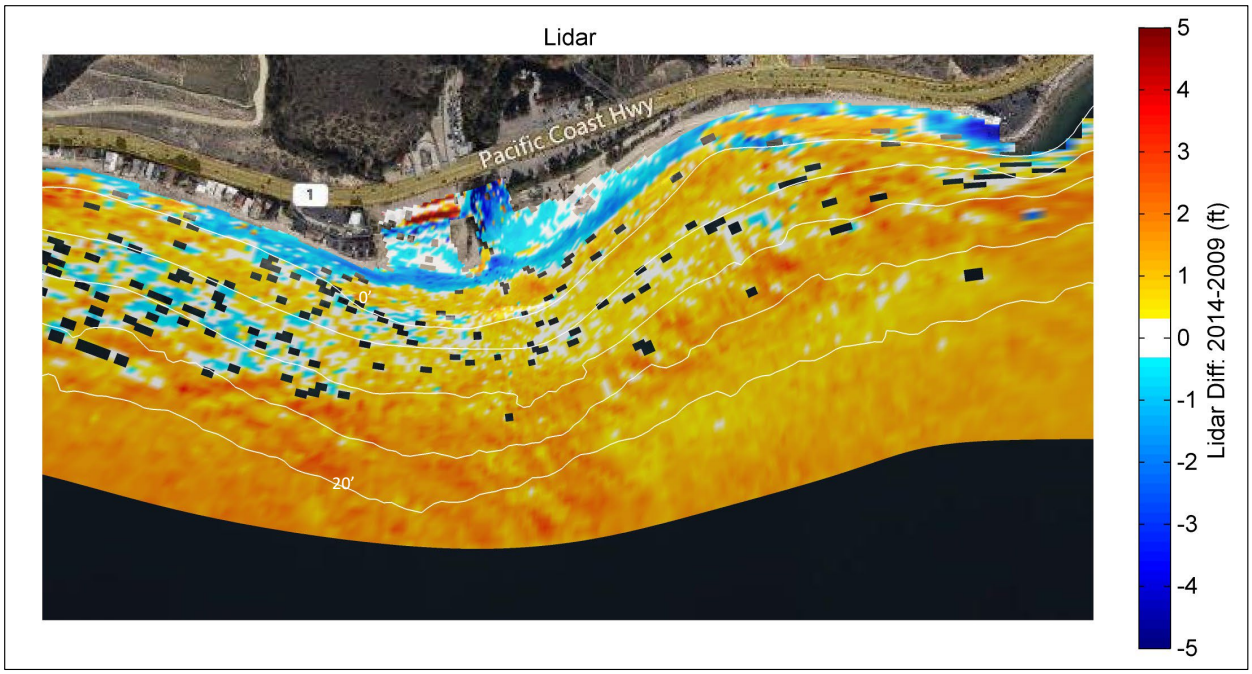


FIGURE 3.23: ELEVATION DIFFERENCES BETWEEN 2009 AND LOWERED 2014 LIDAR

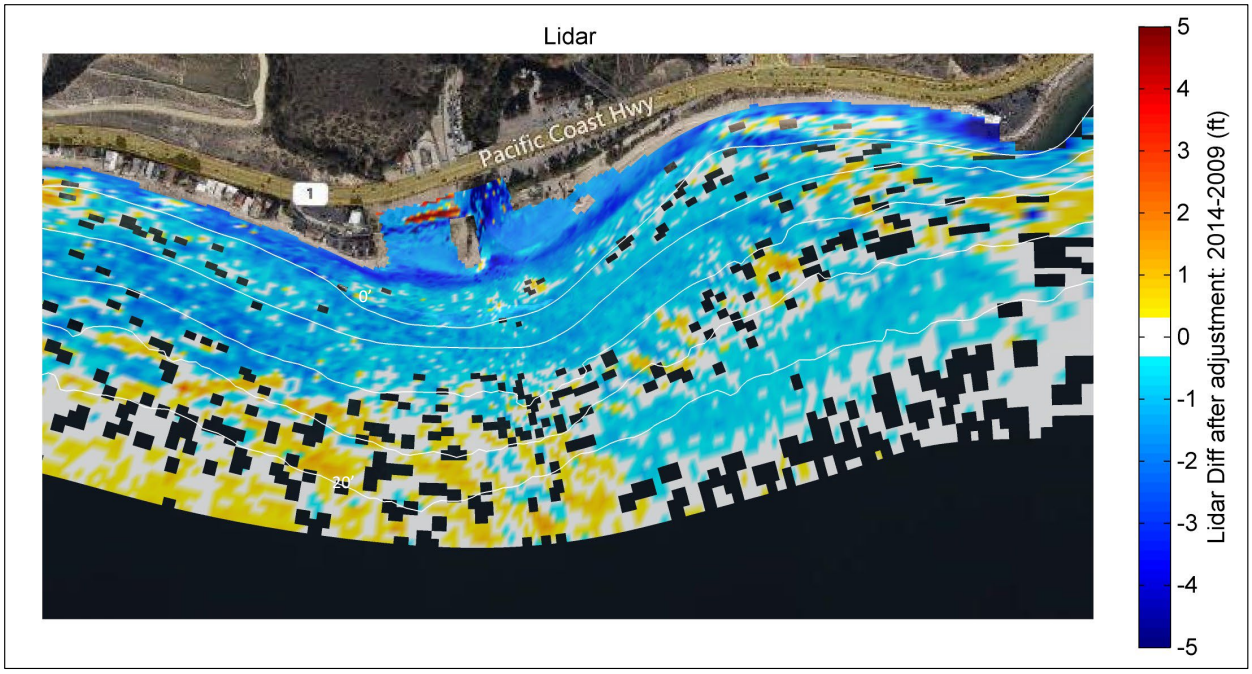


FIGURE 3.24: EXAMPLE PROFILE COMPARISONS BETWEEN SURVEYS

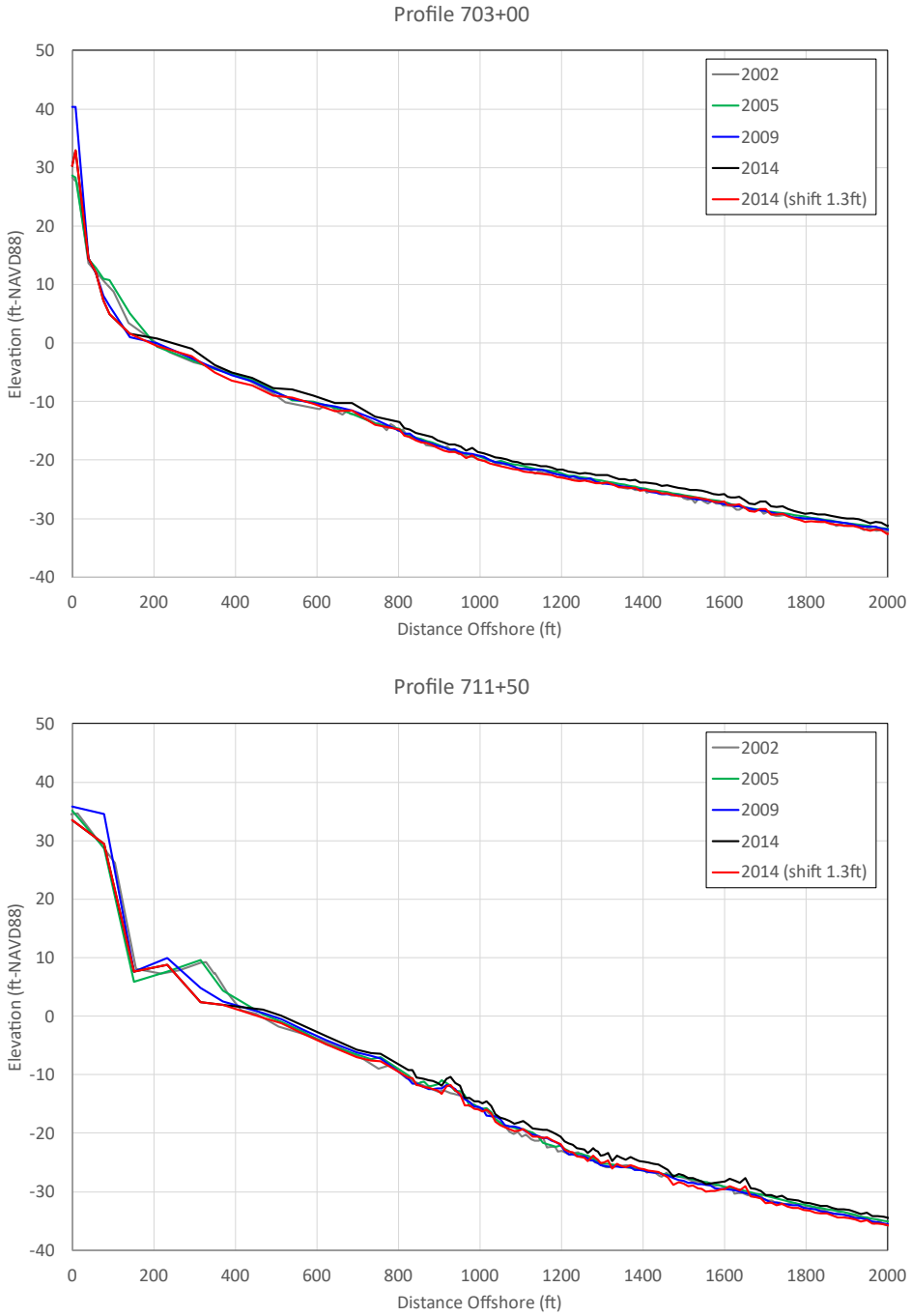


Figure 3.25 and Figure 3.26 present the morphological changes predicted by Delft3D FM (with representative waves described in section 3.6.3 and initial sediment thickness map described in section 3.6.6) after 1 year and 5 years, respectively. The model results show erosion in the shallower nearshore area and deposition in the deeper area. After 1 year, most of the erosion occurs above depth of 10 ft-NAVD88, and then continuously transported offshore in the following years. The pebbles and cobbles below the Topanga Lagoon are barely moved under typical annual wave conditions with a maximum wave height of 11 ft after 5-years.

FIGURE 3.25: MODELED MORPHOLOGY CHANGES AFTER 1 YEAR

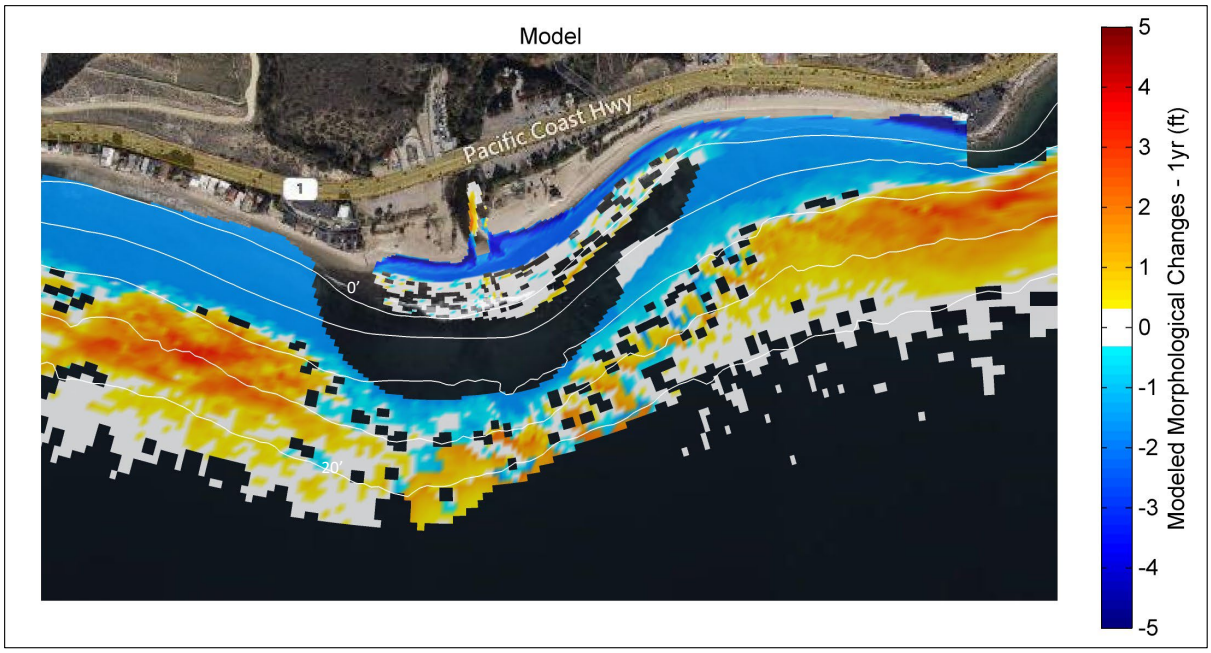
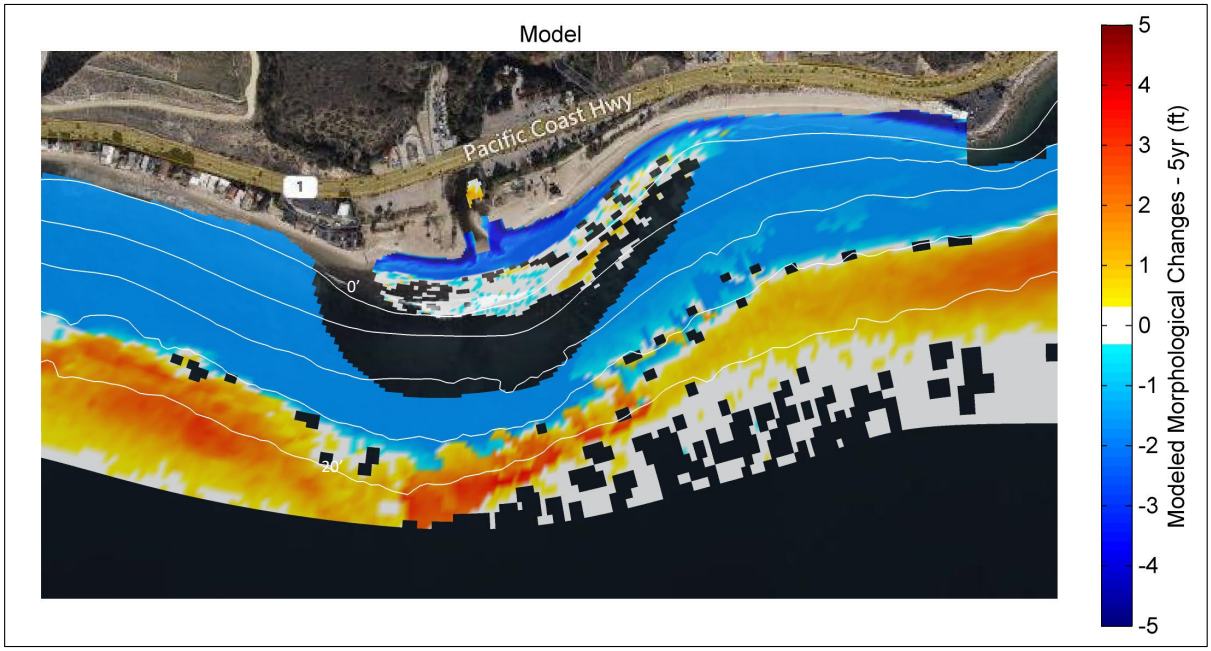


FIGURE 3.26: MODELED MORPHOLOGY CHANGES AFTER 5 YEARS



Volume changes along cross-shore transects were calculated from both the model results and lidar data. These transects are not the historical survey transects, but rather following the model grid lines in the cross-shore direction as shown in Figure 3.27. The difference does not impact the longshore transection comparison. Figure 3.28 presents the total volume changes per unit area between the model results after 5 years and lidar. Volume changes from both original and lowered 2014 lidar data relative to 2009 lidar are included. The volume changes based on the original 2014 lidar indicate accretion along the whole coastline both east and west side of the Topanga Lagoon (+30 CY/ft on average). On the contrary, the volume changes from the lowered 2014 lidar show erosion on both sides of the lagoon. The model results are in good agreement with the lowered 2014 lidar data.

FIGURE 3.27: CROSS-SHORE TRANSECTS – MODEL CROSS-SHORE GRID LINES

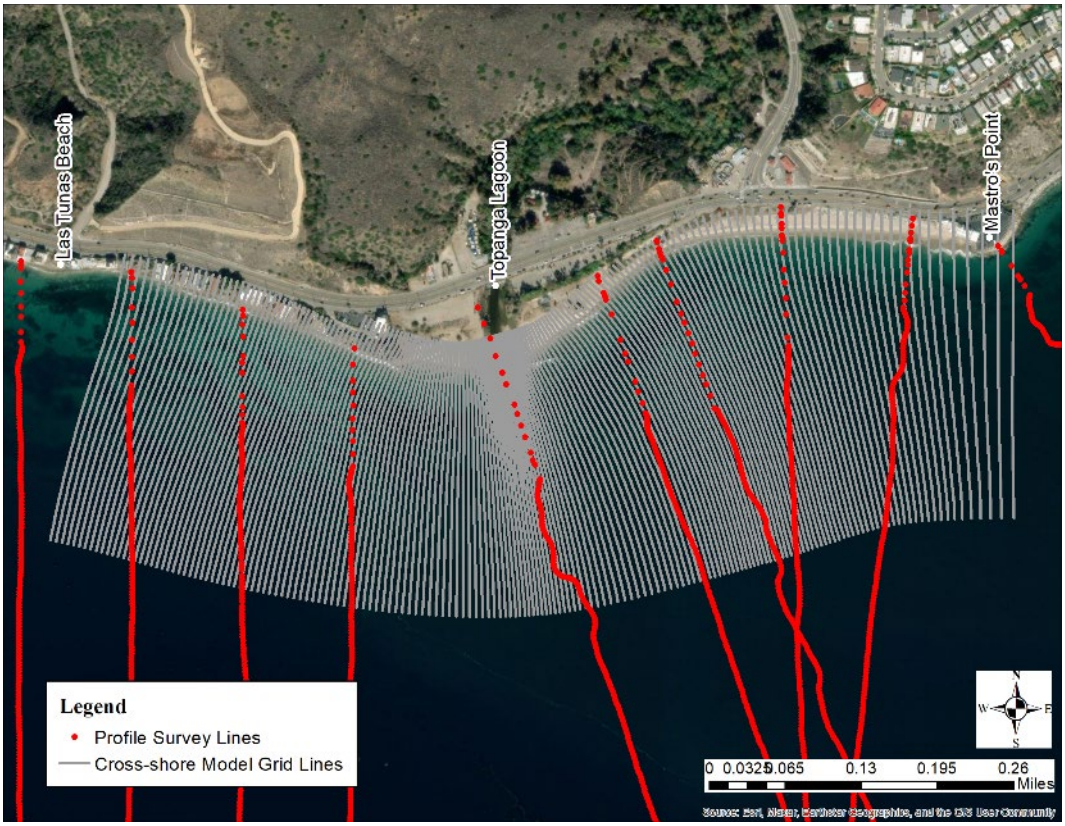
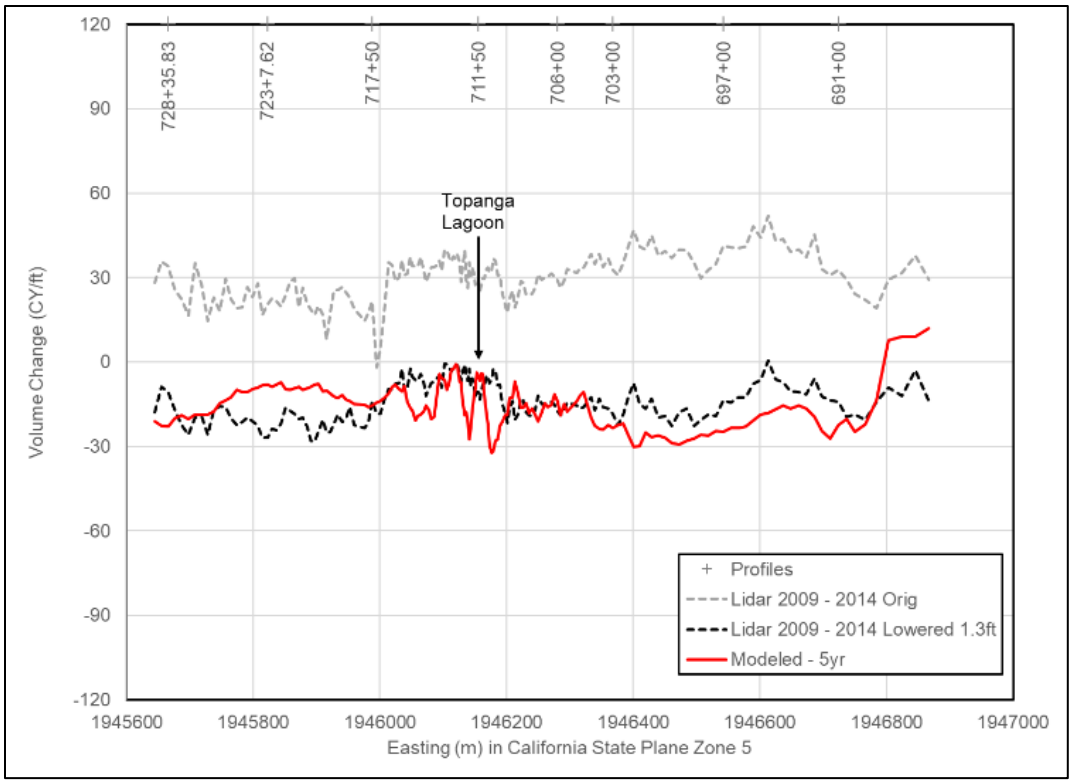


FIGURE 3.28: VOLUME CHANGES NEAR TOPANGA LAGOON ABOVE -24 FT-NAVD (MODELED VS LIDAR)



4 Morphological Modeling – Alternatives

4.1 Topanga Lagoon Restoration Alternatives

Four Topanga Lagoon restoration alternatives were developed and studied for the project (Moffatt & Nichol, 2022b). Their impacts on the beach and nearshore morphologies were investigated based on the morphological model developed as described in the previous section. These four restoration alternatives are:

- Alternative 1 – No project/no build, managed decline
- Alternative 2 – Maximum lagoon habitat, removal of motel
- Alternative 3 – Limited lagoon habitat expansion, retention of motel
- Alternative 4 – Maximum managed retreat, partial motel retention

4.1.1 Channel Breach Scenario

A total of seven channel size and alignment variations (as listed in Table 4.1) were simulated in the hydraulics, sediment transport, SLR impacts, and fish passage assessment (Moffatt & Nichol, 2022a).

For beach morphological modeling, the straight wide channel scenario (40 ft width x 160 ft length) was selected as the initial lagoon channel breach condition.

TABLE 4.1: MODELED CHANNEL BREACH SCENARIOS

Channel Alignment	Inlet Channel Width		Breach Inlet length
Straight	Narrow Channel	10 ft	160 ft
Straight	Medium Channel	25 ft	160 ft
Straight	Wide Channel	40 ft	160 ft
Migrated	Narrow Channel	10 ft	200 ft
Migrated	Medium Channel	25 ft	200 ft
Migrated	Wide Channel	40 ft	200 ft
Migrated	Narrow Channel (extra-long)	9 ft	350 ft

4.1.2 SLR Condition

Future SLR impact to the long-term shoreline morphology was modeled with the USGS COAST model by Integral. Three SLR scenarios of 1.6ft, 3.3ft and 6.6ft were modeled. The detailed modeling analyses and results are included in Appendix A.

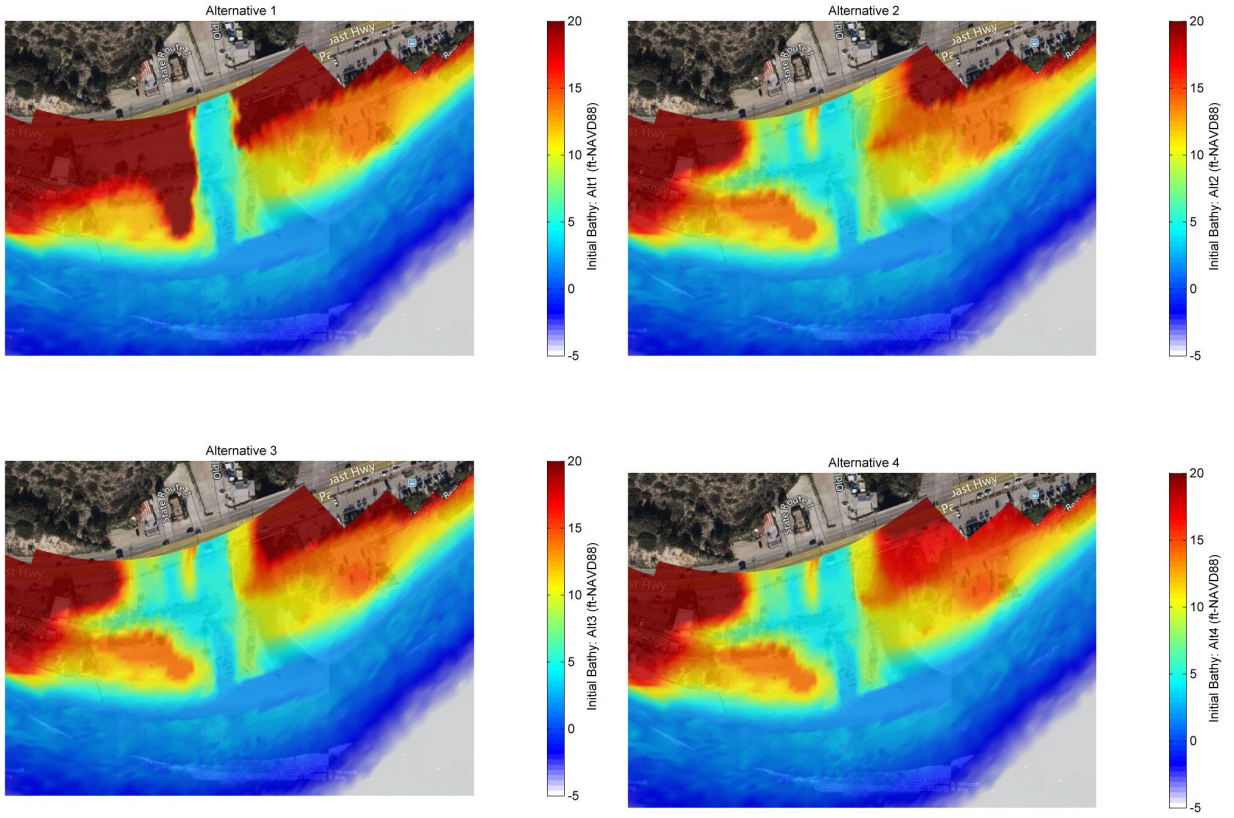
4.1.3 Initial Bathymetry

Figure 4.1 depicts the initial model bathymetry for all four alternatives in the lagoon area. The adjusted 2014 Lidar was applied to develop the initial model bathymetry for Alternative 1 (existing condition). The restored lagoon bathymetries for Alternatives 2 through 4 were based on the lagoon grading plan as shown in Figure 2.1.

4.1.4 Sediments

Four sediment size classes were included in the morphological modeling of alternatives: sand of 0.4mm, pebble of 3mm and 12.5mm, and cobble of 160mm (0.52ft). Sediments larger than 160mm were considered as non-erodible materials. The initial sediment thicknesses of sediments were considered the same as what developed during the morphological model calibration (Figure 3.19).

FIGURE 4.1: MODEL BATHYMETRY FOR ALTERNATIVES



4.2 Topanga Creek Inputs

Three Topanga Creek flow conditions were considered:

1. Dry weather condition – no lagoon flow and sediment input
2. 10-yr return period fluvial flow condition– March 1983 event, representing average morphological conditions
3. 100-yr return period fluvial flow condition– February 1980 event, representing the extreme storm conditions

The flows and sediment inputs from Topanga creek were extracted from modeling results of the MIKE11 sediment transport models (Moffatt & Nichol, 2022a). Figure 4.2 presents the creek flows, whereas the creek sediment inputs are presented in Figure 4.3 and Figure 4.4 for the 10-yr and 100-yr events, respectively. The 12.5mm pebbles and 160mm cobbles were considered non-existent in the creek outflows to the ocean.

FIGURE 4.2: TOPANGA CREEK FLOWS FOR ALTERNATIVES

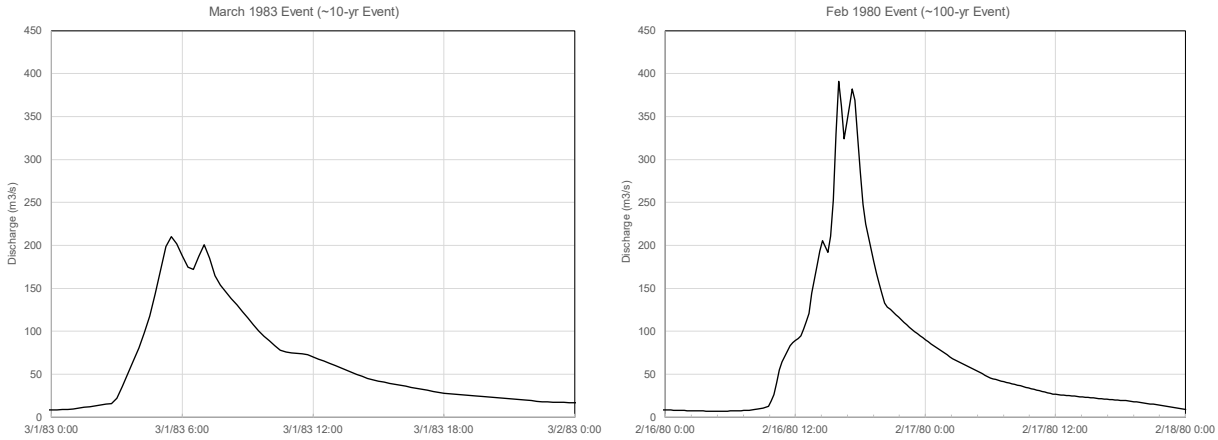


FIGURE 4.3: TOPANGA CREEK SEDIMENT INPUTS FOR ALTERNATIVES – 10-YR EVENT

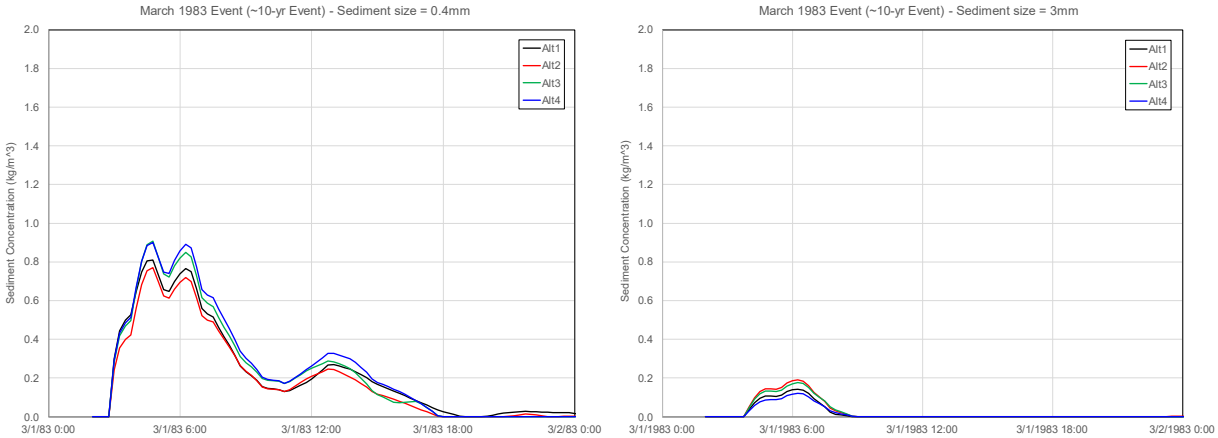
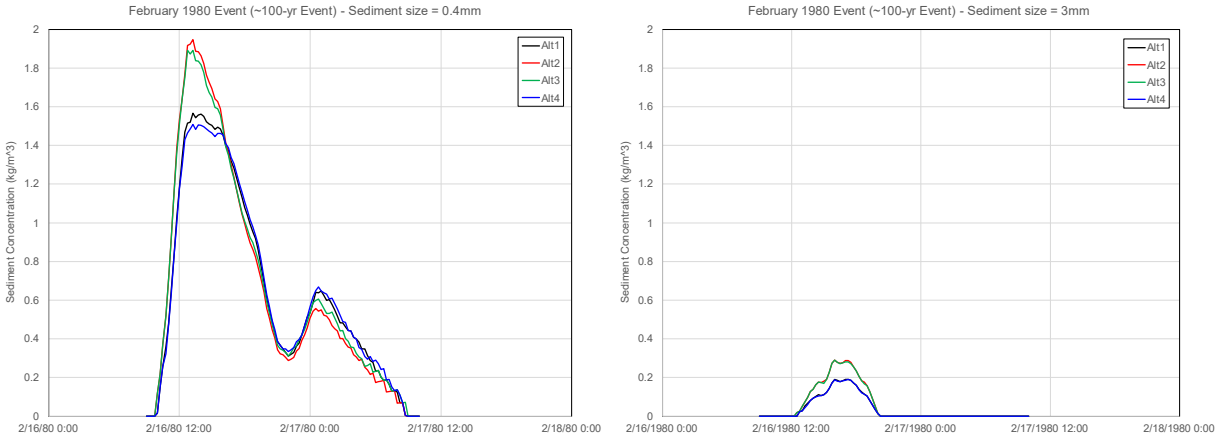


FIGURE 4.4: TOPANGA CREEK SEDIMENT INPUTS FOR ALTERNATIVES – 100-YR EVENT



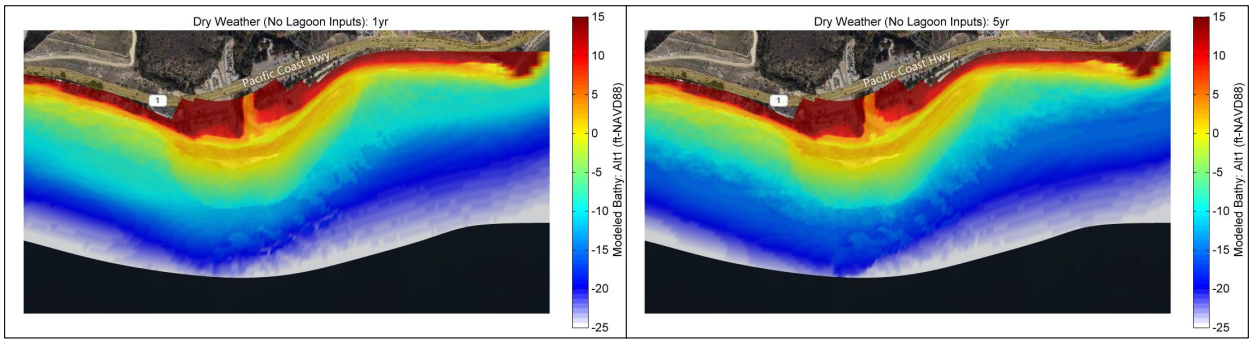
4.3 Morphological Modeling Results

4.3.1 Dry Weather Condition

Alternative 1

Figure 4.5 presents the predicted 1yr and 5yr bathymetries of Alternative 1 (existing conditions) under the dry weather condition (no lagoon sediment input).

FIGURE 4.5: MODEL PREDICTED BATHYMETRY OF ALTERNATIVE 1 UNDER DRY WEATHER CONDITIONS: 1 YRS AND 5 YRS



Alternative 2

Figure 4.6 and Figure 4.7 present the predicted bathymetries of Alternative 2 1yr and 5yr post-construction, respectively, under the dry weather condition. The predicted bathymetry differences between Alternative 2 and Alternative 1 are shown on the right. The bathymetry differences due to initial alternative lagoon grading are excluded in the difference plots in order to isolate and demonstrate the morphological changes over time caused by environmental forces. Under dry weather conditions without lagoon sediment input, the morphological changes in Alternative 2 are similar to Alternative 1. This result is to be expected since all gradings are above +14 ft-NAVD88, except a pilot channel under the proposed PCH bridge which will not have any impact under the dry weather conditions, and no grading south of the current beach berm.

Alternative 3 and Alternative 4 were not simulated under the dry weather condition, their impacts on morphology are expected to be the same as Alternative 2.

FIGURE 4.6: MODEL PREDICTED POST-1-YR BATHYMETRY OF ALTERNATIVE 2 AND DIFFERENCE FROM ALTERNATIVE 1 UNDER DRY WEATHER CONDITIONS

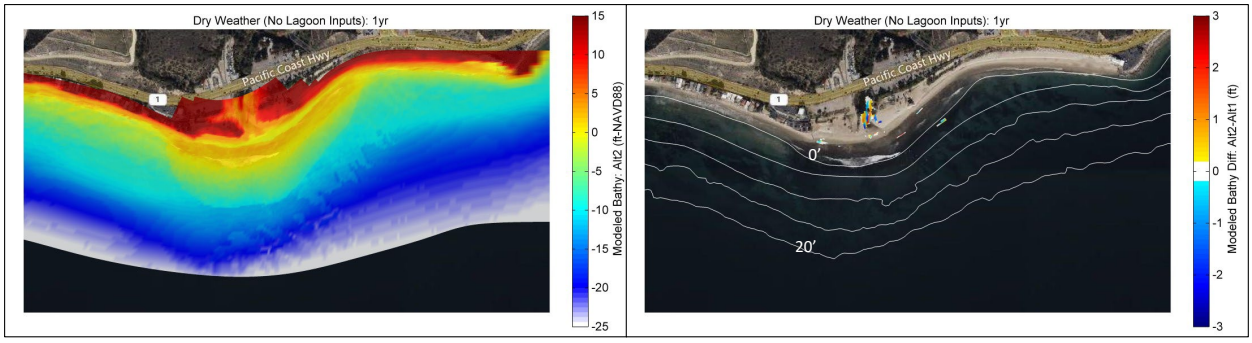
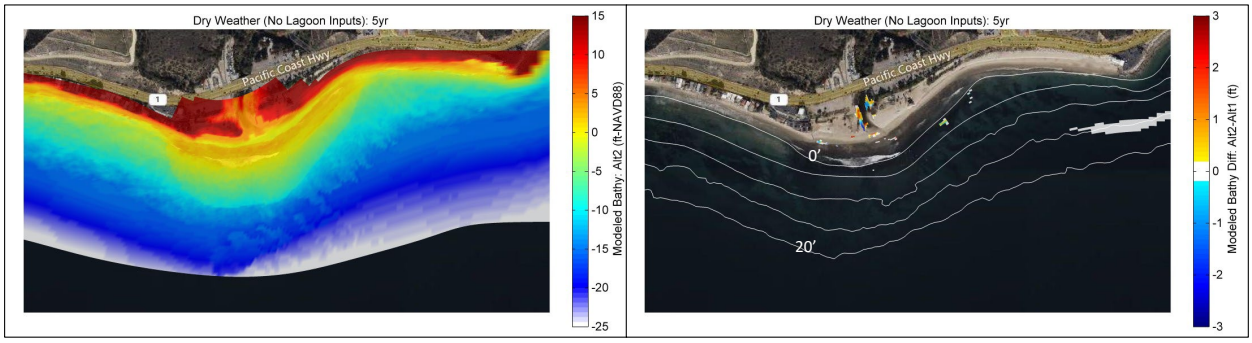


FIGURE 4.7: MODEL PREDICTED POST-5YR BATHYMETRY OF ALTERNATIVE 2 AND DIFFERENCE FROM ALTERNATIVE 1 UNDER DRY WEATHER CONDITIONS

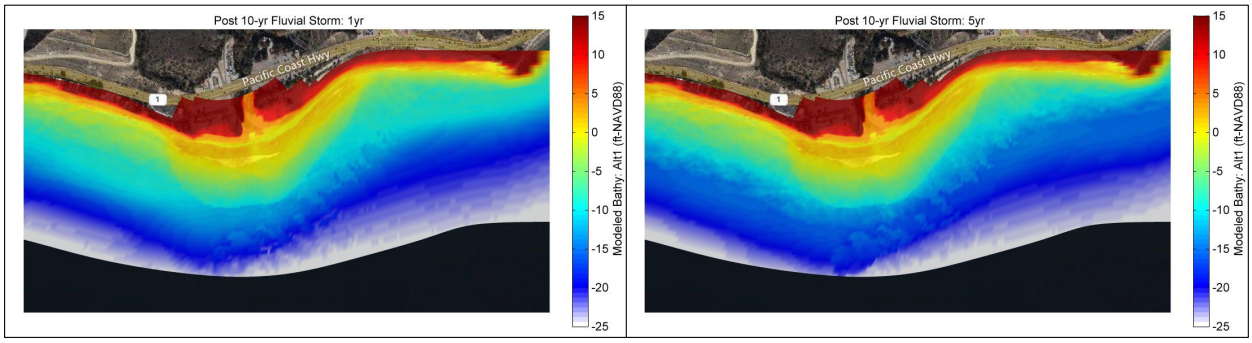


4.3.2 10-yr Return Period Fluvial Storm Condition

Alternative 1

Figure 4.8 presents the predicted 1yr and 5yr bathymetries of Alternative 1 after the 10-yr return period (RP) fluvial storm.

FIGURE 4.8: MODEL PREDICTED BATHYMETRY OF ALTERNATIVE 1 AFTER 10-YR RP FLUVIAL STORM: 1YR AND 5YR



Alternative 2

Figure 4.9 and Figure 4.10 present the predicted 1yr and 5yr post-construction bathymetries of Alternative 2, respectively, after the 10-yr RP fluvial storm, along with the bathymetry differences between Alternative 2 and Alternative 1, shown in the right. The shoreline differences occurred between 0 to -5 ft-NAVD88 contours in the Topanga Point area and the magnitudes are less than 0.4ft. All proposed alternatives include a pilot channel west of the current creek thalweg. The modeling results indicate that there is erosion in the pilot channel after the storm event, which could lead to west breach of the lagoon mouth. A west breach is considered favorable for surfing.

FIGURE 4.9: MODEL PREDICTED POST-1YR BATHYMETRY OF ALTERNATIVE 2 AND DIFFERENCE FROM ALTERNATIVE 1 AFTER 10-YR RP FLUVIAL STORM

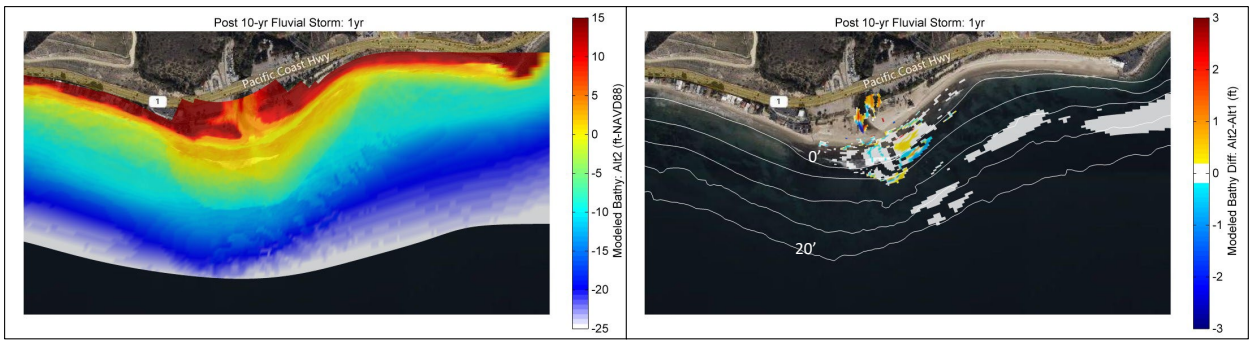
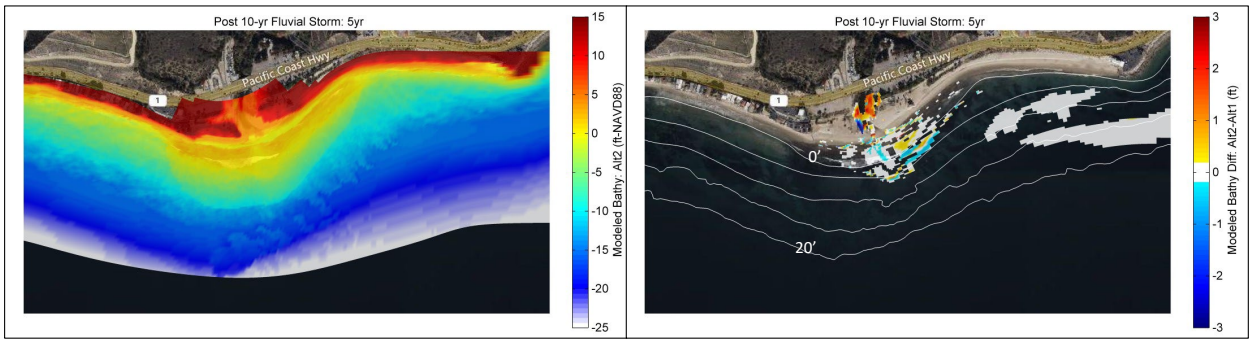


FIGURE 4.10: MODEL PREDICTED POST-5YR BATHYMETRY OF ALTERNATIVE 2 AND DIFFERENCE FROM ALTERNATIVE 1 AFTER 10-YR RP FLUVIAL STORM



Alternative 3

Figure 4.11 and Figure 4.12 present the predicted 1yr and 5yr post-construction bathymetries of Alternative 3, respectively, after the 10-yr RP fluvial storm, along with the bathymetry differences between Alternative 3 and Alternative 1. Similar to Alternative 2, the differences occurred above -5 ft-NAVD88 contour in the Topanga Point area and the magnitudes are less than 0.4ft.

FIGURE 4.11: MODEL PREDICTED POST-1YR BATHYMETRY OF ALTERNATIVE 3 AND DIFFERENCE FROM ALTERNATIVE 1 AFTER 10-YR RP FLUVIAL STORM

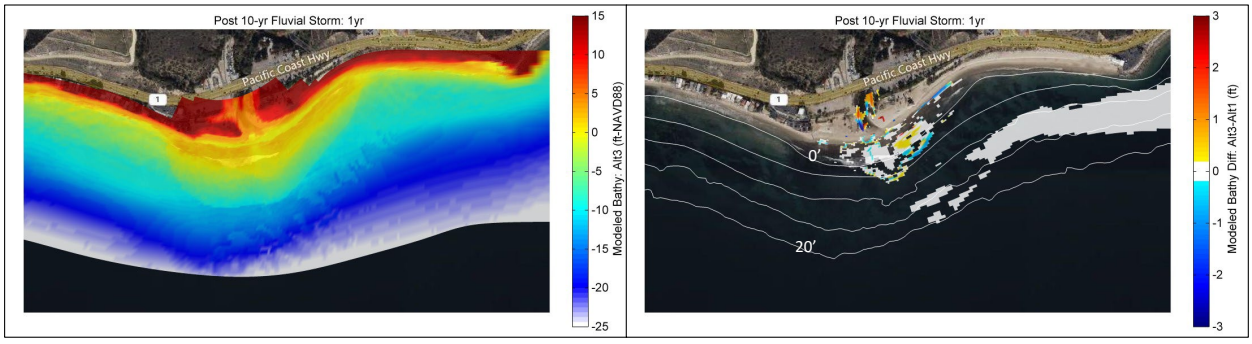
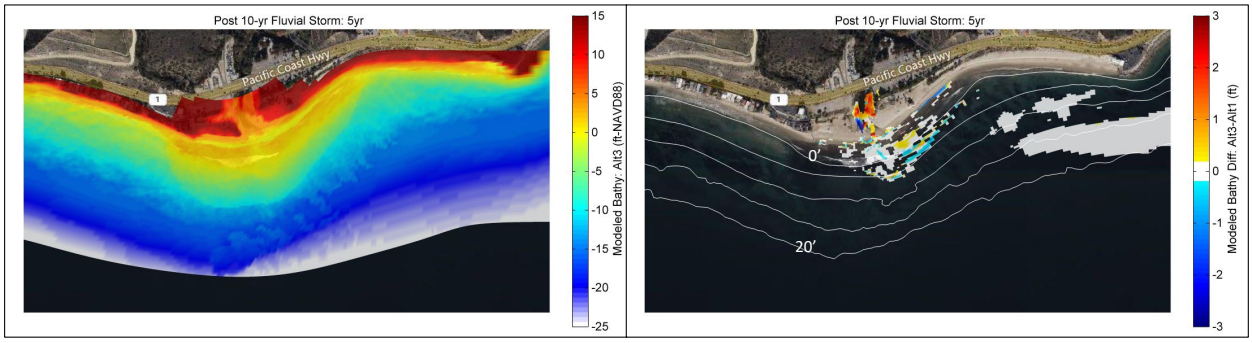


FIGURE 4.12: MODEL PREDICTED POST-5YR BATHYMETRY OF ALTERNATIVE 3 AND DIFFERENCE FROM ALTERNATIVE 1 AFTER 10-YR RP FLUVIAL STORM



Alternative 4

Figure 4.13 and Figure 4.14 present the predicted 1yr and 5yr post-construction bathymetries of Alternative 4, respectively, after the 10-yr RP fluvial storm, along with the bathymetry differences between Alternative 4 and Alternative 1. Similar to Alternatives 2 and 3, the differences occurred above -5 ft-NAVD88 in the Topanga Point area and the magnitudes are less than 0.4ft.

In summary, after a 10-year fluvial storm event, the proposed Alternatives will result in very minor morphological changes compared to the existing condition, less than 0.4ft. This difference is well within seasonal morphological changes. CRM performed two nearshore habitat surveys in August-October 2022 and June-July 2023 as part of the overall project. The field staff indicated that they found 6-inch or more sand level changes in some areas between the two surveys.

FIGURE 4.13: MODEL PREDICTED POST-1YR BATHYMETRY OF ALTERNATIVE 4 AND DIFFERENCE FROM ALTERNATIVE 1 AFTER 10-YR RP FLUVIAL STORM

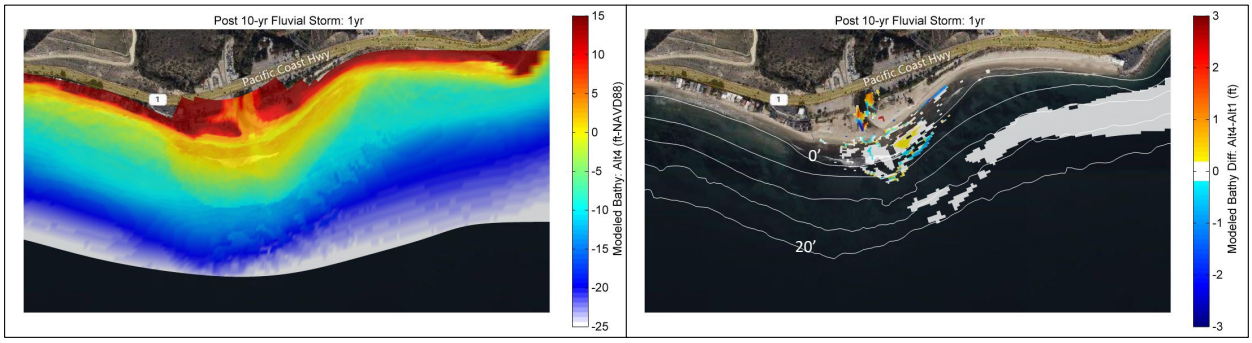
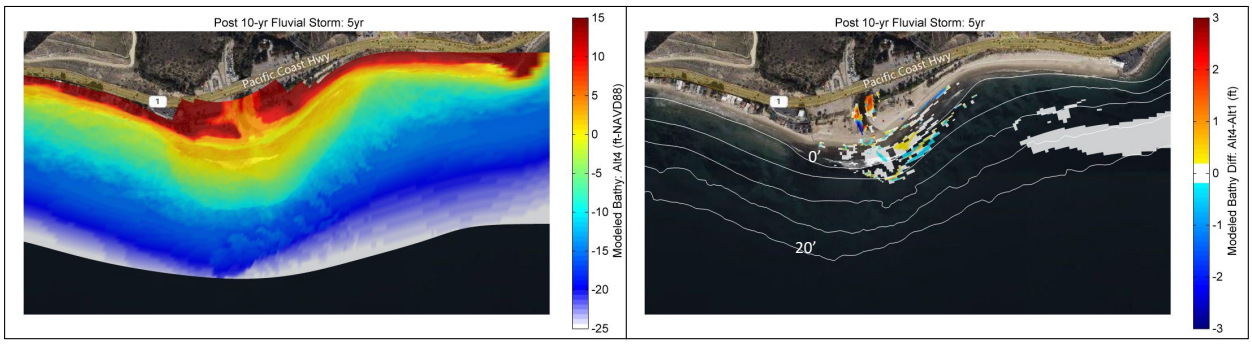


FIGURE 4.14: MODEL PREDICTED POST-5YR BATHYMETRY OF ALTERNATIVE 4 AND DIFFERENCE FROM ALTERNATIVE 1 AFTER 10-YR RP FLUVIAL STORM

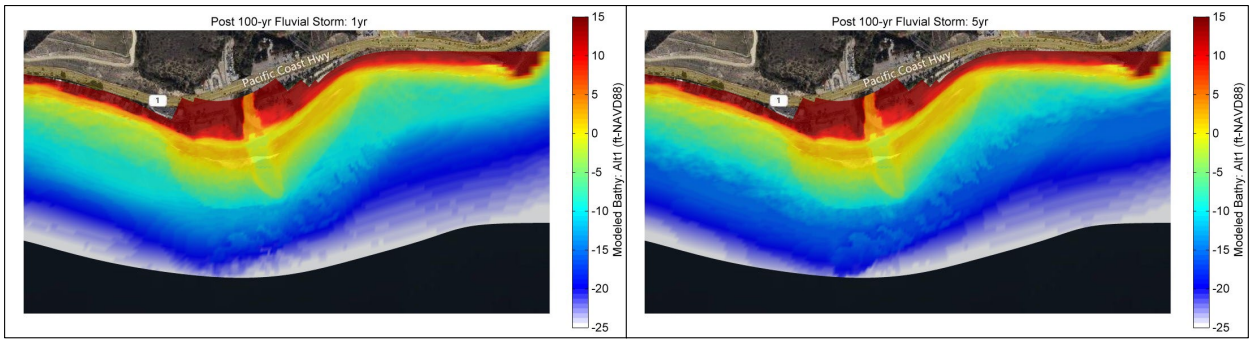


4.3.3 100-Year Return Period Fluvial Storm Condition

Alternative 1

Figure 4.15 presents the predicted 1yr and 5yr post-construction bathymetries of Alternative 1 after the 100-yr RP fluvial storm. Due to the high velocities of the 100-yr RP fluvial storm from the lagoon, the existing cobbles offshore of the lagoon breach channel were mobilized and transported offshore and a channel was created through the cobble berm. This morphological change remains after 5 years of wave action because the typical waves could not move the cobbles once they settled.

FIGURE 4.15: MODEL PREDICTED BATHYMETRY OF ALTERNATIVE 1 AFTER 100-YR RP FLUVIAL STORM: 1YR AND 5YR



Alternative 2

Figure 4.16 and Figure 4.17 present the predicted 1yr and 5yr post-construction bathymetries of Alternative 2, respectively, after the 100-yr RP fluvial storm, along with the bathymetry differences between Alternative 2 and Alternative 1. Due to the flow field differences during the 100-yr RP fluvial storm between alternatives, the existing cobbles offshore of the lagoon were transported in slightly different directions. Thus, slightly different channel orientation was generated. Alternative 2 cuts through the cobble berm slightly to the west compared to Alternative 1, which could lead to west shift of the thalweg and breach. The magnitudes of morphological differences for the nearshore area are less than 1ft.

FIGURE 4.16: MODEL PREDICTED POST-1YR BATHYMETRY OF ALTERNATIVE 2 AND DIFFERENCE FROM ALTERNATIVE 1 AFTER 100-YR RP FLUVIAL STORM

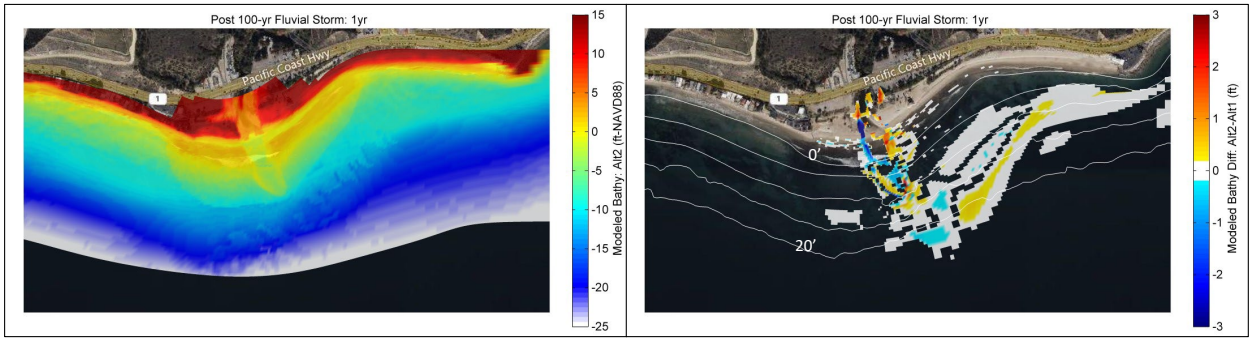
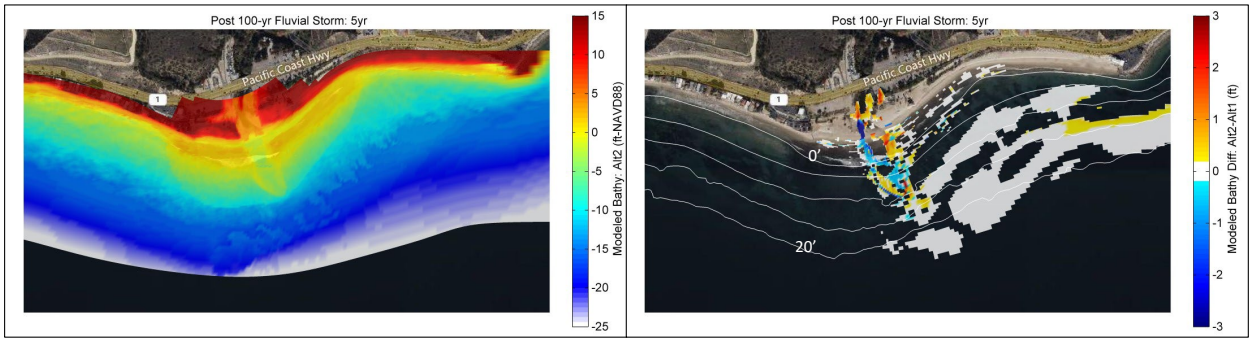


FIGURE 4.17: MODEL PREDICTED POST-5YR BATHYMETRY OF ALTERNATIVE 2 AND DIFFERENCE FROM ALTERNATIVE 1 AFTER 100-YR RP FLUVIAL STORM



Alternative 3

Figure 4.18 and Figure 4.19 present the predicted 1yr and 5yr post-construction bathymetries of Alternative 3, respectively, after the 100-yr RP fluvial storm, along with the bathymetry differences between Alternative 3 and Alternative 1. Due to the flow field differences during the 100-yr RP fluvial storm between alternatives, the existing cobbles offshore of the lagoon were transported in slightly different directions. Like Alternative 2, Alternative 3 cuts through the cobble berm slightly to the west compared to Alternative 1, which could lead to west shift of the thalweg and breach; and the magnitudes of morphological differences for the nearshore area are less than 1ft.

FIGURE 4.18: MODEL PREDICTED POST-1YR BATHYMETRY OF ALTERNATIVE 3 AND DIFFERENCE FROM ALTERNATIVE 1 AFTER 100-YR RP FLUVIAL STORM

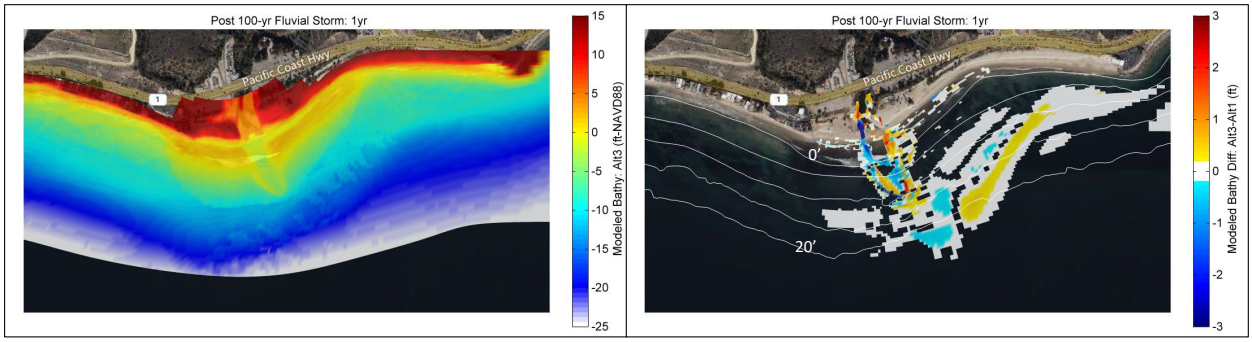
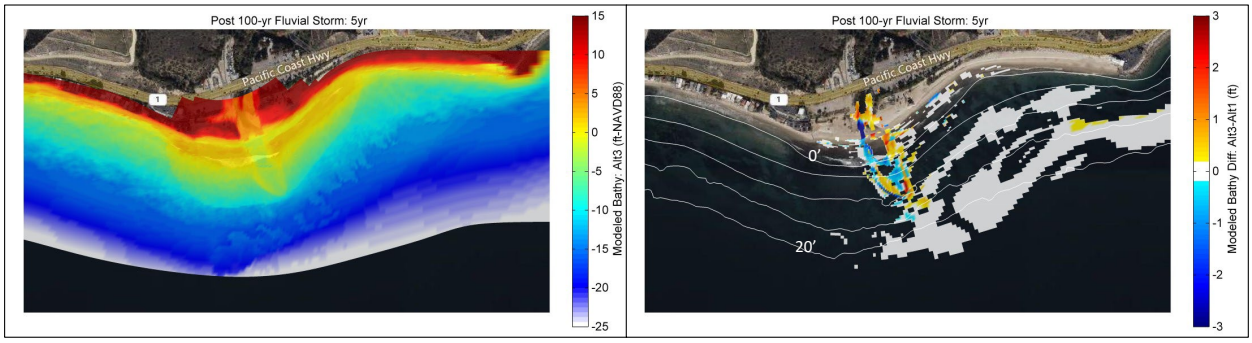


FIGURE 4.19: MODEL PREDICTED POST-5YR BATHYMETRY OF ALTERNATIVE 3 AND DIFFERENCE FROM ALTERNATIVE 1 AFTER 100-YR RP FLUVIAL STORM



Alternative 4

Figure 4.20 and Figure 4.21 present the predicted 1yr and 5yr post-construction bathymetries of Alternative 4, respectively, after the 100-yr RP fluvial storm, along with the bathymetry differences between Alternative 4 and Alternative 1. Due to the flow field differences during the 100-yr RP fluvial storm between alternatives, the existing cobbles offshore of the lagoon were transported in slightly different directions. Similar to Alternative 2, Alternative 4 cuts through the cobble berm slightly to the west compared to Alternative 1, which could lead to west shift of the thalweg and breach; and the magnitudes of morphological differences for the nearshore area are less than 1ft.

FIGURE 4.20: MODEL PREDICTED POST-1YR BATHYMETRY OF ALTERNATIVE 4 AND DIFFERENCE FROM ALTERNATIVE 1 AFTER 100-YR RP FLUVIAL STORM

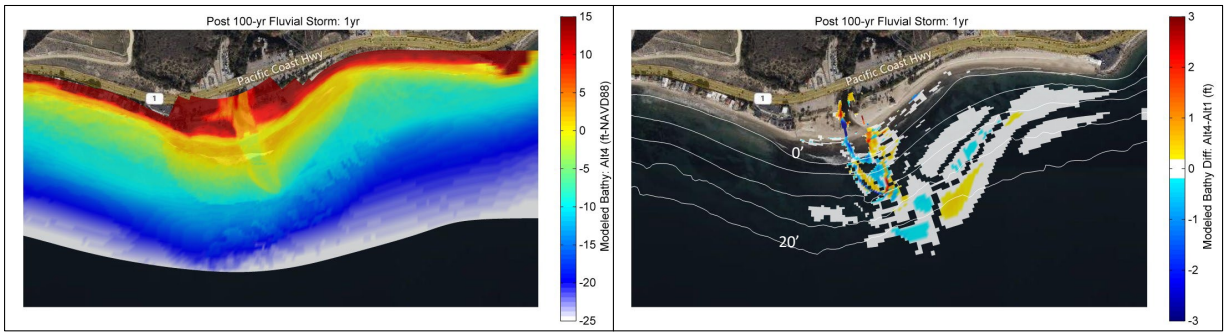
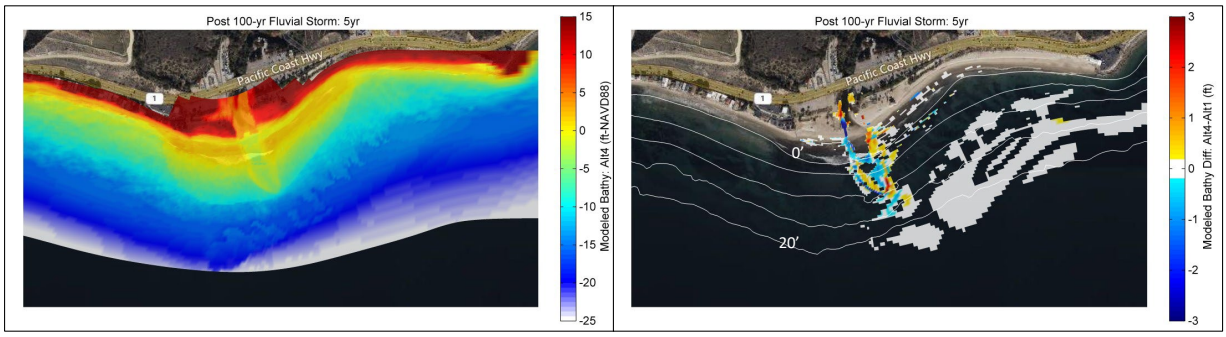


FIGURE 4.21: MODEL PREDICTED POST-5YR BATHYMETRY OF ALTERNATIVE 4 AND DIFFERENCE FROM ALTERNATIVE 1 AFTER 100-YR RP FLUVIAL STORM



4.4 Summary of Findings

A 2D Delft3D FM morphological model was created for the Topanga Lagoon and adjacent beaches for sediment transport and shoreline morphology change analyses caused by different lagoon restoration alternatives. The model was calibrated with recorded waves, currents, and morphological changes. The impacts of alternatives on beach and nearshore morphology were studied under three different lagoon flow conditions: dry weather, 10-yr and 100-yr RP fluvial storms. The key findings are summarized below:

- Under both dry weather and 10-yr RP fluvial storm conditions, the morphological changes were similar between alternatives, well within seasonable changes.
- Under the 100-yr RP fluvial storm, the high velocity cuts a channel through the existing cobble berm offshore of the lagoon mouth. The cut channel alignment is slightly different and thus creates different channel orientations through the cobble berm between alternatives. Compared to Alternative 1, Alternatives 2, 3 and 4 cut through the cobble berm slightly to the west compared to Alternative 1 resulting in a slightly west orientated channel. The morphological changes in other areas between alternatives were less than 1 ft, which is well within the natural seasonal changes.
- The proposed western pilot channel (based on historic thalweg alignment) was further eroded after both 10-yr and 100-yr fluvial storms, which could lead to thalweg shifting west, a favorable condition for surfing.

- Based on the model results, the removal of the Helipad and lifeguard building would not cause more erosion on adjacent beaches under modeled wave conditions in current sea level since proposed gradings adjacent to the Helipad are above +14ft and the lifeguard building pad is also above +14ft. The highest observed tidal water level in Santa Monica Bay under the current sea level is 7.5ft NAVD88. The FEMA effective 100-year wave runup elevation is 13ft NAVD88 (FEMA 2023, Map No. 06037C1562G, effective 4/21/2021). The CoSMoS results indicate the wave runup would reach the lifeguard building with 0.8ft (025 m) of sea level rise.

5 Historical Shoreline Changes

5.1 Aerial Imagery

A record search of historical aerial imagery was conducted at the library of University of California Santa Barbara through FrameFinder (2023). A few representative aerial images are cited here. More images are available at the FrameFinder website. The earliest imagery of the Topanga Point dated back to January 1, 1928.

- Figure 5.1 is a 1928 image before the PCH bridge was shortened and realigned in 1933.
- Figure 5.2 is a 1940 image and shows the new aligned PCH and shortened PCH bridge, but there were no Helipad and lifeguard buildings.
- Figure 5.3 is a 1947 image, the first image showing the Helipad.
- Figure 5.4 is a 1976 image, after Helipad before lifeguard buildings.
- Figure 5.5 is a 1980 image, the first image of lifeguard tower.
- Figure 5.6 is a 2001 image, the first image with sheet pile groin west of the Topanga lagoon.
- Figure 5.7 is a 2023 Google Earth image, current condition shows recent erosions of east Topanga Beach.

Review of historical images indicates that the Topanga Point formed with large cobbles and boulders has been very stable since the first record in 1928. The Helipad was added in the 1940s, a lifeguard tower was added in 1970s, and the current lifeguard buildings were completed in 1986. The Topanga Point has been stable before and after those features were added. The Topanga cobble delta is a very large natural feature. The size of Helipad and lifeguard buildings are much smaller and insignificant features compared to the large cobble delta to affect the future shoreline. Hence, it is not expected that removing the two features will have any meaningful impact on shoreline morphology at the Topanga Point and therefore impacts to surfing are not expected. Narrower beach width on east Topanga Beach is shown in the 2023 image compared to 2001 and 1980 images, indicating beach erosion in the recent years. The beach widths in a few prior years (1940, 1947 and 1976) are similar to the current narrow beach width. This shows variations in shoreline morphology and beach width. The seasonal variability is further discussed in the next section.

FIGURE 5.1 1928 IMAGERY OF THE TOPANGA POINT (OLD PCH ALIGNMENT)

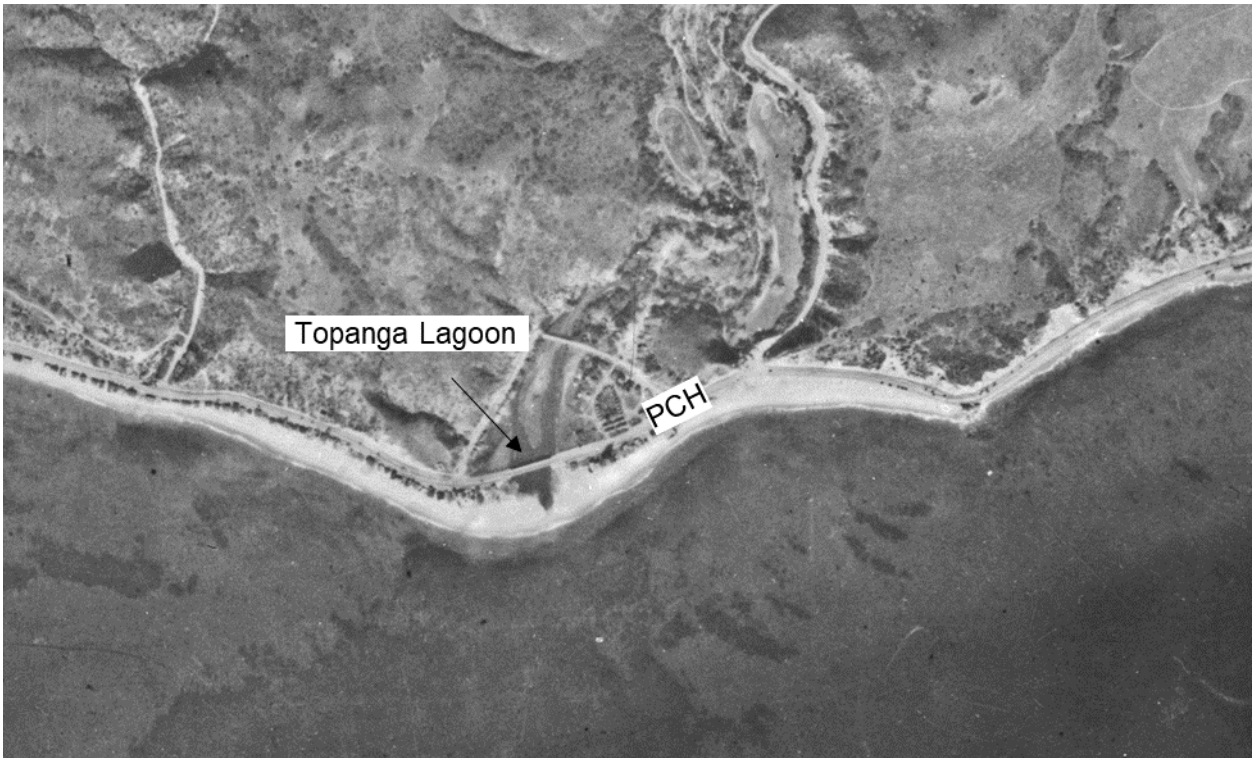


FIGURE 5.2 1940 IMAGERY OF THE TOPANGA POINT (NEW PCH ALIGNMENT)

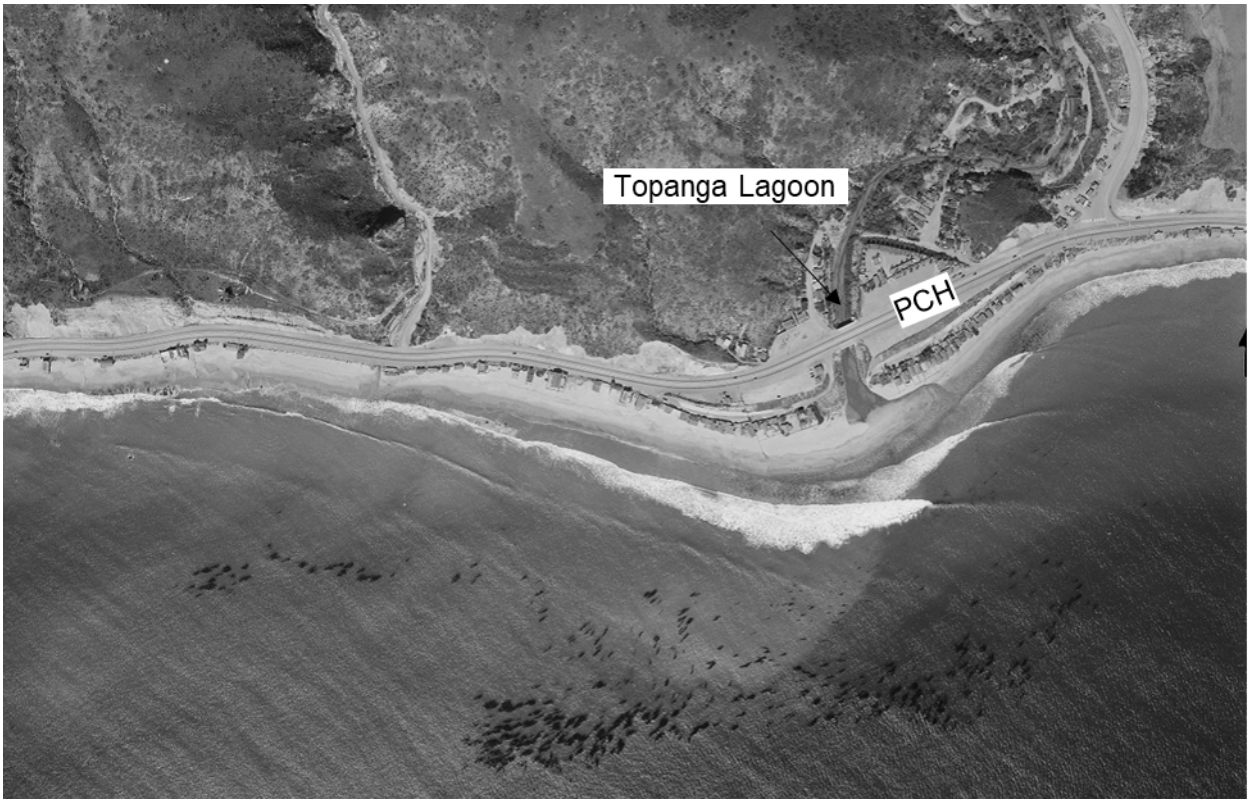


FIGURE 5.3 1947 IMAGERY OF THE TOPANGA POINT (NEW HELIPAD)

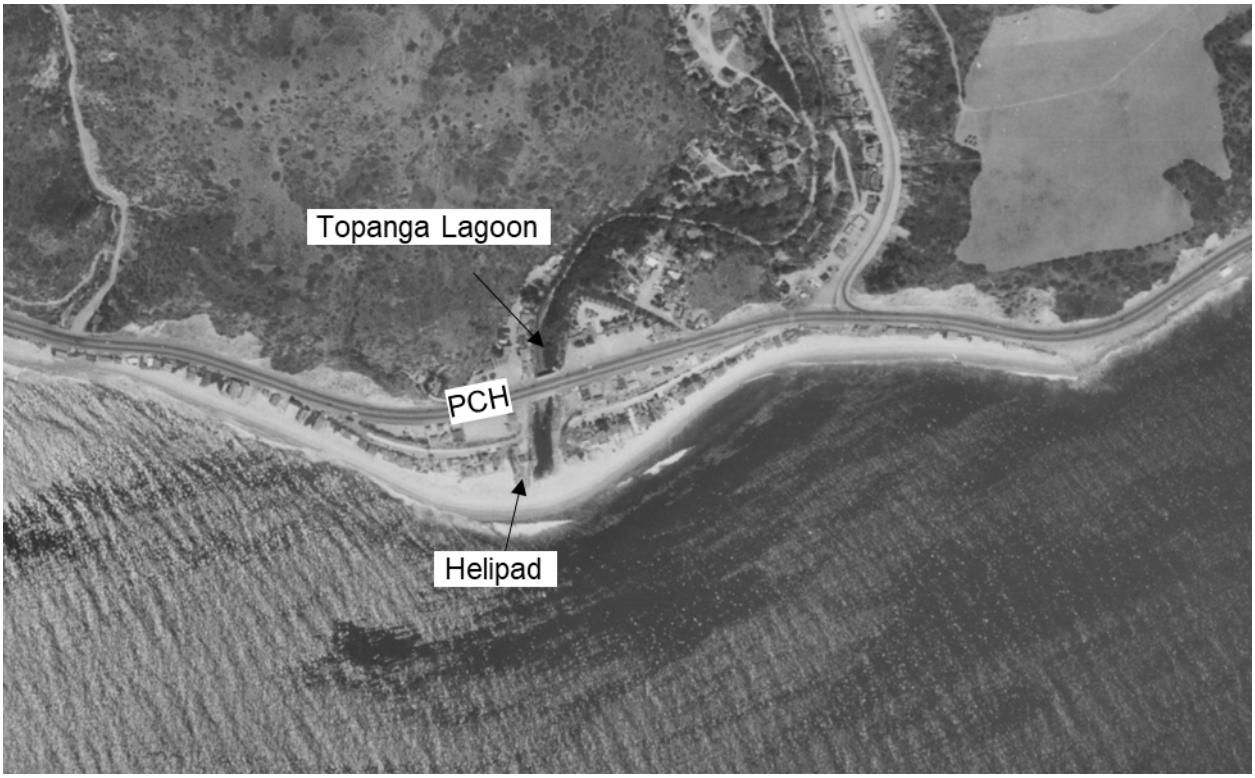


FIGURE 5.4 1976 IMAGERY OF THE TOPANGA POINT (AFTER HELIPAD BEFORE LIFEGUARD BUILDINGS)

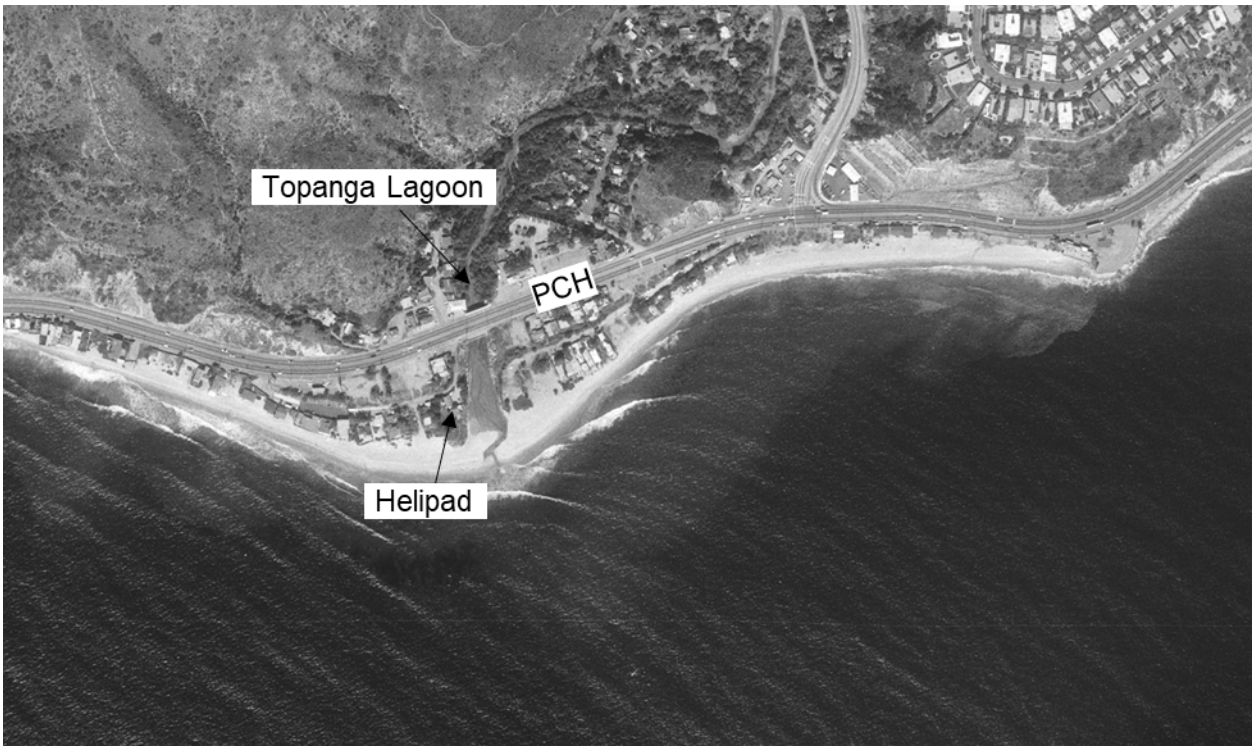


FIGURE 5.5 1980 IMAGERY OF THE TOPANGA POINT (NEW LIFEGUARD TOWER)

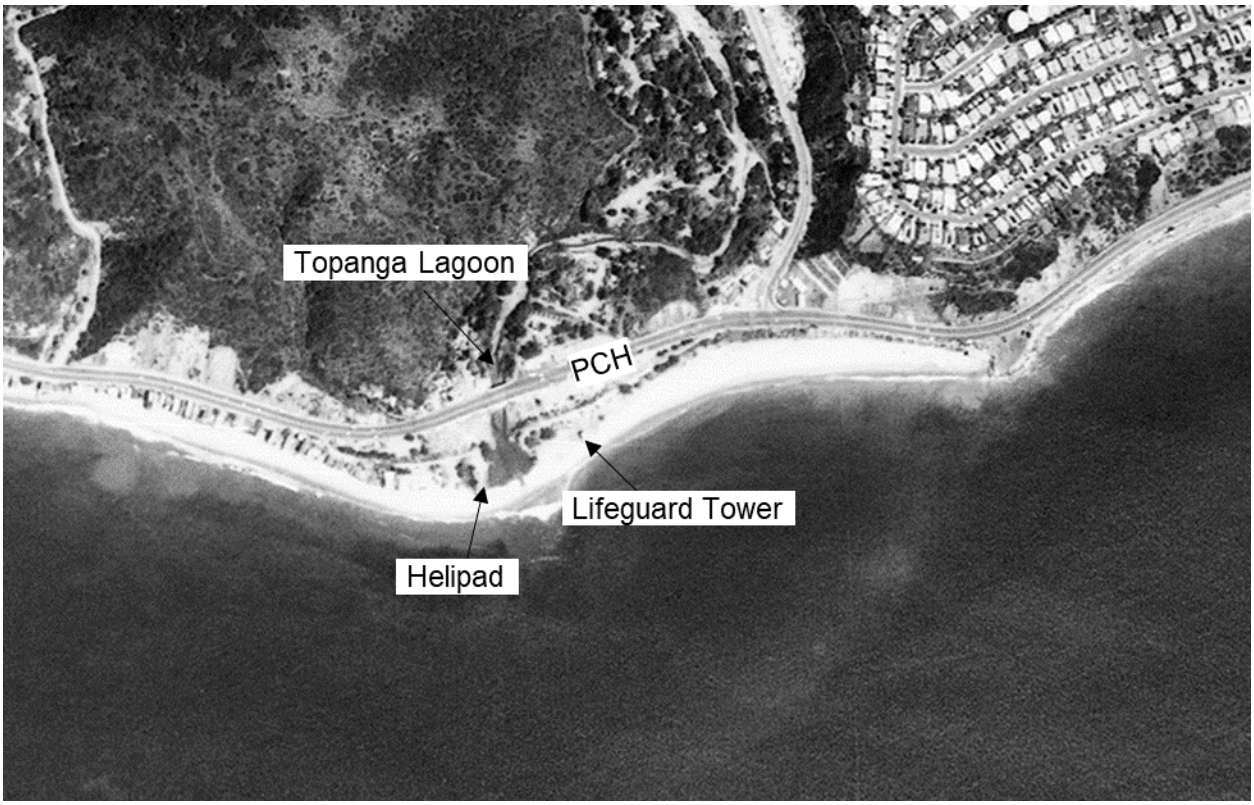


FIGURE 5.6 2001 IMAGERY OF THE TOPANGA POINT (NEW SHEETPILE GROIN)

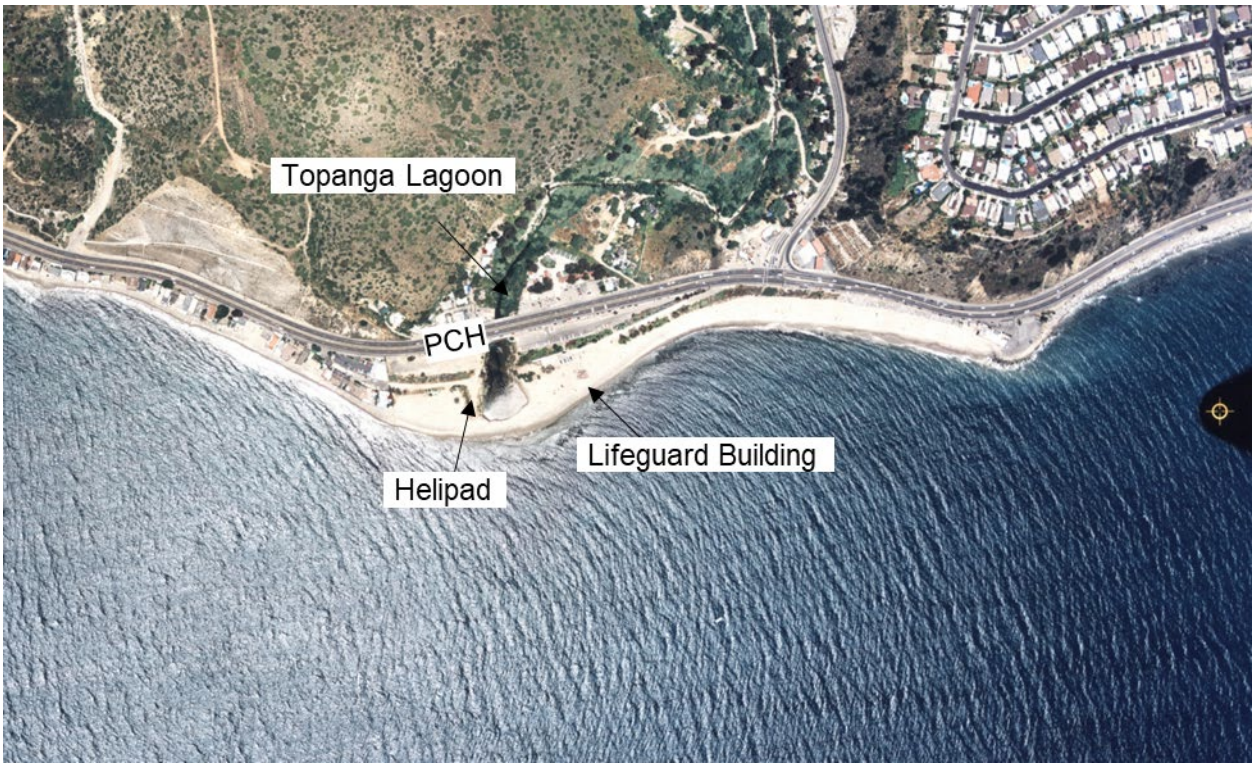


FIGURE 5.7 2023 JULY IMAGERY OF THE TOPANGA POINT (PRESENT CONDITION)

5.2 Historical Beach Profiles and Widths

The CoastSat data from United States Geological Survey (USGS) and the University of New South Wales provide satellite-derived shoreline position changes for the past 38 years from 1984 to 2021 (Vos et. al., 2019). Figure 5.8 presents CoastaSat analysis transects in the project area with erosional shoreline reaches highlighted in red. The color of the transect lines indicates the long-term shoreline change rate at the transect location. Warm color indicates erosion with a negative shoreline change rate, and cold color indicates accretion with a positive shoreline change rate. A neutral color close to white means a relatively stable shoreline with a shoreline change rate close to 0. Per CoastSat data (in other words, based on the analysis of historical shoreline images), the following conclusions can be derived for the study reach from west to east:

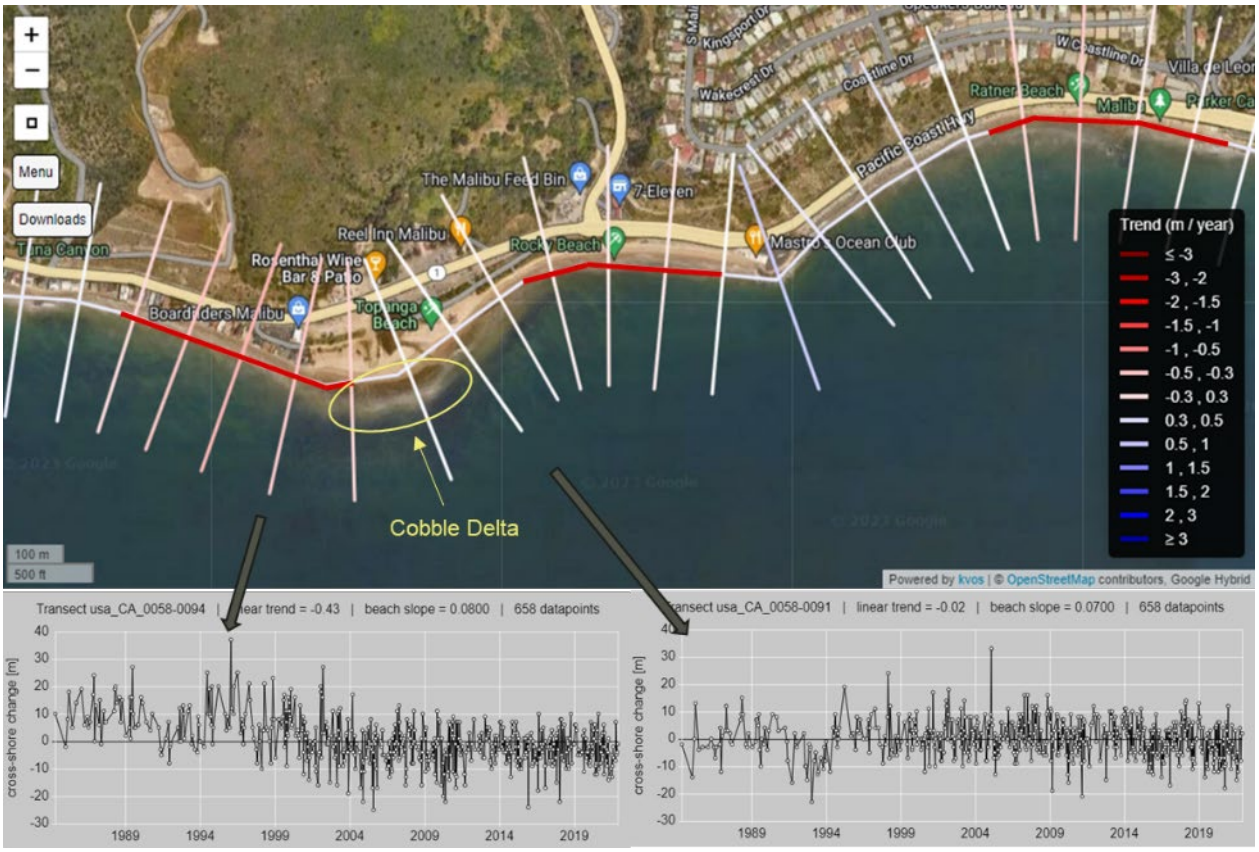
1) The southwest facing reach west of the Topanga Point has the highest erosion rate compared to other reaches within the studied area, due to its exposure to south and southwest waves.
2) The Topanga Point is stable due to the large cobble delta presence as shown in Figure 3.3.
3) The reach immediately east of the Topanga Point is stable due to sheltering of the Topanga Point, which blocks the direct westerly wave impacts.
4) The south to southwest facing Cove beach is retreating due to its exposure to direct south to southwest wave impacts.
5) The reach from Mastro's Point to east is stable due to the presence of Mastro's Point. Positive shoreline accretion is seen at Mastro's Point as the eastly moving sand is retained by the Mastro's Point. The reach immediately to the east is stable due to sheltering effect of Mastro's Point.
6) The most east segment of the study area (called "Ratner Beach") is retreating due to its exposure to direct south to southwest wave impacts similar to the Cove Beach.

In general, all southwest facing shorelines retreat over the past 38-years, due to their exposure to southwesterly wave impacts. Topanga Point due to the large cobble delta presence and Mastro's Point due to the rock protection are stable. Reaches east of the two features are stable due to sheltering of the two features.

It is worth pointing out that beach width changes seasonally and periodically. Beaches are typically narrower in the winter through spring due to winter coastal storm impacts and recover and become wider again in the summer and fall. The cross-shore change in the two lower plots of Figure 5.8 shows beach width seasonal changes over the 38-year period. A negative value indicates retreat, and a positive value indicates accretion. This seasonal change can easily be up to 20-30 ft in the region. The beach width is also subjected to other meteorological impacts such as El Nino and fluvial storms. El Nino brings larger coastal storms and erodes beaches; however, fluvial storms bring more sand to the beaches and nourish beaches. This kind of event occurs periodically. Hence, beach widths also change periodically as shown in images in Section 5.1.

The beneficial reuse of excavated materials from the lagoon grading and placing sediment nearshore documented in a companion study will hopefully slow down the erosion and nourish the sand starving beach there.

FIGURE 5.8 HISTORICAL SHORELINE CHANGES WITHIN THE STUDY AREA (COASTSAT, 2023)



6 Questions and Responses

As described previously, the proposed project will remove the lifeguard building and Helipad, lengthen the PCH bridge, and reconfigure the lagoon to expand lagoon habitats. The public, including surfers, raised concerns that the proposed changes may negatively affect recreational activities at Topanga beach and the surf at Topanga Point. To address those concerns, shoreline morphology analyses were performed, and a Topanga Surf Quality Impact Assessment study was conducted as a companion study included in Appendix B. This section addresses questions raised.

6.1 Morphology Related Questions

How will the beach (bathymetry and profile) be affected by the project for adjacent beaches?

Does the beach continue to erode once the Helipad and lifeguard building are removed?

The Topanga Point is a large natural feature formed and stabilized by large volumes of cobbles and boulders. Waves are breaking at the outer edge of the Point before reaching the beach. All proposed gradings for the project are landward of the beach berm and above +14-ft NAVD88, except a pilot channel under the PCH bridge, thus should not change any beach morphology. The results from the shoreline change model COAST performed by Integral conclude that the proposed alternatives would have rather small impacts to the shorelines. But SLR has large impacts on future shorelines.

Because both the Helipad and lifeguard building are very small features compared to the Topanga Point, removal would not change the Topanga Point and the wave break, as shown by the historical aerial photos and historical shoreline change rates from CoastSat data (Section 5). The morphological model results show that the removals of Helipad and the lifeguard buildings would have little impact on adjacent beaches under the modeled wave conditions and current sea level.

What is the regional context for beach erosion and how is that being addressed?

The historical regional shoreline changes are discussed in detail in Section 5 based on aerial imagery and CoastSat data. The shoreline is relatively stable for the reach between Topanga Lagoon mouth to the lifeguard building over the long term. However, the beach width changes seasonally and periodically depending on winter coastal storm conditions and sediment delivery from the watershed. The shoreline has been retreating, and the beach is narrow in the recent years as shown in Figure 5.7. In general, the southwest facing shorelines are retreating. The trend will continue, and the project will not change the trend. However, SLR will cause more beach erosion in the future.

The restoration project is intentionally proposing sediment beneficial reuse to nourish the beach. The proposed reuse will benefit the downcoast beaches.

6.2 Surf Quality Related Questions

Integral Consulting Inc. performed a surf quality impact assessment (Appendix B) to better understand how the Topanga Lagoon Restoration Project may affect the quality of the surf at Topanga Point. A surfer focus group meeting was held to understand the best offshore wave conditions for surfing at Topanga Point. The conditions agreed upon were input into a high-fidelity wave modeling tool to understand the impact the lagoon restoration may have on surf quality at 1- and 5-years post construction. The effects of sea level rise and flood vs drought years were also analyzed. Many of the key concerns of the local surfers are answered below but more information can be found in the full report in Appendix B.

How will the surf be affected by the project?

Project alternatives will have little to no impact on the quality of the surfing at Topanga Point. During a long-period south swell, model results showed that the project will make the outside section of the wave up until the restrooms break slightly steeper and faster while making the inside section closer to the cove become

softer and more “rippable” 1-year post construction. 5 years post construction there are essentially no changes in wave quality due to the project for this wave case. During a large west swell (7ft @ 10s), the project was modeled to have no impact on the surf quality. All changes due to the lagoon restoration are within the bounds of the difference between a flood and drought year without the project. It was shown that sea level rise will have the biggest impact on the surf quality at Topanga Point.

Could the quality of the waves for surfing be negatively affected?

The peel angle of the waves at Topanga Point (related to the speed at which they are “peeling”) was modeled to change slightly 1-year post construction due to the lagoon restoration. This change, however, was not outside the bounds of a surfable wave and may in fact make the wave steeper and in better shape for intermediate to advanced level surfers. 5-years post construction the impact of the project diminishes and no noticeable affect due to the project will remain.

Is the swell window impeded in any way?

No, the swell window is not impeded in any way from the project. All project construction will occur north of the beach berm and will remain outside of the swell window of Topanga Point.

Is the accessibility to the surf break negatively affected?

Accessibility to the surf break may be slightly hindered during project construction but it is still available. Accessibility will be restored once the project is completed.

What actions can we take during next stage of design development to direct flows to west? (bridge piling shape alignment, grading, etc.)

A pilot channel west of the current thalweg is included in all proposed alternatives to support westward migration of the thalweg. To protect the fish species in the lagoon, the project is not allowed to change the current wet lagoon. Bridge bents are aligned parallel to creek, not perpendicular to the road to allow the flow exit westerly. Morphological modeling results indicate that all proposed alternatives will cut through the cobble delta more westerly compared to the existing conditions during the extreme fluvial storms.

What adaptive management actions should we consider in case things go east instead of west?

1) The lagoon breaching is a natural process. Breach orientation mainly depends on creek flow and velocity. Easterly migration of the breach is due to west and southwest waves.
2) The design already considered promoting the westerly breach as demonstrated in the modeling results.
3) Artificial breaching is illegal.

6.3 Water Quality Related Question

Is the water quality impacted?

The water quality along Topanga beach will not be impacted by the proposed project. All proposed alternatives will increase the lagoon size and habitat acreage, and therefore its tidal connection when open. The improved coastal habitats and a larger lagoon area and volume should improve the lagoon circulation and therefore water quality when it is connected to the ocean. The increase of the lagoon size will require a relatively larger storm event (more rainfall) to breach the berm, hence, the breaching frequency may be slightly reduced. However, after it is breached open, the breach will stay open slightly longer due to increased lagoon area and volume. Overall, the proposed alternatives are not expected to change the breach pattern and the overall duration. Please refer to the following document for detailed breach pattern and duration analyses: Topanga Lagoon Restoration Ecohydrology Report: Fish Passage, Fish Habitat Suitability and Habitat Zone Elevations (ESA 2022).

6.4 Sea Level Rise Impact Questions

What will happen to the shoreline and beach due to SLR? Does the project change this at all?

Integral Consultants Inc. used a shoreline model developed by the USGS called COAST to simulate the effect of SLR on the shoreline and beach at Topanga. 1.6, 3.3 and 6.6 ft of SLR were modeled while adjusting different environmental parameters such as beach slope, sediment supply from the lagoon, and inlet breach location to determine which had the greatest effect on the projected shoreline position. It was found that the shoreline position is relatively insensitive to the effects the project may have on the beach slope, sediment supply, and lagoon breach location and that SLR's impact on the shoreline is much greater than any effects of the project. The beach width is expected to decrease with SLR and erode to the base of the homes west of Topanga Lagoon with 3.3 ft of SLR. The beach along Topanga Point is expected to maintain 220 to 240 ft of width with 6.6 ft of SLR while the beach within the cove is projected to be approximately 80 ft wide. Adjusting environmental parameters only causes a slight change in the projected shoreline position, signifying that the project will have little to no impact on the shoreline.

What will happen to the surf at Topanga Point due to SLR? Will the project make this effect worse?

SLR was modeled to have the greatest effect on the quality of the surf at Topanga Point when compared to changes due to the project and flood vs. drought years. The impact of 1.6 and 6.6 ft of SLR were evaluated. 1.6 ft of SLR was shown to create conditions similar to present-day high tides which are unfavorable for surf quality. 6.6 ft of SLR was shown to make the surf break unrecognizable, with wave breaking occurring over the present-day structures along the shoreline. This effect will occur with and without the project construction.

6.5 Beneficial Reuse of Excavated Materials Questions.

Is there a way to use the fill material to nourish Topanga Beach and if not why not?

It is not recommended to place the excavated materials directly on Topanga Beach. The sediment samples from the Topanga Lagoon excavation sites are dark brown in color and have rigid shapes that are distinctly different from existing beach sand. Directly placing these sediments on the beach could cause injuries to the beach users. Placing excavated materials closer to Topanga Point is also not a good option, neither is the west of Topanga Point as the materials include silt and clay as high as 30% and there is potential for turbidity impacts in the water to the beach users and surfers. Additionally, sensitive marine habitats will be covered if placing the excavated materials close to the Point per 2023 Habitat Survey Map. The beach just west of the Point is a private community that may require additional permits for moving discharge lines through the area and could lead to turbidity in front of the community and the surf point.

Where will the material go once placed?

Once the materials are placed on one of the proposed sites, coarse materials will remain at the site longer, and part of the fine material will be transported onshore and alongshore towards the east. The materials will be transported to beaches on both sides of Mastro's point and will move further east (down drifting direction) and disperse over time in the long term.

How much time will it take for the mound to disperse/reach equilibrium?

Overall, the dispersion of the sediment placed on the proposed sites will not exceed 15% of the original amount (excludes silt and clay) in the first year under the average wave conditions. The amount of sediment dispersed reduces year by year and will reach close to equilibrium after five years. The sediment loss between year 4 and year 5 is only 1% compared to the amount of original placed sediments. The dispersal duration also depends on wave conditions. It will disperse faster under larger wave conditions. For detailed dispersion modeling results, please refer to the Nearshore Mound Dispersal Study (Moffatt & Nichol, 2023).

Would the movement of that material improve the beach erosion east of Mastro's point?

Yes, the proposed beneficial reuse of the excavated material from lagoon dredging will benefit the downcoast beaches. The amount of sediment that goes to the shore is a relatively small portion of the entire beneficial reuse materials, as the sediments are proposed to be placed in an offshore location with elevations between -20ft to -30ft NAVD88 to avoid impacts to sensitive marine habitats. This depth is close to the depth of closure, where the currents are weaker than those at a shallower depth. The model also shows that the sediments dispersed from the placement site and traveled northeast towards the shore will be mainly sands.

How has the importation of sand to protect the lifeguard buildings affected erosion and surf over time?

The volume imported to protect the lifeguard buildings is small and it is placed on the downcoast of the Point. This should not impact or benefit surfing over time.

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8 Appendix A: COAST Long-term Shoreline Change Analysis

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MEMORANDUM

To:	Weixia Jin, Moffat & Nichol
From:	David Revell, Kara Scheu, and Ashley Ellenson
Date:	11/13/2023
Subject:	COAST Long-term Shoreline Change Analysis
Project No.:	C3561 – Task 2C (Topanga Lagoon Restoration Project – Long-term shoreline and beach position)

This memo provides the deliverable for shoreline change analysis (Task 2c) conducted by Integral Consulting Inc. (Integral) to evaluate long-term shoreline changes and potential impacts on surf quality for the Topanga Lagoon Restoration Project (the Project) with Moffatt & Nichol (M&N). The results of this long-term shoreline change study will be incorporated into M&N's report on morphological assessment of Project alternatives. The Project includes a lengthening of the Pacific Coast Highway bridge span and to restore more historic lagoon habitat. Project alternatives considered in modeling conducted by M&N vary in terms extent of the lagoon expansion. This study was included to evaluate longer term changes to shoreline position and beach width related to potential Project impacts.

The shoreline change evaluation was conducted using the USGS – COAST shoreline evolution model to evaluate potential impacts on long term future beach widths and shoreline position resulting from different potential morphological changes associated with the Project. Integral modified the COAST model to incorporate the effect of differences in sediment loading from the lagoon, different mouth locations potentially associated with the Project, under future sea level rise (SLR) scenarios of 1.6, 3.3, and 6.6 ft (corresponding to low-emission 2070, low-emission 2100, and high-emission 2100 SLR scenarios; see M&N 2022). The following memo describes the COAST model, the methodology and analyses to modify the USGS COAST model including changes in assumptions and sensitivity testing in this analysis. Results project a range of long-term shoreline change and beach widths based on possible conditions associated with the Project.

USGS COAST MODEL OVERVIEW

The USGS developed COAST (Coastal One-line Assimilated Simulation Tool) model is a large-scale shoreline change prediction model that predicts shoreline position over time (Vitousek 2017; 2023).[1] The empirical shoreline position model is a transect based model that uses historic shoreline position (satellite imagery from CoastSAT) and hindcast wave conditions to tune key model and statistical parameters to match historic shoreline position (erosion or accretion). The tuned unmodified model can then be used to predict shoreline position based on SLR projections and projected wave conditions to 2100 with projected wave and SLR conditions from COSMOS.

The existing publicly available COAST model has transects located approximately 100m apart and the model was cropped to only simulate the local shoreline change position in Topanga (see Figure 1). The Topanga study area included transects from the neighborhood west of the Helipad and to Mastro's Ocean Club. The non-erodible shoreline position[2] defined in the COAST model is also shown in Figure 1. It is important to note that both the Helipad and the Restrooms are not considered in the existing publicly available COAST model due to the resolution of the model transects (see M&N 2023 report for more details on morphological impacts not included in the COAST analysis).

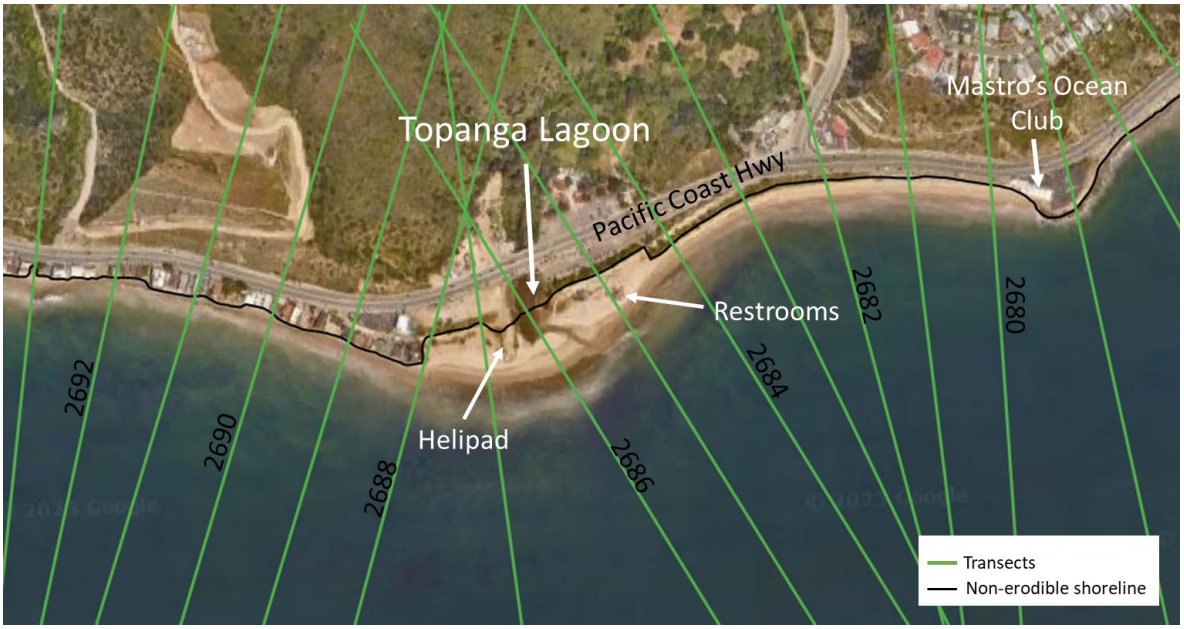

Figure 1. Overview of COAST transect locations and the position of non-erodible shoreline as defined in COAST.

[1] USGS COAST model code is publicly available here: https://code.usgs.gov/pcmsc/cosmos-coast.
[2] The non-erodible shoreline is defined in COAST as the developed backshore of the beach and includes structures, roadways, parking lots, and revetments.

The shoreline position computed in COAST uses the following overall governing equation (Vitousek 2023):

$$\frac{\delta Y}{\delta t} = -\frac{1}{d_c}\frac{\delta Q}{\delta X} - \frac{c}{\tan(\boldsymbol{\beta})}\frac{\delta S}{\delta t} + \boldsymbol{v_{lt}} + \mathrm{ST}$$

shoreline change | longshore transport | sea level rise migration | long-term residual | short-term processes

In the governing equation the shoreline position change over time $\left(\frac{\delta Y}{\delta t}\right)$ is a function of the longshore transport based on offshore wave conditions $\left(-\frac{1}{d_c}\frac{\delta Q}{\delta X}\right)$, the SLR migration of shoreline position as a function of slope (β) and SLR $\left(-\frac{c}{\tan(\boldsymbol{\beta})}\frac{\delta S}{\delta t}\right)$, the long-term residual position change based on un-resolved processes including sediment loading from watersheds (v_{lt}), and other short-term processes (ST) described in more detail in Vitousek 2023. To look at a range of possible beach width changes, the Integral team modified some of the key parameters in the scenarios to evaluate Project impacts including the slope (β) and the long-term residual position change (v_{lt}), which incorporates changes to shoreline position associated with sediment loading from the Lagoon. All other model parameters and wave and SLR forcing conditions were unchanged from the publicly available COAST model (Vitousek 2023). The modifications to these parameters were used to develop the long-term shoreline change scenarios described in the section below.

LONG-TERM SHORELINE CHANGE SCENARIOS

The effect of potential lagoon restoration alternatives was incorporated into the COAST model by modifying key input parameters on future shoreline projections and beach widths. The COAST scenarios in this study modified key input parameters to incorporate potential project impacts on beach slope, sediment loading from the Lagoon, and Lagoon mouth location. As described above, the key parameters in the COAST model relevant for to this analysis are the long-term residual shoreline position correction term (v_{lt}) and shoreline slope (β). The project alternatives are not anticipated to impact the foreshore slope (β) near the lagoon mouth. However, SLR may change the beach or foreshore slopes, and therefore, the slope was modified in this analysis to evaluate shoreline position sensitivity to slope changes. It should be noted that the transect slope in COAST is a single value and does not incorporate the effects of changes in topography or slope in the nearshore or along a transect location. For this reason, β was modified systematically to evaluate the effect of foreshore slope changes on shoreline position over time through model sensitivity analysis. The slope parameter range was informed by the slope range in the existing COAST model and high and low values were selected from the existing model parameters.

The long-term residual shoreline correction term (v_{lt}) incorporates a wide array of processes (including watershed loading) that are not well resolved by the COAST model. The parameter is specified based on statistical tuning of the model to match historic shoreline positions. This model parameter incorporates sediment loading from watershed systems and was modified to consider changes in sediment loading associated with the Project at Topanga Lagoon mouth. The Project, as shown in previous studies and the morphological modeling (M&N 2022), will likely result in a change in sediment loading to the coast due to the potential storage capacity of the lagoon and adjustments to the potential location and width of the outlet channel. The change in sediment loading from the lagoon from M&N modeling (M&N 2022) for each of the Project alternatives was calculated as a percent change relative to existing COAST model conditions. The most significant anticipated change in sediment loading from the Project alternatives is an approximately 10 percent reduction in loading to the coast for Alternative 2 compared to Alternative 1 (no change; M&N 2022). The percent change in sediment loading was incorporated into COAST as a corresponding percent change in v_{lt} at the lagoon mouth transect location. The COAST model parameter range used +/-25 percent to conservatively assess the Project impact on long-term shoreline position.

As part of the Surf Impact Assessment survey, the mouth location was raised as a primary concern of the surf community with the potential to alter the length of ride and quality of wave. While the COAST analysis cannot provide specific details on the influence of a wider range of lagoon outlet locations, it can evaluate the effect of lagoon breach location on shoreline change and beach widths. This was done by moving the location of the sediment loading perturbation (percent change in v_{lt}) both to the East and West of the existing lagoon mouth. The downcoast shoreline position impact associated with changes in breach location could then be evaluated using a proportional percent change in the sediment loading term (v_{lt}) location for potential West and East breach locations.

In total, the Coast model scenarios allowed for projections of possible impacts on future shoreline positions and beach widths by modifying the existing COAST model for three key parameters (beach slope, long-term loading, and the location of long-term loading). For each key parameter, two bounding conditions (e.g., a high and low value or east and west position) were simulated in COAST as a sensitivity analysis with the scenarios summarized in Table 1. The COAST scenarios simulated considered all possible parameter combinations (case 1, case 2, and existing values). Each of these parameter combination scenarios were evaluated at the three SLR conditions (1.6, 3.3, and 6.6 ft).

Table 1. Key COAST parameters and the two bounding cases considered in the COAST model scenarios.

Parameter	Case 1	Case 2
Foreshore slope (β)	Steep (slopes of 0.15)	Flat (slopes of 0.9)
Sediment loading (v_{lt})	Reduced (-25%)	Increased (+25%)
Outlet location	East (transect number 2685)	West (transect number 2687)

The modified COAST model was run for each combination of parameters, resulting in 22 modified total model runs. The projected shoreline output for each new scenario from COAST is the distance along a transect. The shoreline position can be converted to beach width by subtracting the final shoreline position from the minimum erodible shoreline position (Figure 1) for each of the three SLR conditions (1.6, 3.3 and 6.6 ft). Changes in the modified model results are reported in changes in beach width.

LONG-TERM SHORELINE CHANGE RESULTS

The shoreline position and corresponding beach width are assessed for each SLR horizon for each of the parameter combinations (Table 1) to determine shoreline sensitivity to beach slope, outlet location and sediment yield. The results for all model scenarios (22 in total) are shown as future changes in alongshore beach width in Figure 2 below. The bold line shows the projected beach width of the original unmodified COAST model for each of the 4 SLR conditions. The range of projected beach width values due to the different values of input parameters is shown as a shaded band for each SLR horizon.

The initial shoreline position is indicated by the SLR of 0.0 ft in the model results. The beach width decreases for every transect location as SLR increases. The beach width goes to 0 (shoreline eroded entire beach to the non-erodible shoreline defined in COAST) in front of the homes to the west of Topanga Lagoon by a SLR of 3.3 feet. The widest future beaches are projected to occur around the point where the lagoon mouth is located. At these locations, the beach widths are maintained at 220 to 260 feet even with a SLR of 6.6 feet, although this is reduced to around half of the present-day beach width. Finally, the eastern portion (from about the restrooms to Mastro's) is projected to maintain beach widths of approximately 80 feet with a SLR of 6.6 feet, likely as a result of sand trapping by the revetment surrounding Mastro's.

The range of projected beach width for each scenario and for each SLR horizon are represented by the shaded bands in Figure 2 and are associated with the sensitivity and

modifications to the existing COAST model based on different assumptions of sediment loading, beach slopes, and outlet locations (see scenarios outlined in Table 1). The largest effect of the modifications and sensitivity testing to the COAST model are most significant around the Lagoon mouth and down-coast, east of the Lagoon.

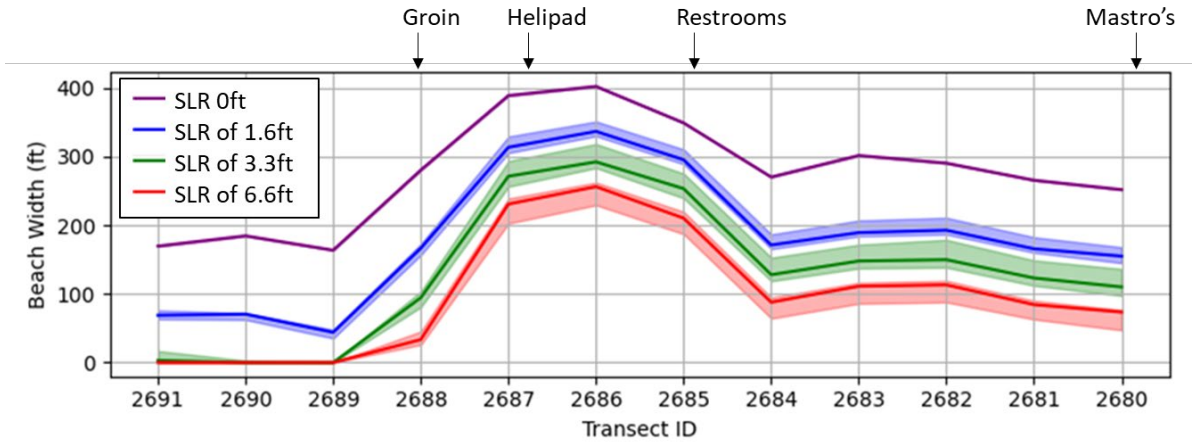

Figure 2. Beach width (shoreline position minus the non-erodible shoreline position) at each transect location for 4 SLR conditions for the existing COAST model conditions (solid line) and the modified COAST model conditions (shaded area represents minimum and maximum for all scenarios considered).[3]

To determine the relative impact of each parameter on SLR, the COAST model was changed by only one parameter and one value at a time. The maximum and mean change of beach width is detailed in Table 2 below. Note that positive values indicate a relative increase in beach width and negative values indicate a relative decrease in beach width. For each SLR horizon, the parameters affect the shoreline position differently. Increases in beach slope (steeper) result in an increase in beach width relative to the unmodified model for SLR less than 3.3 ft, while a flatter beach slope generally results in decreased beach width for most SLR cases.

The sediment loading (incorporated as a percent increase or decrease in the long-term shoreline position relative to the unmodified model) has the largest impact on shoreline change with decreased loading resulting in decreased beach width and increased loading

[3] It should be noted that beach width values were determined by calculating the difference between the initial shoreline position and minimum erodible position specified in the existing COAST model. The initial shoreline position in the existing COAST model were derived using CoastSAT, which is subject to uncertainty in extracting shoreline position from satellite imagery. The model reported beach widths are slightly inflated due to the slightly offshore initial shoreline position in COAST. To correct the initial shoreline position in COAST, a reassessment of the CoastSat method and the existing COAST model calibration would have had to be performed, which was not within the scope of this project. The results presented here use the existing COAST model calibration and use scenarios to understand Project and SLR impacts based on relative changes in beach width and shoreline position.

resulting in an increased beach width. This trend generally increases with increasing SLR. It should be noted that the shoreline position analysis in COAST (+/- 25 percent) was selected to provide a conservative assessment of shoreline position change with potential Project impacts. The movement of the mouth to the east or west also modifies the shoreline position, although to a lesser extent compared to sediment loading. The projected beach width increases as the mouth moves west and remains largely unchanged as the mouth moves east.

Table 2. The average and maximum shoreline position change (ft) for each SLR elevation is reported for each of the key parameter perturbation (Table 1)

Parameter	Average (Maximum) Change for SLR 1.6 ft	Average (Maximum) Change for SLR 3.3 ft	Average (Maximum) Change for SLR 6.6 ft
Steep slope	5 (7)	9 (11)	-3 (-6)
Flat slope	1 (2)	0 (-3)	-6 (-9)
Decreased loading	-3 (-4)	-5 (-7)	-21 (-25)
Increased Loading	7 (9)	12 (14)	4 (6)
West Outlet	8 (10)	13 (16)	-1 (-4)
East Outlet	0 (0)	0 (0)	0 (3)

SUMMARY AND CONCLUSIONS

Overall, the shoreline position and beach width are relatively insensitive to the range of modifications potentially associated with the Project within the COAST model, including changes to long-term sediment loading, and mouth location supplying long-term sediment loading, when compared with change associated with SLR (Figure 2). The parameter modifications in the COAST model provide some insights on the potential importance of future sediment discharge, differences in beach slope that serve as an estimate for more or less cobbles provided to the beach, and a wider range of lagoon mouth locations than considered in the morphological modeling.

It should be noted that the COAST model is relatively coarse and unable to resolve small-scale features such as the lifeguard tower or Helipad (see M&N 2023 report). Nor is the model able to incorporate complex cross-shore bathymetric profiles as the transect slope in the model is only captured using the foreshore slope, beta. Such changes were noted in the detailed M&N morphological modeling (M&N 2023) that were considered in detail in the Surf Quality Impact Assessment. Nonetheless, the study demonstrates that perturbations to these key parameters results in small overall shoreline position and beach width changes, particularly when compared to the impacts of SLR.

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9 Appendix B: Topanga Surf Quality Impact Assessment Report

Topanga Surf Quality Impact Assessment Report

Topanga Lagoon Restoration Project

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CONTENTS

LIST OF FIGURES ..... **iv**
LIST OF TABLES ..... **vi**
ACRONYMS AND ABBREVIATIONS ..... **vii**
EXECUTIVE SUMMARY ..... **viii**
1 Introduction **1-1**
2 Surf Focus Group Survey **2-1**
2.1 SAMPLING PROCESS 2-1
2.1.1 Respondent Demographics 2-2
2.1.2 Economic Value of Surf Visits by Survey Respondents 2-3
2.1.3 Critical Components and Optimal Conditions Sampling 2-3
2.2 PREFERRED SURFING CONDITONS 2-5
2.2.1 Swell Size 2-6
2.2.2 Swell Period 2-6
2.2.3 Swell Direction 2-6
2.2.4 Tide Height and Direction 2-7
2.2.5 Takeoff Location 2-7
2.2.6 Lagoon Entrance Conditions 2-8
2.3 OPINIONS ON PROJECT IMPACTS 2-9
2.3.1 Surfer Perceptions of Lagoon Entrance Impacts 2-9
2.3.2 Perceptions of Impacts on Surfing 2-10
2.3.3 Opinions of Project Impacts on Access 2-11
2.4 SUMMARY 2-12
3 Surf Quality Modeling Analysis **3-1**
3.1 SURF ANALYSIS METHODOLOGY 3-1
3.1.1 Wave Peel Angle Definition 3-2
3.1.2 Surf Wave Model 3-3
3.1.3 Peel Angle Calculation 3-4
3.2 SURF MODEL SCENARIOS 3-6
3.2.1 Wave Cases 3-6
3.2.2 Existing Surf Conditions 3-7
3.2.3 Project Alternatives 3-8
3.2.4 Surf Model Scenarios 3-10
3.3 SURF MODEL RESULTS 3-11

3.3.1 Alternative 2 3-11
3.3.2 Alternative 4 3-14
3.3.3 Sea Level Rise 3-16
3.4 SURF MODEL CONCLUSIONS 3-18
4 References 4-1

LIST OF FIGURES

Figure 1. Overview of Project area and surf break around Topanga Point and Topanga Creek Lagoon.
Figure 2. Surfer respondent age distribution.
Figure 3. Surf survey results of the importance of surfing visit attributes.
Figure 4. Surf survey results of factors affecting surf quality.
Figure 5. Surf survey results of optimal swell direction for Topanga based on number of responses.
Figure 6. Surf survey results of primary takeoff location.
Figure 7. Perception of the Topanga Lagoon Restoration Project impacts.
Figure 8. Surfer perceptions of Project impact on surf quality.
Figure 9. Perception of Project impact on access.
Figure 10. Overview of site with structures and important features along the point break.
Figure 11. (*Left*) Depiction of the peel angle (α) (from Mendonça et al. 2012) and (*Right*) a simplified schematic of peel angle (α) and definition of wave peel speed, wave propagation speed, and surf speed.
Figure 12. Snapshot of wave breaking from XBeach surf model (a) and composite breaking map over the entire model simulation (b) with the wave path (blue dashed line in b) delineated the "whitewater" region of the surf zone.
Figure 13. Example peel angle calculation (red angle; 55 degrees) for an individual wave with the wave path (dashed line) and wave crest (solid line) shown.
Figure 14. Peel angle results for three wave cases (1 is blue, 2 is orange, and 3 is green) with existing bathymetric conditions. The model-computed peel angle alongshore is shown (dots) with a smoothed trend line (solid line) and with key landmarks for reference, including turning, restrooms, 2nd, and 3rd stairs (vertical lines).
Figure 15. Example of the bathymetric change (comparing Alternative 2 and Alternative 1) for the 100-year flood event 1-year post-construction.
Figure 16. Peel angle after a 100-year flood event 1 year post-construction (upper panel) and 5 years post-construction (lower panel) for the southern, long period swell (Wave Case 1) for Alternative 1 (no change) and Alternative 2.
Figure 17. Peel angle after dry conditions 1-year post-construction (upper panel) and 5 years post-construction (lower panel) for the southern, long period swell (Wave Case 1) for Alternative 1 (no change) and Alternative 2.
Figure 18. Peel angle after a 100-year flood event 1-year post-construction for the large western waves (Wave Case 3) for Alternative 1 (no change) and Alternative 2.
Figure 19. Peel angle after dry conditions 1-year post-construction for the large western waves (Wave Case 3) for Alternative 1 (no change) and Alternative 2.
Figure 20. Peel angle after a 100-year flood event 1 year post-construction (upper panel) and 5 years post-construction (lower panel) for the southern, long period swell (Wave Case 1) for Alternative 1 (no change) and Alternative 4.

Figure 21. Peel angle after a 100-year flood event 1-year post-construction for large western waves (Wave Case 3) for Alternative 1 (no change) and Alternative 4.
Figure 22. Peel angle with 1.6 ft SLR compared with existing conditions.
Figure 23. Wave breaking composite map shown for Wave Case 1 and with 1.6 ft of SLR.
Figure 24. Wave breaking composite map shown for Wave Case 1 and with 6.6 ft of SLR.

LIST OF TABLES

Table 1. Model Wave Cases as Determined from the Surf Focus Group.
Table 2. Summary of Modeling Scenarios and Results Provided by M&N.
Table 3. Surf Model Scenarios.
Table 4. Average Model Predicted Peel Angle for Wave Case 1 for the Three Regions Along Topanga Point (Turning to Restrooms, Restrooms to 2nd Stairs, and 2nd to 3rd Stairs).

ACRONYMS AND ABBREVIATIONS

ENSO	El Niño Southern Oscillation
Integral	Integral Consulting Inc.
M&N	Moffatt & Nichol
Project	Topanga Lagoon Restoration Project
RCDSMM	Resource Conservation District of Santa Monica Mountains
SLR	sea level rise

EXECUTIVE SUMMARY

Integral Consulting Inc. (Integral) completed a surf quality impact assessment to evaluate the potential impacts of the Topanga Lagoon Restoration project (Project) on the quality of surf conditions at Topanga in coordination with Moffatt & Nichol (M&N) and through the Resource Conservation District of the Santa Monica Mountains. Topanga Point, formed by cobbles and sediment from the Topanga Creek and Lagoon, is an important feature that provides recreational surf conditions and draws surfers year-round with different skill levels ranging from beginner to expert. The proposed Project alternatives include modifications to the lagoon to enhance habitat and lengthening the Pacific Coast Highway bridge to allow the creek thalweg to migrate, with the potential to modify sediment discharge and affect nearshore wave conditions. To evaluate the potential impact of the Project on wave conditions and surf quality, Integral conducted a surf quality impact assessment, described herein.

As part of the surf quality impact assessment, Integral facilitated a surf group focus workshop and survey to better understand existing surf quality and conditions at Topanga Point. The survey responses were used to document wave conditions that result in preferred surfing conditions and surfer concerns about Project impacts. The results of the survey (Section 2) were used to develop wave cases for preferred surf conditions used in the surf model. Surveyed surfers overall believed that the Project will have negative impacts on surf quality at Topanga Point. The surfer focus group and survey were conducted prior to the wave modeling impact analysis, so these views represent preconceptions. A follow-up survey of key surfing stakeholders is scheduled, after presentation of the initial wave modeling results to gauge changes in surfer perceptions; however, results of the post-project survey were not available at the time of preparation of this report.

The impact of proposed changes on surf quality was evaluated by Integral using a high-fidelity wave modeling tool to resolve the propagation and breaking on a wave-by-wave basis. The wave model used morphological model results provided by M&N (2023) to evaluate the impact of Project alternatives on surf conditions at Topanga (Section 3). Integral simulated wave breaking conditions for Alternatives considered (provided by M&N 2023) for the three wave conditions (identified in the surf focus group). The purpose of the surf quality study was to determine what would cause the largest risk to surf quality—the effects of the Project, drought and flood year conditions, or sea level rise.

The surf modeling results indicate that sea level rise has an outsized impact on surf conditions at Topanga, drastically altering wave breaking and surf conditions. The impacts of the Project (based on morphological change maps provided by M&N) were most significant 1 year after restoration work and the impacts decayed by 5 years following project completion. Rainfall and watershed runoff variability also produced significant changes to the wave climate with differences in surf conditions associated with dry years and 100-year flood events. The smaller wave height scenarios were more impacted by small changes in the offshore topography

compared with large wave scenarios, which break farther offshore in deeper water. Based on the rigorous modeling analysis, the surf conditions are not expected to be negatively impacted by the Project when compared to natural seasonal variability (flood/drought) and SLR impacts. Overall, the results of the surf study indicate that the Project impacts to surf conditions are comparable to interannual creek flow discharge changes and that any of the short-term impacts of the Project decay within 5 years of project completion.

1 INTRODUCTION

Moffatt & Nichol (M&N) contracted with the Resource Conservation District of the Santa Monica Mountains (RCDSMM) to provide professional services to restore estuarine lagoon habitat at Topanga Lagoon. The Topanga Lagoon Restoration project (Project) led by M&N has proposed four potential restoration alternatives (M&N 2022, 2023), including Alternative 1 (no change). Alternative 2 (maximum lagoon habitat expansion) involves the most significant change to the lagoon and potential to alter sediment discharge from Topanga Creek. Alternative 3 (limited lagoon habitat expansion) is a more limited lagoon habitat expansion alternative. Alternative 4 (maximum managed retreat) expands the area for managed retreat by moving the highway northward and expands lagoon habitat.

Integral Consulting Inc. (Integral) is supporting M&N to evaluate the potential impacts of the Project alternatives on wave and surf quality conditions at Topanga. The shoreline at Topanga forms a cobble point (Topanga Point) where Topanga Creek Lagoon meets the ocean (Figure 1), which is an important feature that provides recreational surf conditions. The point break is a righthander (breaking from west to east) around the point that breaks predominantly over cobbles and sand. The surf break at Topanga Point draws surfers year-round with different skill levels ranging from beginner to expert.

Figure 1. Overview of Project area and surf break around Topanga Point and Topanga Creek Lagoon.

The Project has the potential to modify sediment discharge and offshore sediment location, important for surf quality. The surf quality impact analysis and evaluation conducted by Integral were to identify the potential impacts of the Project on surf quality.

As part of the analysis, Integral held a focus group workshop with local surfers to get a qualitative understanding of surf conditions as related to offshore and lagoon conditions. The results of the focus group workshop are presented in Section 2 and summarize the survey methods, characterization of preferred surf conditions, and documented surfer's perceived impacts of the project on surf conditions.

The impact of proposed changes on surf quality was evaluated using a high-fidelity wave modeling tool that can resolve the propagation, refraction, and breaking on a wave-by-wave basis. The surf model used results from morphological modeling provided by M&N (2023) that showed where sediment discharge changes associated with the Project would affect nearshore bathymetry off Topanga Point. Integral simulated wave breaking conditions pre- and post-construction for the three wave conditions (identified in the surf focus group), two stream flows (drought and 100-year discharge), with three sea level rise (SLR) conditions (present day, 1.6 ft, 6.6 ft). The surf model development, wave condition analysis, and surf quality model results are presented in Section 3.

2 SURF FOCUS GROUP SURVEY

Integral conducted a surf study focus group to help the RCDSMMbetter understand the importance of surfing at Topanga Beach and Topanga Point, as part of the Project. The surfer consultation process had two key objectives:

- Inform the process of modeling the impacts on the surf zone
- Gather information about the contingent behavior response of local surfers to the new surfing conditions.

The data collection process for the focus groups and surveys was structured to obtain detailed information about surf quality parameters from experienced surfers, and to gather general information about the views and concerns of local surfers regarding potential impacts from the Project.[1] Respondents were asked questions that sought to identify the key swell conditions to produce excellent surf at Topanga. Surf conditions are the result of bathymetry (affected by water levels, including tide heights), swell size, swell direction, swell period, wind strength, and wind direction. A range of other (nonphysical) factors can also influence the quality of the "surf experience," including traffic, ease of parking, weather, and crowding or congestion. The following summarizes the sampling process and survey results.

2.1 SAMPLING PROCESS

An in-person surfer focus group was held at Topanga Ranch Motel on July 24, 2023, attended by approximately 35 people. Hard copy surveys were distributed, and 14 hard copy responses were collected at the meeting. The meeting attendees also provided input to the concurrent surf modeling process by identifying the optimum conditions for surfing across the following parameters:

- Swell direction and size
- Tide height
- Lagoon entrance conditions and sediment supply.

To allow for participation of those who were unable to attend the in-person meeting, an online survey was distributed on July 25, 2023. The survey remained open for 17 days and could be completed online or by returning a hard copy to the RCDSMM office.

[1] Due to delays in obtaining information about the modeled sediment delivery to the surf zone associated with the new lagoon entrance, and overall time constraints of the Project, it was not possible to conduct the surf modeling exercise prior to the socioeconomic data collection activities. It was therefore not possible to conduct a true contingent behavior study, as there was insufficient information about the contingent states.

A total of 110 surveys provided at least partial responses to the questions posed in the survey and focus group materials, across both the in-person, email, and online survey. The completion and comprehension rates were good, with 77 respondents providing answers to all questions.

2.1.1 Respondent Demographics

Anecdotal data suggests that surfers at Topanga are typically older than the general population, and the survey was also specifically targeted towards respondents with extensive surfing experience. As a result, the sampled population is skewed towards the central age brackets (35 to 64 years of age). Figure 2 shows the age distribution of the sampled population, relative to the 2020 Census data for Los Angeles County. Only three percent of the sample responses were from people under 18 years of age (three responses), whereas 27 percent of the population of Los Angeles County was under 18 at the 2020 Census. As surfing is an active pursuit, the level of participation among those over 65 is lower than the total proportion of residents.

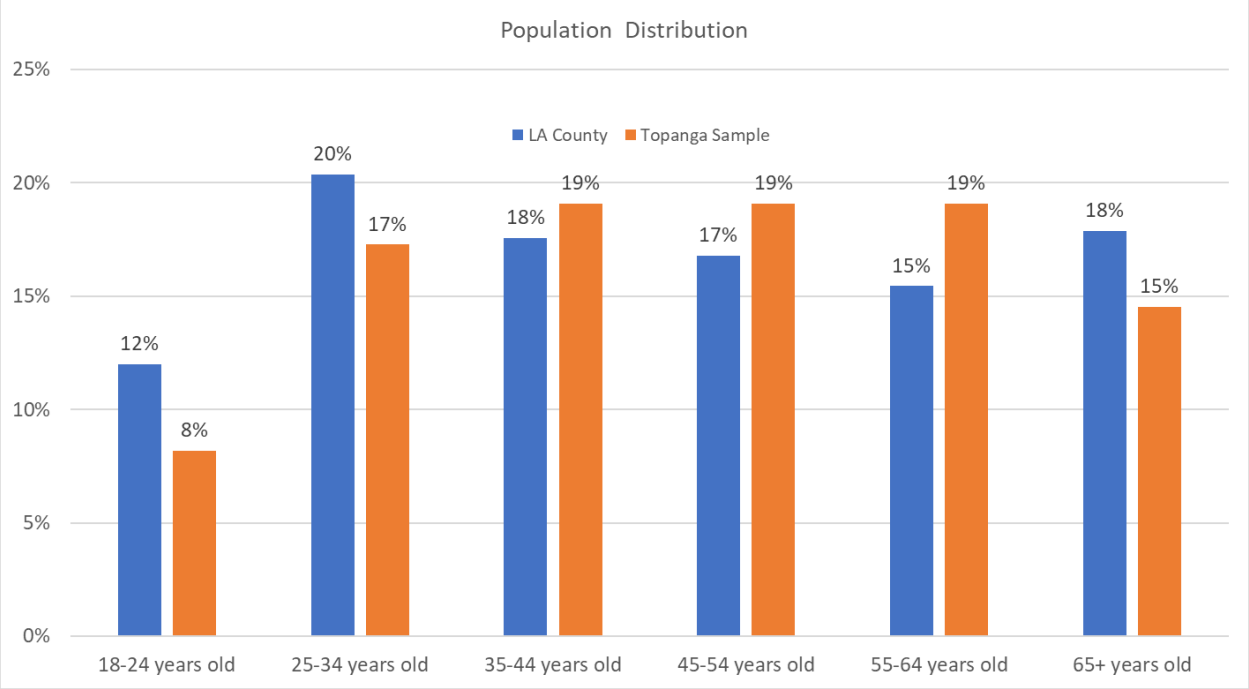

Figure 2. Surfer respondent age distribution.

The respondent sample (deliberately) comprised highly experienced and avid surfers. The median number of years of surfing experience was 20. The median number of years of experience with surfing Topanga was 14 years. The total number of years of surfing experience accessed through the survey and focus group was 2,762 years, with 2,052 years of cumulative experience surfing at Topanga.

Surfing avidity (the number of sessions per week) was also high. Respondents indicated that they surfed on average almost four times per week, across all seasons. The median number of surf sessions per surfer per year was 163, or almost 18,000 surf session observations per year across the sampled surfers. Across 14 years, that represents a collective experience resource of more than 250,000 lifetime surf observations. Average travel time was 37 minutes for weekday visits and 27 minutes for weekend visits.

Approximately 14 percent of respondents (13 of 95) stated that they kept a surf diary, which indicates some degree of focus on the conditions that existed for each surf session. Four respondents had been keeping a surf diary for more than 30 years, with two respondents having kept surf diaries for more than 60 years. One-third (33 of 92) of respondents who answered the question stated that they kept images of the best surfing conditions.

2.1.2 Economic Value of Surf Visits by Survey Respondents

The survey sample was deliberately biased towards the most avid and knowledgeable surfers. As a result, it is not possible to use the travel cost data collected in the survey and focus group to estimate the total economic value of surfing at Topanga. It is possible, however, to make some estimates of the non-market value of surfing for the survey respondents. As noted, the surfers who participated in the survey and focus group collectively undertake approximately 18,000 surf sessions per year. If it is assumed that 50 percent of those sessions take place at Topanga, that totals approximately 9,000 sessions per year. That assumption is likely conservative for local resident surfers, but is balanced by the site avidity of those traveling from further afield.

A surf session in California is valued at somewhere between $57 and $150, based on previous studies conducted at Mavericks and Trestles, respectively. Using a conservative central estimate of $75 per session, this equates to $675,000 per annum in recreational value. It is not possible to estimate the potential impacts on these existing values due to the project alternatives, or changes in weather and climate, but the scale of these values highlights the importance of surf impact analysis for similar projects.

2.1.3 Critical Components and Optimal Conditions Sampling

An open-ended text-entry question asked people to name the best surf conditions they could remember. The most cited answers related to the recent swells in May 2023, December 2022 to January 2023, and those associated with Hurricane Marie in August 2014. There is likely some measure of recency bias in the focus on events in the past 12 months, although these periods were also identified by those who had been surfing for multiple decades.

Most years identified as being good surf years related to El Niño conditions, or neutral El Niño Southern Oscillation (ENSO) years that occurred immediately after El Niño years. Specific years mentioned include 1960–1964, 1975–1976, 1982–1983, 1997–1998, 2006–2007, and

2022–2023.[2] Comments made specific mention of the need for heavy rains and El Niño conditions to provide optimal conditions, due to the delivery of sediment to the surf zone.

While respondents generally agreed that the best months for surf were from September to October and December to February, the most frequently named individual swell events occurred in July, August, and January.

Figure 3 summarizes responses to the importance of different components of the surfing experience at Topanga. Respondents were asked to rate the importance of the following attributes, and could also write in and rate an attribute of their choice:

- Easy parking
- Length of ride
- Shape of the wave
- Speed of the wave
- Multiple sections or takeoff points.

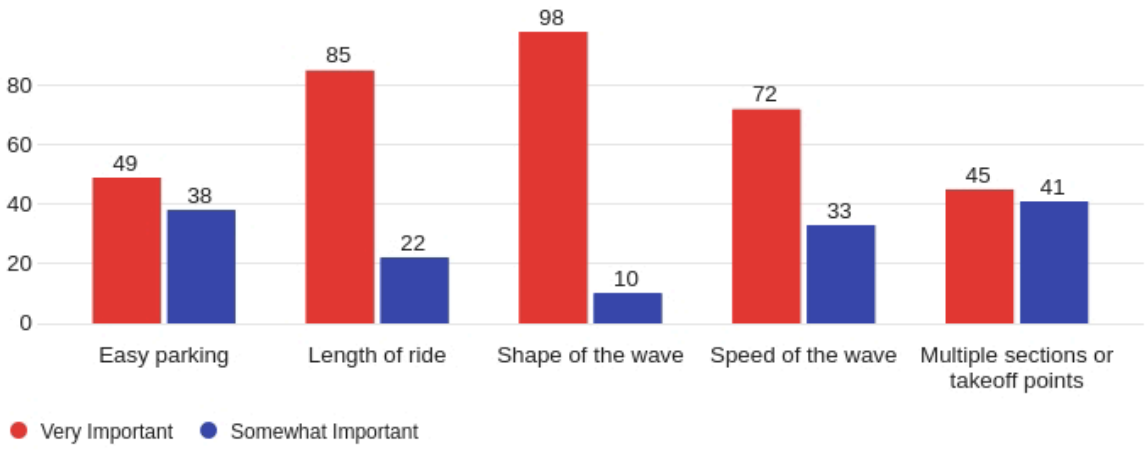

Figure 3. Surf survey results of the importance of surfing visit attributes.

The most critical components of the surf quality for respondents were the shape of the wave and the length of the ride. Having multiple sections was considered less important, as was having convenient parking.

In text-based responses, water quality, surf consistency, and crowding or congestion were highlighted as key issues. The presence of multiple generations of surfers of differing ability

[2] NOAA, Physical Science Laboratory, ENSO – Past Events, accessed on August 30 2023.

levels was also identified as a prized attribute. Showers and bathroom facilities were also listed as key attributes.

2.2 PREFERRED SURFING CONDITONS

This section reports on the physical attributes identified by the surf survey that describe the context of the surf itself.

Unsurprisingly, physical wave parameters were identified as the most important factors in determining surf quality. Figure 4 summarizes the number of responses rating weather, climate, and lagoon characteristics as either Very Important or Somewhat Important.

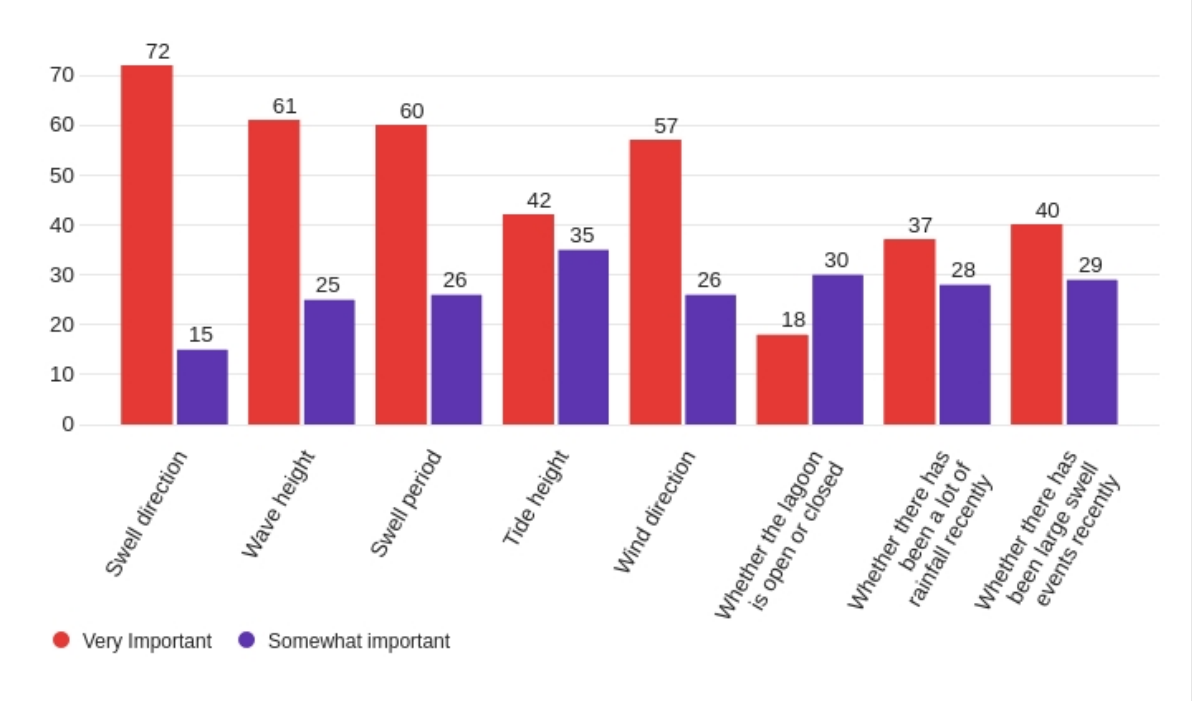

Figure 4. Surf survey results of factors affecting surf quality.

Swell parameters and wind conditions were rated as Very Important by the greatest number of respondents. Tide height was less likely to be rated as Very Important, indicating that the break is surfable on most tides. The state of the lagoon entrance was the least likely parameter to be rated as Very Important. The rainfall and wave climate history were considered more important than the state of the lagoon entrance, as these parameters more directly affect the location and volume of sediment in the surf zone.

2.2.1 Swell Size

The preferred swell size was in the range of 2–5 ft. This represents measurements taken at the offshore buoy, which translate into larger wave faces as the swells interact with local bathymetry. Wave height is a product of both amplitude and wave period, but as a general rule, a 2 ft swell would translate to waves in the knee–thigh high range, and a 5 ft swell would translate to waves that were roughly head high.[3] Surfable swell sizes at Topanga range from 1 to 15 ft, or ankle–shin height to triple overhead, though few surfers listed upper surf sizes over 10 ft (double overhead). Although the bathymetry of Topanga may be suitable for larger waves, there is a substantially smaller pool of surfers who wish to surf waves of that size.

2.2.2 Swell Period

The optimum swell period identified by respondents was dependent on direction. Longer period swells (14–16 seconds or more) were preferred from the south, whereas swells from the west or northwest were considered optimum when the period was in the range 10–12 seconds.

2.2.3 Swell Direction

Respondents provided information about the optimal swell direction, which was incorporated into the surf modeling process. Responses were transformed from degree readings to cardinal directions, and the numbers of mentions of each direction are summarized in Figure 5.

Swell shadowing from the Channel Islands and more westerly regions of mainland California (e.g., Point Conception) mean that optimum swell angles are restricted to 185–210 degrees (south to south-southwest), and 240–260 degrees (west-southwest to west).

[3] Surfline, Surfline's Rating of Surf Heights and Quality, May 5, 2017.

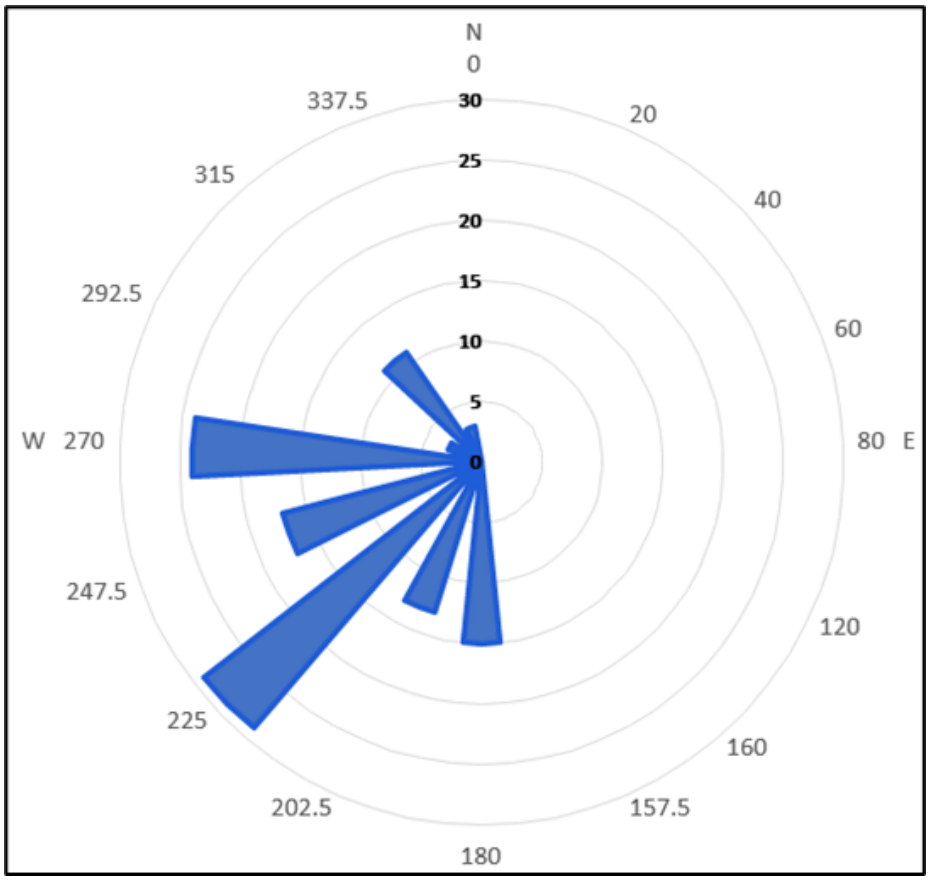

Figure 5. Surf survey results of optimal swell direction for Topanga based on number of responses.

2.2.4 Tide Height and Direction

Most respondents identified that moderate tide heights (2 to 5 ft) and a rising tide were ideal for surfing, but also that Topanga was not particularly sensitive to tide height, and that only the highest and lowest tide ranges caused reduced surf quality, namely during negative tides and when tide heights were above 6 ft. When swell was small or swell periods were low (under 10 seconds), lower and falling tides were preferred by some.

2.2.5 Takeoff Location

The online survey asked people to click on an aerial image to identify the primary takeoff location. Focus group participants were also asked to draw on an image on the hard copy survey instrument. Few focus group responses were received, and those that were provided were incorporated into the online survey location data. Figure 6 shows a heat map of the preferred takeoff location.

Figure 6. Surf survey results of primary takeoff location.

Interviews and focus group responses highlight the importance of nearshore bathymetry, with a number making mention of a rock outcropping immediately to the east of the lagoon entrance.

2.2.6 Lagoon Entrance Conditions

Despite many respondents saying that surf conditions were best in El Niño conditions, which typically would be associated with higher intensity rainfall events and more frequent or intense lagoon breaching events, respondents were divided on whether surf conditions were better when the lagoon was open (19 percent), had recently breached (9 percent), or was closed (14 percent). About one in seven (13 percent) said that it made no difference, while almost half (45 percent) provided more information about the complex interaction between rainfall, sediment supply, and the position of the lagoon entrance.

The consensus from the survey results and focus group responses was that lagoon breaching further west was better for surfing. The supply of sediment to the break was considered important in the creation of the sandbars, which create a more powerful section or extension of the surf break into the bay.

Multiple respondents noted that the surf quality and water quality are intrinsically linked, and that water quality after the lagoon breaches is poor. Though some surfers avoided poor water quality events, others indicated that surfers would expose themselves to the risk of infection if the surf was very good.

2.3 OPINIONS ON PROJECT IMPACTS

Understanding the anticipated changes in the behavior of the lagoon entrance and the expected impacts on surf quality is important to gauge the level of impact of the project. As noted previously, modeling of the surf zone was not completed prior to collection of surfer responses, so the survey asked respondents the extent to which they agreed with statements about potential impacts on the lagoon itself, secondary impacts on the surf quality, and non-surf impacts related to access and parking.

2.3.1 Surfer Perceptions of Lagoon Entrance Impacts

As swell, tide, and wind conditions are external drivers that are not affected by the proposed activities of the Project, the key impacts are those resulting in changes of the behavior of the lagoon entrance. Figure 7 summarizes the level of agreement with statements about potential impacts on the lagoon. These outcomes are not modeled, but rather those that respondents anticipated as a result of the project. The statements were chosen based on initial discussions with local surfers, and questions posed in the public information sessions about the broader Project.

Approximately one third of respondents either agreed or strongly agreed that the lagoon flow velocity would change, that the lagoon would be open more frequently, and that sediment supply to the surf zone would be reduced. More than 40 percent of respondents thought that the lagoon entrance would change location, and that the beach would be narrower than it is now. Half of the respondents thought that water quality would get worse as a result of the Project.

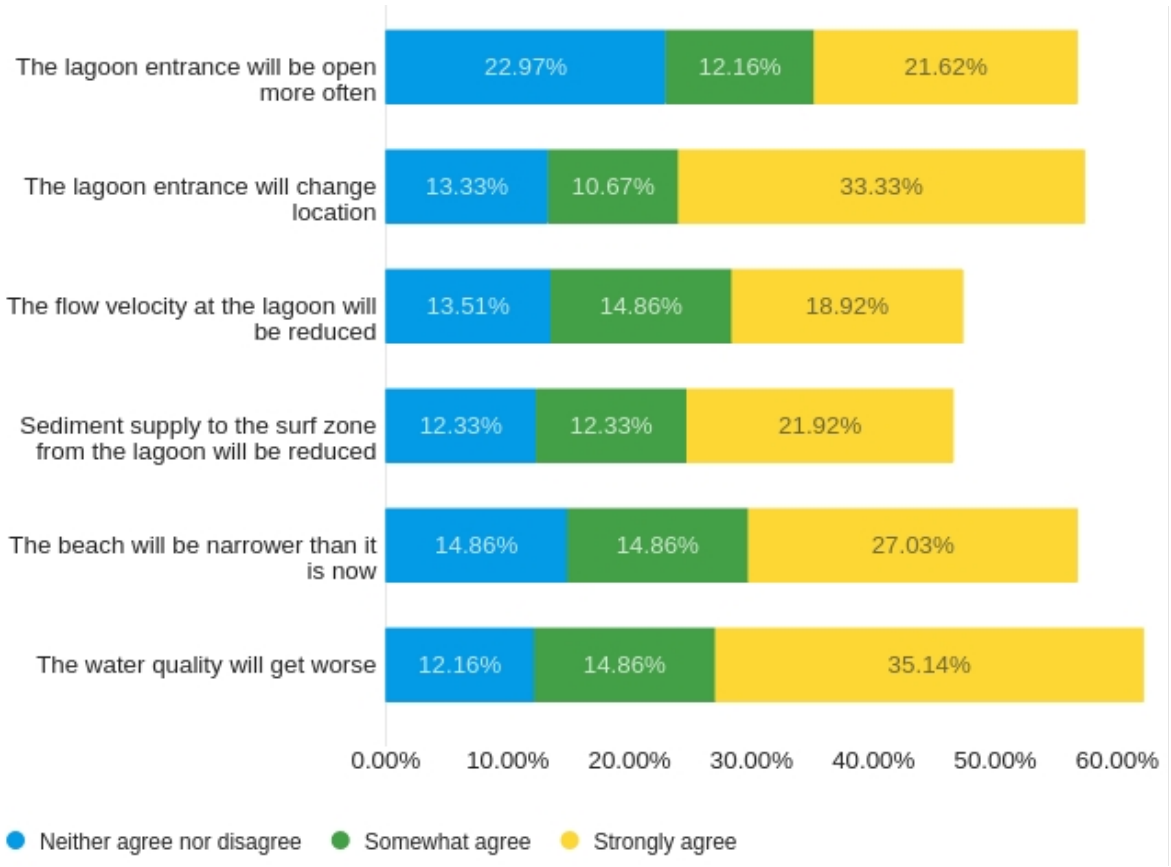

Figure 7. Perception of the Topanga Lagoon Restoration Project impacts.

2.3.2 Perceptions of Impacts on Surfing

Respondents and focus group participants were asked how they expected the Project to impact surf quality, both overall and on the best days. Figure 8 summarizes their responses.

Around half of respondents strongly agreed with statements that surf quality would go down, both across the average conditions experienced at Topanga, and the conditions on the best days. Including those who somewhat agreed with the statement, between 60 and 65 percent of respondents thought that the project would have negative impacts on the surf quality. This is almost twice the proportion of respondents who agreed that there would be impacts on the lagoon entrance and highlighted the importance of the surf modeling exercise to estimate true impacts.

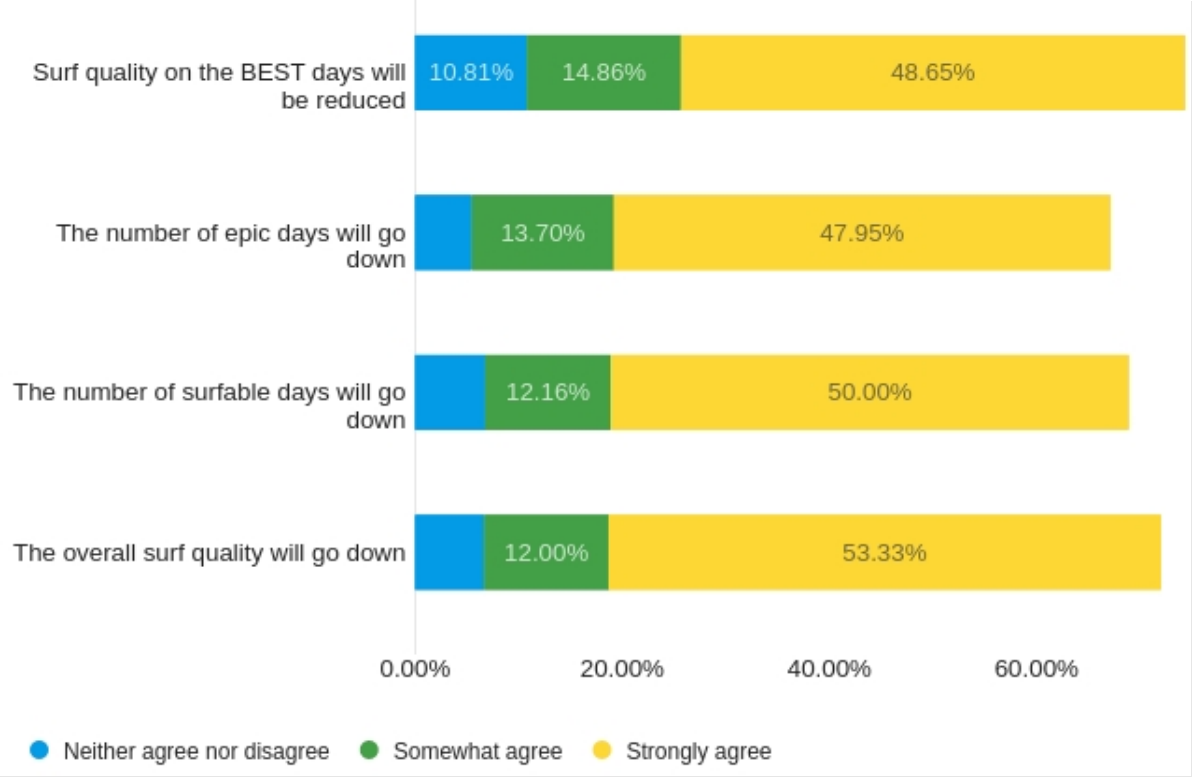

Figure 8. Surfer perceptions of Project impact on surf quality.

2.3.3 Opinions of Project Impacts on Access

Respondents were less likely to agree with statements that suggested that access or parking would be more difficult after the project had been completed, relative to the expected impacts on the wave itself. Approximately one-third of respondents expected more difficult parking and access, while a little over a quarter of respondents anticipated a reduced ability to see the surf from the highway. Figure 9 summarizes the level of agreement with statements about parking and access impacts.

A number of respondents were residents of Topanga Beach, and as a result, the availability of parking spaces is not relevant to them. As a more experienced cohort of surfers, including those who are considered “locals,” the respondents are likely less impacted by crowding and able to compete for waves at the primary takeoff point.

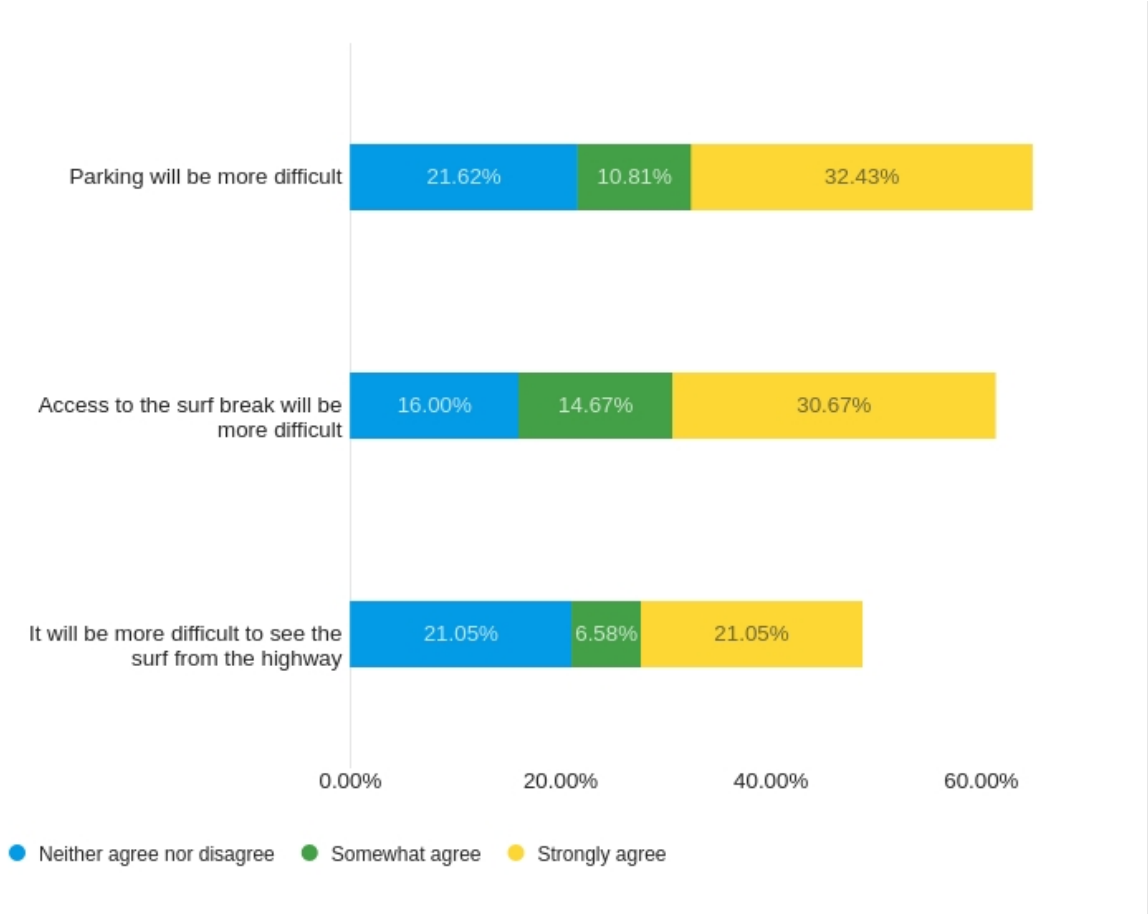

Figure 9. Perception of Project impact on access.

2.4 SUMMARY

Results of the surfer focus group and survey data analysis were presented to key stakeholders on November 1, 2023. Attendees of the November 1 presentation agreed that the presented data reflected an aggregation of their views on the physical factors that contribute to surf quality at Topanga, and that their concerns related to the Project had been captured. Participants thanked the RCDSMM for the opportunity to be involved in the assessment of Project impacts on the surfing resource, and to guide the development of the impact analysis outlined in the next section. The qualitative and quantitative data collected through the participatory processes provide critical inputs to the full evaluation of Project alternatives. A shorter, perception-focused survey will be distributed to key stakeholders to determine the extent to which the surf impact analysis process has improved understanding and addressed key concerns and uncertainties.

3 SURF QUALITY MODELING ANALYSIS

Integral evaluated the impact of the Project on surf quality using a high-fidelity wave modeling tool (XBeach 2-dimensional) to resolve the propagation and breaking on a wave-by-wave basis. The Project impacts to sediment loading and lagoon extent as well as interannual conditions (flood event or drought) result in changes in sedimentation and erosion in the nearshore, which were provided to Integral by M&N (see M&N 2023 for more sediment transport modeling analysis). These bathymetric change results associated with Project alternatives and interannual variability (flood or drought) were incorporated into the surf model to evaluate the impact of the scenario on breaking wave conditions. Integral simulated wave breaking conditions for the Project scenarios with and without construction for the three wave conditions (identified in the surf focus group), two creek flows (drought and 100-year discharge) and for three SLR conditions (present day, 1.6 ft, 6.6 ft).

The wave at Topanga was assessed along three different sections, which are divided with respect to points along the shoreline, depicted in Figure 10. Surfers use the different points along the shoreline (helipad, restrooms, and the two staircases) to orient themselves in the water and determine how far they've traveled along the wave. The first section is between a "turning" point (Figure 10), where the surfers first catch the wave (also called the "takeoff" section). The second section is between the restroom and 2nd stairs, and the final section is between the second and third stairs.

3.1 SURF ANALYSIS METHODOLOGY

Wave surf quality, often referred to simply as "surf quality," is a term used to describe the characteristics and conditions of ocean waves that are ideal for surfing. It is a subjective assessment made by surfers and is influenced by a variety of factors (e.g., tides, wind, swell size) that can affect the overall experience of riding a wave, as documented in the surf survey results presented in Section 2. The objective of the surf modeling analysis is to determine the impact of the Project on surf quality for a set of wave scenarios, determined by the surf focus group.

Figure 10. Overview of site with structures and important features along the point break.

3.1.1 Wave Peel Angle Definition

A key component of wave surfability and surf quality is the wave peel angle, which is the angle between the wave crest and the breaker line shown in Figure 11. A small peel angle (0 degrees) would be a “close-out” wave that would break everywhere along the crest at the same time, while a large peel angle (90 degrees) is a “soft” wave where the crest would break more slowly and more or less go straight toward the shoreline. The peel angle dictates the rate of wave breaking across a site (peel rate, Vp), which governs the surf skill required to catch and execute surf maneuvers. For example, small peel angles (or “steep” waves), require a surfer to ride quickly along the face parallel to the shoreline at the peel rate, while large peel angles (or “soft” waves) would require a surfer to ride straight towards the shoreline. An ideal peel angle is associated with a well-defined, smoothly peeling wave face, making it easier for surfers to ride and perform tricks. The optimal peel angle for recreational surfing is typically between 30 and 65 degrees.

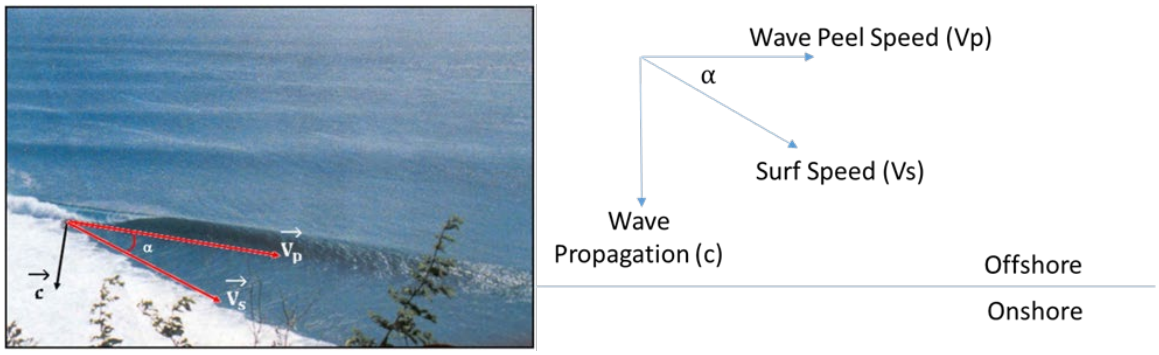

Figure 11. (*Left*) Depiction of the peel angle (α) (from Mendonça et al. 2012) and (*Right*) a simplified schematic of peel angle (α) and definition of wave peel speed, wave propagation speed, and surf speed.

As the wave surf angle decreases, the skill required to surf the wave also increases for a given wave height due to an increase in the surf speed. In addition, different surf maneuvers are associated with different peel angles as documented in Scarfe et al. (2002). The "takeoff" on the wave, or the point at which the surfer would initially begin the ride, might have a peel angle ranging between 45 to 60 degrees. A cutback, a maneuver wherein the surfer reverses directions on the face of the wave, occurs on softer waves (peel angles 55 degrees or higher). A "re-entry" surf maneuver involves redirecting the surfboard back into the face of the wave after completing a bottom turn or a top turn and is viable at medium peel angles (50 to 55 degrees). Finally, a speed section, where the surfer races along the face of the wave, is a surf maneuver that occurs for steeper waves (peel angles approximately 40 degrees). In summary, a smaller peel angle results in a faster more high-performance wave, while a higher peel angle results in a slower mushier wave.

The wave peel angle is therefore an important component of assessing surf quality and has been documented as an important parameter for assessing surfability, surf quality, and possible surf maneuvers (Scarfe et al. 2002). While the determination of surf quality and optimal peel angle is highly subjective and dependent on surf skill, this study uses the wave peel angle as a metric for assessing the Project impact on surf quality by evaluating the change in peel angle with and without construction for a set of preferred wave scenarios identified by the surf focus group.

3.1.2 Surf Wave Model

Breaking wave characteristics and wave surfability were evaluated using a 2-dimensional XBeach model in nonhydrostatic mode (or wave resolving mode). XBeach is a publicly available numerical model and software tool specifically designed for coastal and estuarine environments and is commonly used in the field of coastal engineering, coastal management,

and research (Deltacrest 2010).[4] The nonhydrostatic wave model solves nonlinear wave equations with nonhydrostatic pressure correction and simulates propagation and breaking of individual waves.[5] The 2-dimensional XBeach model also includes the ability to introduce vertical variability with a reduced two-layer model in order to improve wave breaking and dispersion. The reduced two-layer model (parameter no+) effectively introduces vertical variability, important for accurately resolving wave breaking dynamics, with a pressure correction to improve accuracy over a standard 2-dimensional model formulation. The 2-dimensional nonhydrostatic (with no+) XBeach model (herein, the "surf model") provides the best modeling approach to evaluate the wave-by-wave breaking conditions that are critical for evaluating surf conditions and quality. In summary, this XBeach 2-dimensional model has the capability to model individual waves necessary to represent what surfers already know, which is that no single wave is the same as any other wave.

The surf model grid had a 5 ft resolution within the breaking region offshore of Topanga and extends 1 km offshore and 1.5 km east and west of the lagoon mouth .(The surf model was run for 35 minutes of real-world time, sufficient time to see multiple sets of breaking waves for each given wave scenario.

3.1.3 Peel Angle Calculation

To determine peel angle, both the wave path and the breaking wave crest are extracted from the XBeach surf model (Figure 11). The wave path is the general line that the breaking waves make and can be found by outlining the "whitewater," or the foam line, while the wave crest is the shape of the ridden part of the breaking wave as it moves toward shore (Figure 11).

The surf model identifies the location of each wave breaking as the wave moves down the point (Figure 12, a). Since most surfers tend to surf the highest waves, only the breakers associated with the top 1/3 wave heights were considered in the study. composite of wave breaking (summation of wave breaking snapshots over the entire simulation period; Figure 12, b), indicating the location of the top 1/3 of breaking waves, was used to define the "whitewater" region within the breaking zone. The composite of breaking waves was then used to delineate the wave path for each wave case (blue dashed line in Figure 12, b).

[4] XBeach is available here: https://download.deltares.nl/en/xbeach and open source documentation is available here: https://xbeach.readthedocs.io/en/latest/.
[5] The nonhydrostatic XBeach model and has been shown to better characterize single breaking wave dynamics compared to Boussinesq wave modeling (Zijlema et al. 2011). In particular, nonhydrostatic wave modeling has been shown to accurately characterize breaking waves without relying on empirical formulations for breaking conditions required in a Boussinesq wave model.

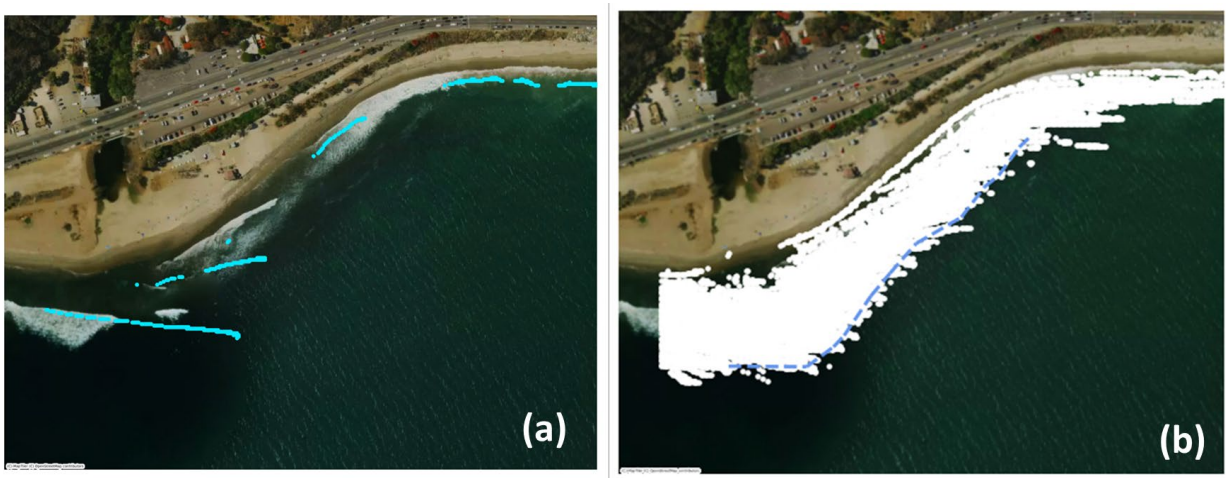

Figure 12. Snapshot of wave breaking from XBeach surf model (a) and composite breaking map over the entire model simulation (b) with the wave path (blue dashed line in b) delineated the "whitewater" region of the surf zone.

The wave crest is then defined as an individual wave as the wave moves down the point. The wave intersection between the breaking wave crest, and the wave path line is then used to calculate the peel angle along the shoreline (Figure 13). The methodology is summarized in the following steps:

1. Extract breaking locations from model output for each wave scenario.

2. Determine areas of high breaking density (i.e., the "whitewater") to delineate the wave path (dashed line, Figure 13).

3. Delineate the wave crest at the wave path for each individual wave (solid line, Figure 13).

4. Calculate the peel angle as the intersection angle between individual breaking waves and the wave path (red angle, Figure 13).

The wave peel angle and the alongshore position of the peel angle is computed for each breaking wave over the 35-minute simulation period and for all scenarios considered to characterize the potential Project impacts on surf conditions and quality.

Figure 13. Example peel angle calculation (red angle; 55 degrees) for an individual wave with the wave path (dashed line) and wave crest (solid line) shown.

3.2 SURF MODEL SCENARIOS

The primary objective of this study was to determine which of the following parameters will have the greatest impact on surf quality: 1) Project conditions; 2) SLR; 3) drought conditions; 4) flood conditions. In particular, the impact of Project construction and future conditions on surf quality was determined by simulating the three wave cases. The surf model analysis incorporated bed elevation changes associated with Project construction (from M&N) to determine the relative impact of the Project on surf quality based on changes to the wave breaking peel angle. The following describes the set of model scenarios evaluated in this analysis.

3.2.1 Wave Cases

Three different wave scenarios were assessed on existing conditions without the Project to determine baseline peel angle conditions to allow for comparison. The preferred wave case scenarios were determined through an in-person surfer focus group held on July 24, 2023 (additional details about the surfer meeting can be found in Section 2). The meeting attendees identified the optimum conditions for surfing based on 1) wave direction, 2) wave size, and

3) tide height. The three wave conditions with the highest ratings across the survey responses were modeled and are detailed in Table 1.

Wave Case 1 represents a long period south swell and has an offshore wave height of 2 ft, period of 15 seconds, and mean wave direction of 230 degrees (nautical from north). The wave case simulates a long period south swell, where waves are more likely to come in defined "sets" and travel obliquely across the point. Wave Case 2 represents a typical small west swell with an offshore wave height of 4 ft, period of 11 seconds, and a mean wave direction of 255 degrees. This case simulates a more "head-on" (shore-normal) wave, with shorter period swell, where the waves might be more consistent in frequency, come in less defined sets, and break more "peaky." Wave Case 3 represents a large west swell and is the largest of the three at 7 ft, period of 10 seconds, and mean wave direction of 260 degrees, representative of a large and less frequently observed wave case.

Table 1. Model Wave Cases as Determined from the Surf Focus Group.

Wave Case	Wave Height (ft)	Wave Period (s)	Incident Wave Direction (degrees from North)
1	2	15	230°
2	4	11	255°
3	7	10	260°

In addition, surfers determined the optimum tide condition to be a "mid-tide." At Santa Monica tidal gage (station 9410840), mean high water is 4.69 ft and mean low water is 0.93 ft (relative to mean lower low water). Therefore, a mid-tide value of approximately 3 ft was taken as the tidal condition for all wave model scenarios considered.

3.2.2 Existing Surf Conditions

The surf model was used to simulate surf conditions for the three wave conditions with existing bathymetry[6] to establish a baseline peel angle to qualitatively validate the surf model results with the surf description from the surf focus group. The peel angle for all three wave cases is shown as it moves down the point (Figure 14) to capture the variability in surf conditions along the surf break from takeoff (near the lagoon entrance where the waves "turn" down the point) toward the second and third stairs.

All three cases begin with steep sections before the "turn" down the point. After the turning point and between the restrooms, the wave becomes softer (peel angles become higher).

[6] Existing conditions bathymetric data from USACE 2014 DEM available at: https://www.fisheries.noaa.gov/inport/item/49416

Between the restrooms and the second stairs, all waves become steeper (peel angle drops) as the wave speeds up, and the southern oblique wave becomes the steepest and fastest of all three wave cases; in the section between the restroom and second stairs, the southern, long period wave case has a peel angle average of 30 degrees, whereas the highest wave height wave case has a peel angle average of 55 degrees. At the final section, between the second and third stairs, the wave becomes softer and more "rippable" as the peel angles increase. The three wave cases have similar peel angles in the final section, averaging around 50 degrees.

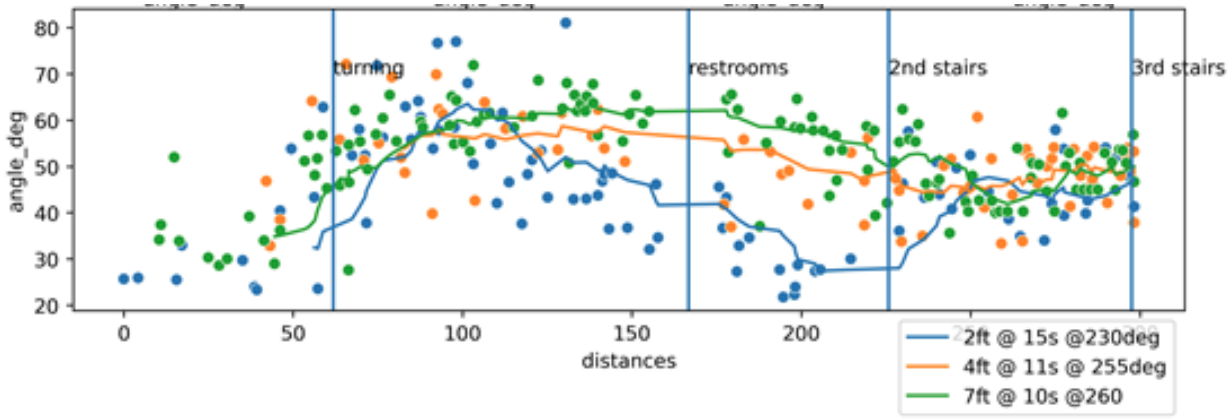

Figure 14. Peel angle results for three wave cases (1 is blue, 2 is orange, and 3 is green) with existing bathymetric conditions. The model-computed peel angle alongshore is shown (dots) with a smoothed trend line (solid line) and with key landmarks for reference, including turning, restrooms, 2nd, and 3rd stairs (vertical lines).

The baseline scenarios form an envelope of conditions, where the biggest (7 ft at 10 seconds) swell is the softest wave (highest peel angles), and the longest period (2 ft at 15 seconds) is the steepest wave (lowest peel angles). Because they demonstrate the disparate end members of the range of conditions within the baseline, the long period (Case 1) and high wave height (Case 3) cases were selected for further study. The model results and surf quality assessment for current conditions based on wave peel angle were presented to the surf focus group on November 1, 2023. The surfers in the second focus group held on November 1, 2023, agreed that the model and peel angle characterization of wave conditions for the three wave cases were consistent with their experience riding the various wave conditions.

3.2.3 Project Alternatives

M&N has proposed four potential restoration alternatives for the Project (M&N 2022), including Alternative 1 (no change). Alternative 2 (maximum lagoon habitat expansion) involves the most significant change to the lagoon and potential to alter sediment discharge from Topanga Creek. Alternative 3 (limited lagoon habitat expansion) is a more limited lagoon habitat expansion alternative. Alternative 4 (maximum managed retreat) expands the area for managed retreat by moving the highway northward and expands lagoon habitat. M&N used a 2-dimensional

hydrodynamic and sediment transport model to evaluate the effects of each alternative on sediment morphology (see M&N 2023 for more details).

The evolution of the nearshore morphology for the project alternatives included different conditions (dry or drought, 10-year flood event, and 100-year flood event) to incorporate the effect of different seasonal conditions of project evolution. For example, storm conditions may result in more frequent lagoon breaching and more fluvial sediment delivery to the beach and nearshore, which may affect wave breaking and surf quality around the point break. These scenarios were also evaluated 1-year post-construction and 5-years post-construction by M&N. Model results were provided to Integral by M&N for each of the four alternatives and for each of six conditions (dry conditions 1-year post-construction, dry conditions 5-year post-construction, 10-year flood 1-year post-construction, 10-year flood 5-year post-construction, 100-year flood 1-year post-construction, and 100-year flood 5-year post-construction) for a total of 24 alternative scenarios (Table 2). M&N provided Integral with the sediment bed elevation at the end of the 24 model scenarios, which were then incorporated into the surf model by modifying the surf model bathymetry.[7] An example of the bathymetric changes among the alternatives provided by M&N is shown in Figure 15 for a 100-year flood event 1-year post-construction.

Table 2. Summary of Modeling Scenarios and Results Provided by M&N.

Alternative	Alternative Description	Model Conditions	Period Post-Construction	No. of Cases
Alternative 1	No Change with Managed Decay	Dry, 10-year and 100-year flood	1 and 5 years	6
Alternative 2	Maximum Lagoon Expansion	Dry, 10-year and 100-year flood	1 and 5 years	6
Alternative 3	Limited Lagoon Expansion	Dry, 10-year and 100-year flood	1 and 5 years	6
Alternative 4	Maximum Managed Retreat	Dry, 10-year and 100-year flood	1 and 5 years	6

[7] The alternative results provided by M&N do not include any changes associated with offshore placement of material nor do the results include any changes to lagoon outlet location.

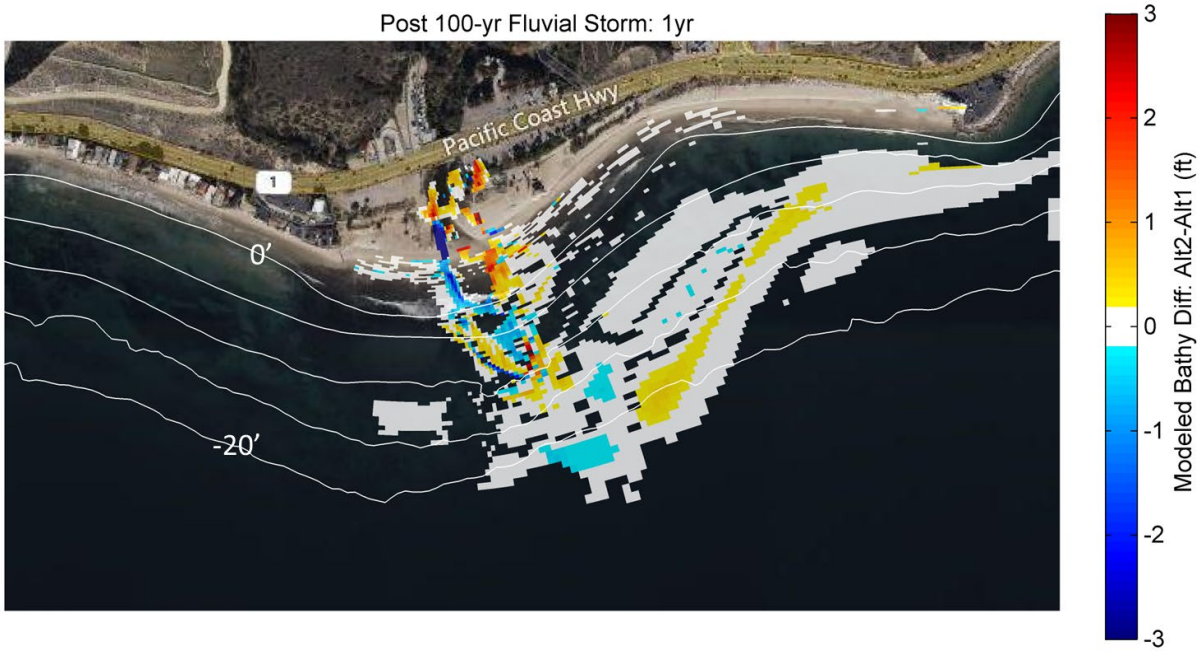

Figure 15. Example of the bathymetric change (comparing Alternative 2 and Alternative 1) for the 100-year flood event 1-year post-construction.

3.2.4 Surf Model Scenarios

The change in bed elevation associated with the restoration Project has the potential to impact wave quality through changes in wave refraction and breaking patterns. The impact of the Project on wave quality was evaluated by incorporating the modified bathymetry (output provided by M&N) associated with Project construction into the surf model to evaluate the Project's impact on wave quality through the peel angle calculation (described in Section 3.1.3).

Project alternatives with construction impacts were evaluated and compared to Alternative 1 (no change). Alternative 2 (maximum lagoon expansion) is expected to result in the smallest sediment loading from the lagoon, whereas Alternative 4 (maximum managed retreat) is anticipated to result in the largest sediment loading from the lagoon mouth (M&N 2022) comparing to no change Alternative 1. Alternative 3 is expected to the be most similar to existing conditions and was therefore not included in the surf impact modeling analysis. These two alternatives are anticipated to provide bounding of the maximum potential impacts of the Project (relative to Alternative 1, no change) on wave and surf conditions; therefore, Alternatives 2 and 4 were the focus of the surf modeling and analysis.

Two different environmental conditions (dry and 100-year flood) at two different time horizons (1 year and 5 years post-construction) were analyzed.[8] In addition, two different SLR scenarios (1.6 and 6.6 ft) in addition to no SLR were considered for existing conditions to characterize the impact of SLR on surf conditions. The model scenarios used for the surf analysis are shown in Table 3.

Table 3. Surf Model Scenarios.

Scenarios	Wave Scenarios	Wet/Dry Conditions	Post-construction	Sea Level Rise	Total Model Runs
Existing Conditions	Cases 1	--	--	1.6 and 6.6 ft	2
Alternative 1 (no change)	Cases 1–3	Dry and 100-year	1 and 5 years	--	12
Alternative 2	Cases 1–3	Dry and 100-year	1 and 5 years	--	12
Alternative 4	Cases 1–3	100-year[9]	1 and 5 years	--	6

3.3 SURF MODEL RESULTS

The surf model results summarize the change in surf peel angle for the range of Project alternatives and conditions described in Table 3. The following describes surf impact associated with Alternative 2, with Alternative 4, and with SLR.

3.3.1 Alternative 2

The model and surf quality were evaluated for Alternative 2 (maximum lagoon expansion) relative to no change (Alternative 1) for the dry and 100-year flood event 1 and 5 years post construction provided by M&N (Table 2) for all three wave cases. The peel angle results presented below are shown for Wave Cases 1 and 3 because these wave cases bound the range of conditions observed at the Site.

Wave Case 1

Wave Case 1 is a long period south swell and is the smallest wave case considered. The model results for peel angle for the wet conditions (100-year flood) 1 and 5 years post-construction are shown in Figure 16. The figure shows the peel angle alongshore (similar to Figure 14 for

[8] M&N also simulated 10-year flood event results. These results fall within the range of impacts between 100-year flood and dry conditions and were therefore not included in the surf evaluation.
[9] Only the 100-year flood event was evaluated for Alternative 4 because the 100-year flood event resulted in the most significant bathymetric changes across all alternatives.

existing conditions) for existing conditions (today), Alternative 1 (no change), and Alternative 2 (design conditions).

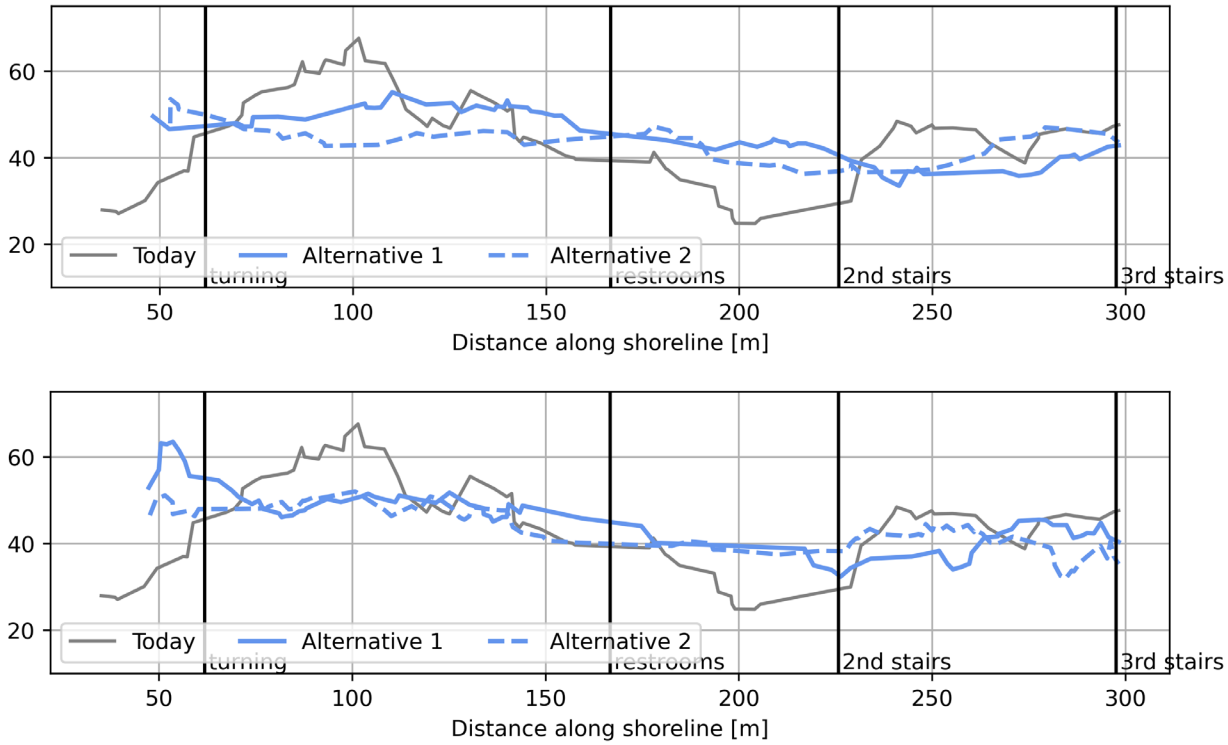

Figure 16. Peel angle after a 100-year flood event 1 year post-construction (upper panel) and 5 years post-construction (lower panel) for the southern, long period swell (Wave Case 1) for Alternative 1 (no change) and Alternative 2.

For the 100-year flood conditions, the peel angle is modified pre- and post-construction compared to present day conditions (gray line, Figure 16). In particular, the section between the turning and restrooms becomes slightly steeper (smaller peel angle) after the large flood compared to the baseline for both Alternative 1 (no change) and Alternative 2 (maximum lagoon expansion). In contrast, the section between the restroom and second stairs becomes softer and more “rippable” (higher peel angles) than the present-day conditions for both alternatives 1 and 2. Alternative 2 results in a slightly steeper wave compared to Alternative 1 (no change) up to the restrooms for the 1-year post-construction scenarios (upper panel, Figure 16). At the final section (between the second and third stairs), the wave conditions become slightly steeper (lower peel angles). After 5 years, the model-predicted peel angles for Alternative 1 and Alternative 2 scenarios converge, indicating that the project’s impacts are diminished over time (lower panel, Figure 16).

The model results for peel angle for the dry conditions (drought) 1 and 5 years post-construction are shown in Figure 17. The figure shows the peel angle alongshore for existing conditions (today), Alternative 1 (no change), and Alternative 2 (design conditions).

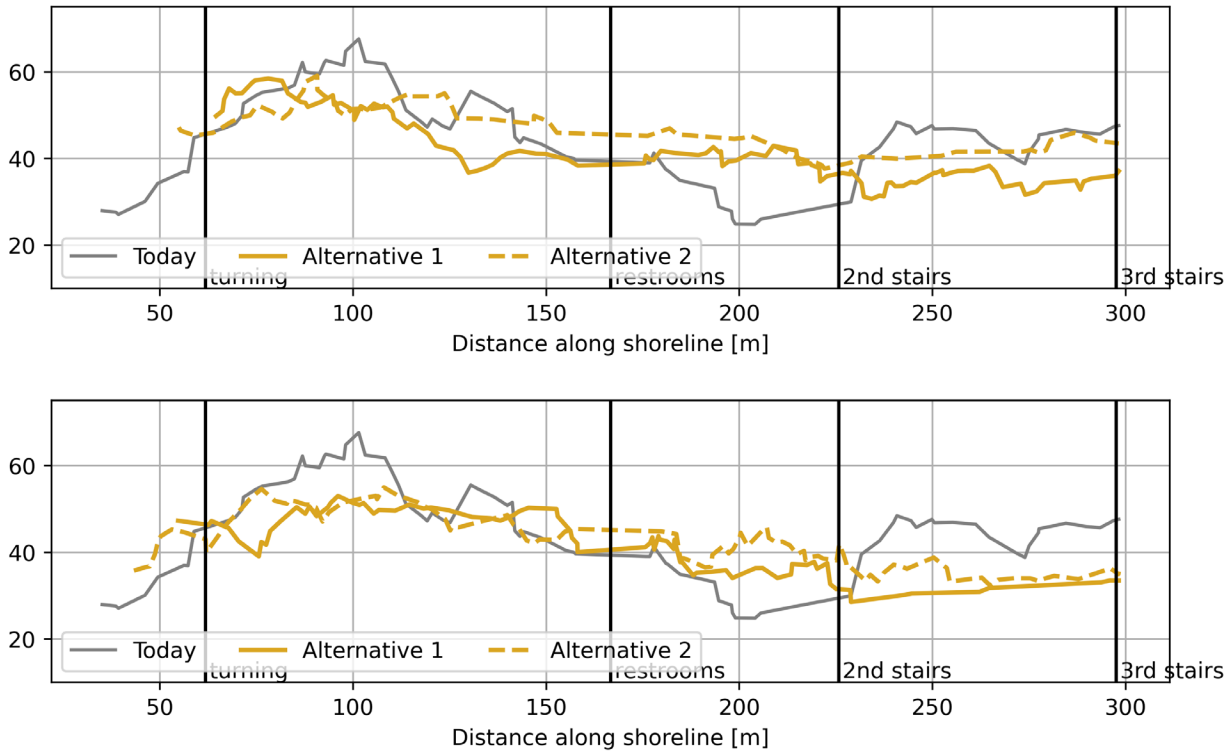

Figure 17. Peel angle after dry conditions 1-year post-construction (upper panel) and 5 years post-construction (lower panel) for the southern, long period swell (Wave Case 1) for Alternative 1 (no change) and Alternative 2.

Similar to the 100-year flood conditions, the peel angle is modified for both Alternative 1 (no change) and Alternative 2 from present day conditions (gray line). Specifically, the wave becomes steeper than baseline before the restrooms, softer than baseline before the second stairs, and steeper for the final section (Figure 17). The dry conditions result in smaller changes in the peel angle relative to the baseline conditions, with the largest impact occurring between the restrooms and the second stairs. After 5 years, the model-predicted peel angles for Alternative 1 (no change) and Alternative 2 (design conditions) converge, indicating that the Project's impacts are diminished over time with some lingering impacts between the restrooms and second stairs (softening relative to no change).

Wave Case 3

Wave Case 3 is the largest of the three wave cases at 7 ft, period of 10 seconds, and mean wave direction of 260 degrees, representative of a large and less frequently observed wave

case. For Case 3, results from the post-1 year are displayed in Figure 18 and Figure 19 for the wet (100-year flood) and dry conditions, respectively.

For all scenarios considered with Wave Case 3, the project alternatives closely follow the existing conditions, indicating minimal or negligible Project impact on the largest wave case surf conditions. The large (7 ft) waves break farther offshore and are less impacted by nearshore bathymetric changes compared to the smaller wave case (Wave Case 1).

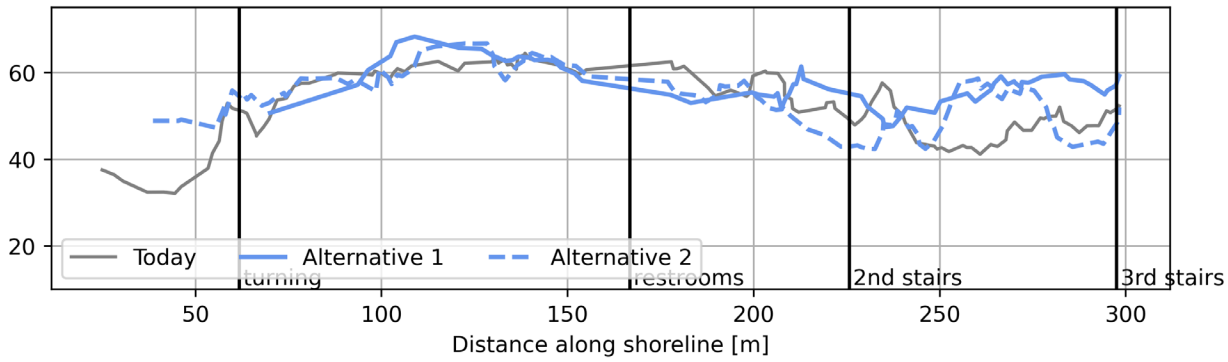

Figure 18. Peel angle after a 100-year flood event 1-year post-construction for the large western waves (Wave Case 3) for Alternative 1 (no change) and Alternative 2.

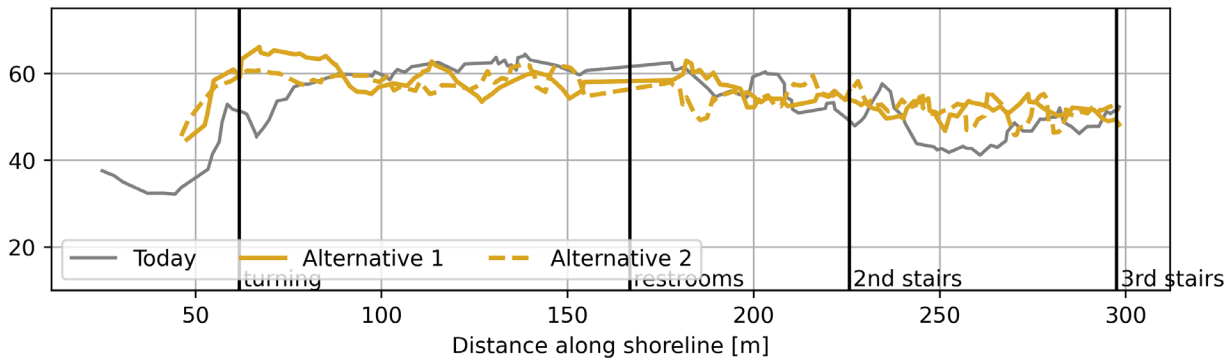

Figure 19. Peel angle after dry conditions 1-year post-construction for the large western waves (Wave Case 3) for Alternative 1 (no change) and Alternative 2.

3.3.2 Alternative 4

The model and surf quality were evaluated for Alternative 4 (maximum managed retreat) relative to no change (Alternative 1) for the 100-year flood event 1- and 5- years post construction provided by M&N (Table 2) for all three wave cases. The peel angle results presented below are shown for Wave Cases 1 and 3 because these cases bound the range of conditions observed at the Site. For all scenarios, the 100-year flood event scenarios resulted in the most significant changes to the offshore bathymetry, important for wave breaking and

surf quality. Therefore, the model results from the 100-year scenarios for Alternative 4 are presented here.

Wave Case 1

Wave Case 1, the long period south swell, is the smallest wave case considered and the most sensitive to Project impacts. The model results for peel angle for the wet conditions (100-year flood) 1 and 5 years post construction are shown in Figure 20.

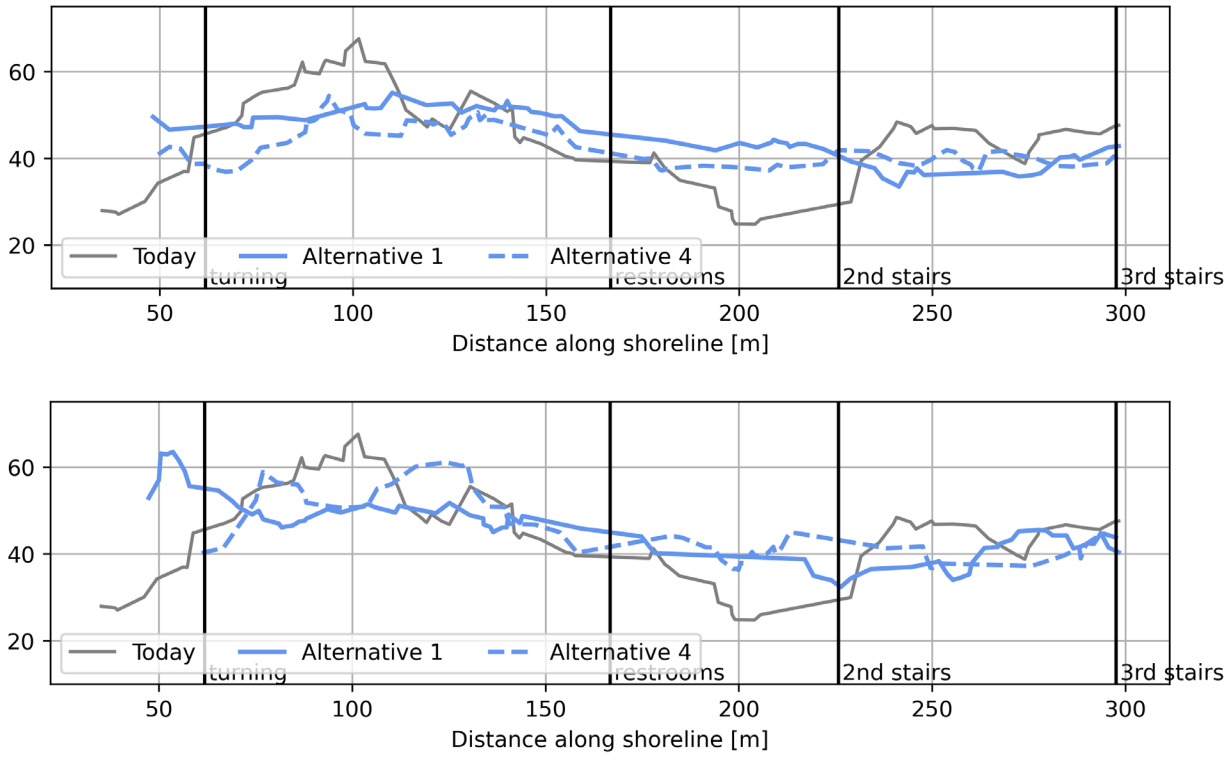

Figure 20. Peel angle after a 100-year flood event 1 year post-construction (upper panel) and 5 years post-construction (lower panel) for the southern, long period swell (Wave Case 1) for Alternative 1 (no change) and Alternative 4.

Overall, Alternative 4 impacts are similar to those observed for Alternative 2 for the 100-year condition (Figure 16). The model predicted peel angles are slightly smaller (faster, steeper waves) compared to existing conditions between turning and the restrooms and gets larger (softer wave) compared to existing conditions between the restroom and the second stairs (Figure 20). The wave then gets steeper for both Alternatives 1 and 4 compared to existing conditions after the second stairs. The results are similar 5 years post-construction with some slight differences in alternatives between turning and the restrooms.

Wave Case 3

Similar to the Alternative 2 results, the surf conditions for the large wave case (Wave Case 3) are relatively insensitive to nearshore changes associated with Alternative 4 (Figure 21). The peel angle for Alternative 4 is slightly lower (faster) between the turning point and the restrooms and then converges with Alternative 1 (no change). Only the surf impact 1-year post construction is shown because the impacts are minimal for Wave Case 3 and diminish over time. The peel angle impact for the 100-year event 5-year post construction are expected to be negligible for the Wave Case 3.

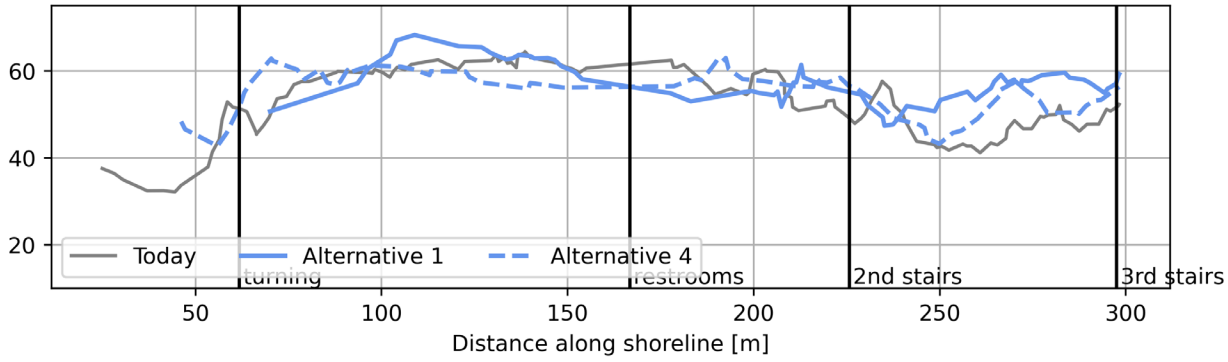

Figure 21. Peel angle after a 100-year flood event 1-year post-construction for large western waves (Wave Case 3) for Alternative 1 (no change) and Alternative 4.

3.3.3 Sea Level Rise

The impact of SLR on breaking conditions, was evaluated using two SLR conditions (1.6 and 6.6 ft) relative to existing conditions as required by the coastal commission and USACE. SLR of 3.3 ft was not included because the impacts to surf quality are bounded by 1.6 and 6.6 ft. The effect of SLR was evaluated only for Wave Case 1 (small, southern, long period wave case) because it is the most sensitive to Project design and interannual creek discharge changes.

The surf conditions were compared for SLR of 1.6 ft with existing conditions (Figure 22). The impact of SLR reduces the peel angle relative to existing conditions near turning, increases peel angle between restrooms and 2nd stairs, and reduces between 2nd and 3rd stairs. The changes in surf conditions associated with 1.6 ft SLR are slightly more significant than changes associated with the 100-year flood event for all alternatives. For a SLR of 1.6 ft, the waves break offshore, similar to current conditions with higher tide as shown in Figure 23. Many surfers have indicated that the best waves occur during mid-tide (3 ft) and that wave quality is reduced at high tide. An increase in SLR will reduce the optimal water level conditions for surfing.

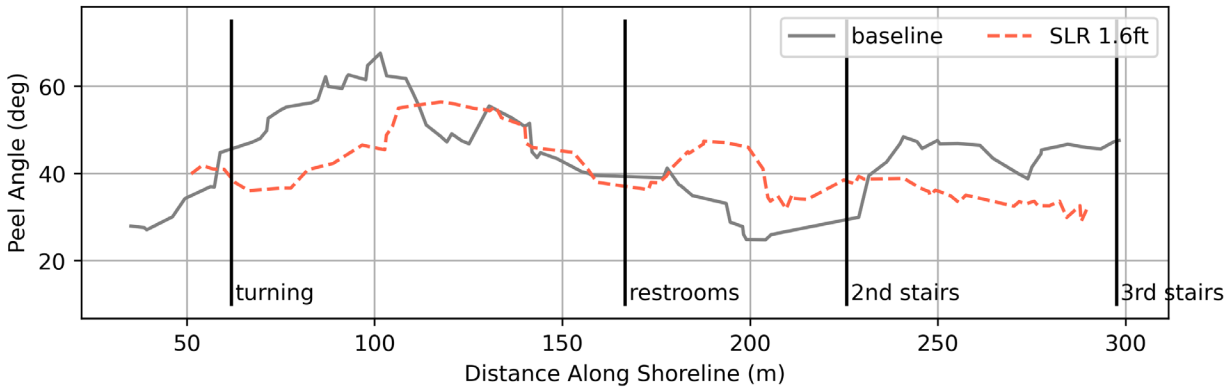

Figure 22. Peel angle with 1.6 ft SLR compared with existing conditions.

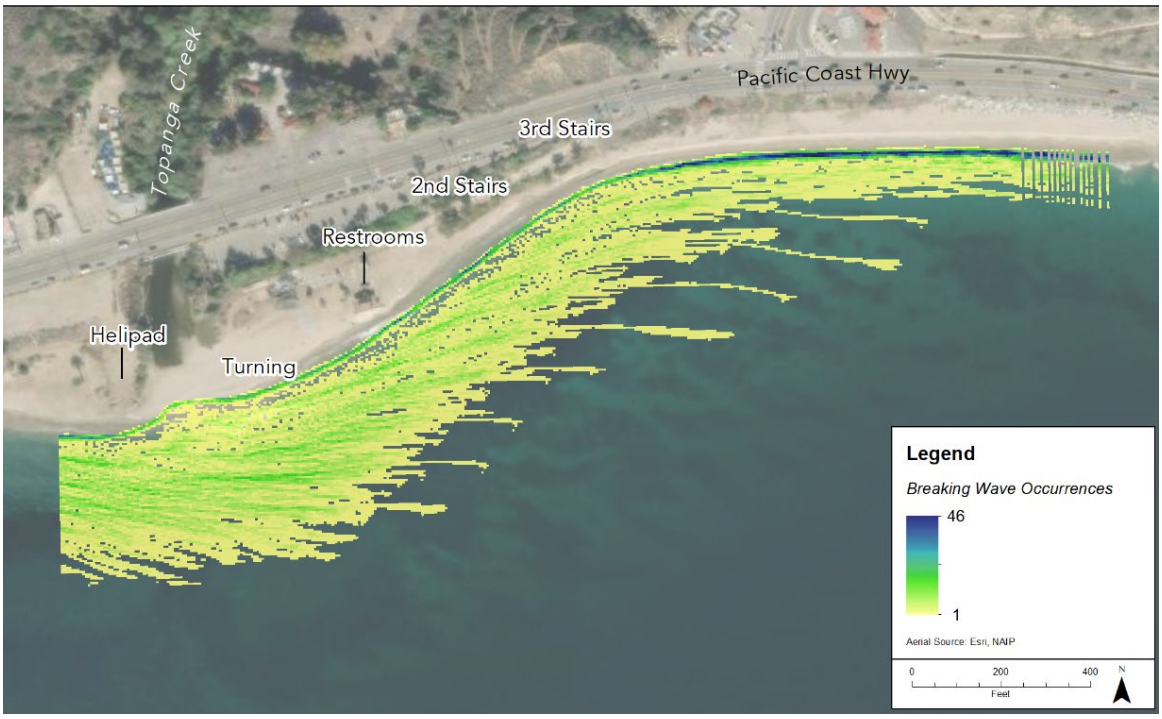

Figure 23. Wave breaking composite map shown for Wave Case 1 and with 1.6 ft of SLR.

At a SLR of 6.6 ft, wave breaking becomes quasi-unrecognizable, as breaking occurs overtop of structures, on the beach, and within the lagoon as shown in Figure 24. Under the high SLR scenario, the wave breaking will be on the beach and within the lagoon at the steepest bathymetric slopes. In fact, without the removal of the helipad, restrooms, and revetment during the Project, the waves are shown to close out at both of those locations. SLR of this magnitude will result in modifications of the shoreline over time such that the upland topography changes (not considered in this analysis) and managed retreat conditions will be important for wave conditions in the future.

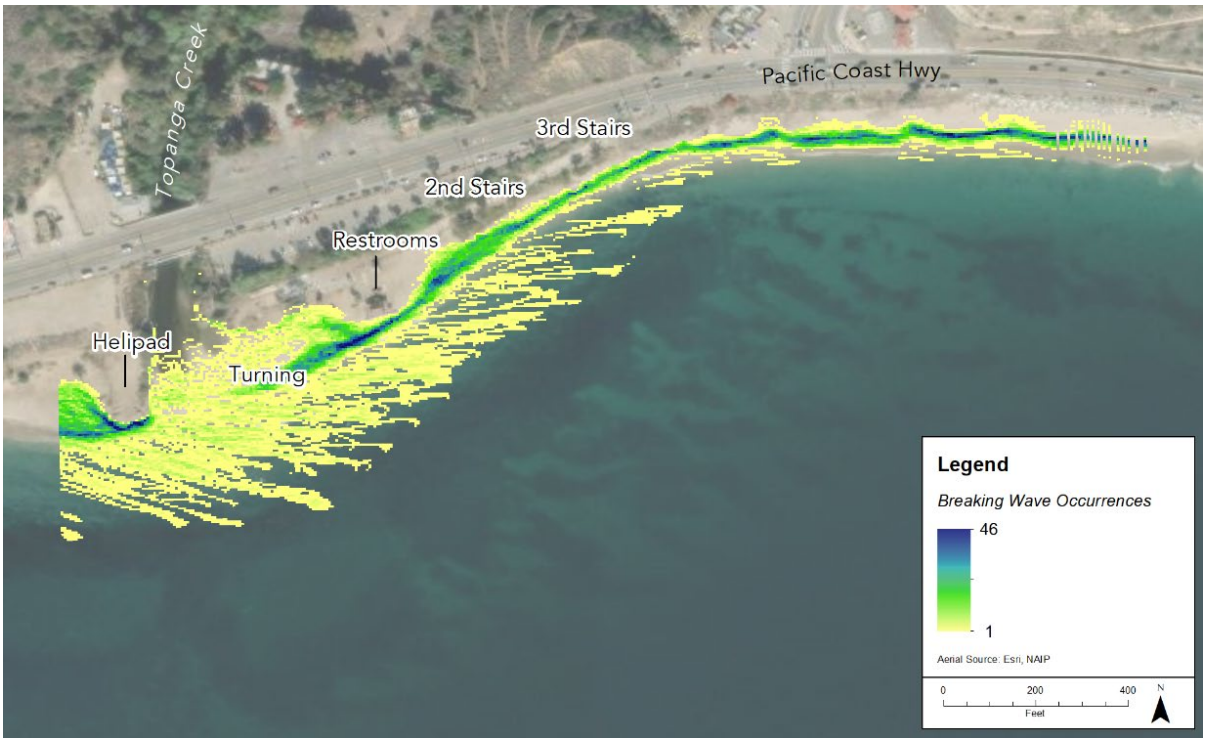

Figure 24. Wave breaking composite map shown for Wave Case 1 and with 6.6 ft of SLR.

3.4 SURF MODEL CONCLUSIONS

As part of the surf focus group, multiple concerns were raised about the future of surfing at Topanga Point and which factor would have the biggest impact on surf quality over time:

- Project Alternatives
- Flood versus Drought Conditions
- Sea Level Rise.

The impact the Project on surf conditions at Topanga Point were evaluated using a high-fidelity surf model with three characteristic wave conditions (informed by the surf focus group). The surf model incorporated the potential impacts associated with the Project by modifying the projected nearshore bathymetry associated with varying Project designs, wet and dry conditions, 1 and 5 years post-construction, and SLR. Nearshore bathymetric elevations were provided by M&N for the range of scenarios considered (M&N 2023). The surf quality impact assessment did not consider the effect of various mouth locations over time, which was beyond the scope of the analysis. This surf quality impact assessment also did not consider any effects of the nearshore placement of sediment resulting from Project construction, although proposed placement location was selected to minimize any impacts to Topanga Point and analysis of nearshore dispersal modeling is in progress. The wave model was used to

predict surf conditions through the calculation of a wave peel angle, the angle that the breaking wave crest forms with the "whitewater" or wave path, an important metric to characterize wave surf conditions. Overall, Wave Case 1 (long period, small southern waves) was the most sensitive to changes in the nearshore bathymetry while there was minimal or negligible impact observed for the largest wave case (Wave Case 3) for all scenarios considered (project design and seasonal). Wave Case 1 surf conditions were impacted by all Project alternatives, including Alternative 1 (no change) when compared to existing conditions. High rain periods (100-year flood) result in steeper waves while dry seasons result in flatter waves compared to existing conditions for all scenarios considered for Wave Case 1. The most significant changes occur at or near takeoff. A summary table of the average peel angle the three surf regions is included in Table 4 for all model scenarios considered for Wave Case 1 (most sensitive wave conditions).

Table 4. Average Model Predicted Peel Angle for Wave Case 1 for the Three Regions Along Topanga Point (Turning to Restrooms, Restrooms to 2nd Stairs, and 2nd to 3rd Stairs).

Average Peel Angle Model Scenario (Wave Case 1)	Turning to Restrooms	Restrooms to 2nd Stairs	2nd to 3rd Stairs
Alternative 1 (100-year event, 1-year post)	51	43	38
Alternative 2 (100-year event, 1-year post)	45	42	41
Alternative 4 (100-year event, 1-year post)	47	38	40
Alternative 1 (100-year event, 5-year post)	49	38	40
Alternative 2 (100-year event, 5-year post)	47	39	40
Alternative 4 (100-year event, 5-year post)	53	41	40
Alternative 1 (Dry event, 1-year post)	49	40	35
Alternative 2 (Dry event, 1-year post)	51	43	42
Alternative 1 (Dry event, 5-year post)	48	38	31
Alternative 2 (Dry event, 5-year post)	48	41	35
Existing 0.0 ft SLR	53	32	44
Existing 1.6 ft SLR	47	39	34

Note: SLR 6.6 ft was not included because peel angles were not able to be computed due to breaking in present-day onshore areas and within the lagoon.

Importantly, the changes to peel angle for Wave Case 1 associated with Project Alternatives 2 and 4 were within the seasonal and interannual variability (e.g., drought and flood) demonstrated by peel angle changes for Alternative 1 (no change), and the impact diminishes within 5 years following construction. In addition, a SLR of 6.6 ft will have the most significant impact on wave conditions. With a large SLR, waves will begin to break within the lagoon mouth (and elsewhere along the shoreline), making the existing surf break unrecognizable. The potential impact of the Project is diminished in comparison to significant SLR in the future.

In summary, the largest impact to future surf conditions at Topanga will be caused by SLR. The changes among the different Project alternatives are similar to the differences in surf quality between a flood or a drought year, indicating that the Project impacts are consistent with changes to surf associated with seasonal variability. In the few cases where the surf quality was impacted by Project alternatives, those differences dissipated within 5 years post-construction, indicating that there is not likely to be any long-term impact to surf quality resulting from the Project.

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Appendix C

Nearshore Dispersal Modeling for Sediment Beneficial Reuse for Topanga Lagoon Restoration MN 2023

The Appendices herein contain supporting information. These Appendices contain highly detailed figures and other graphic information, which are difficult to translate for screen reading software; therefore, the Appendices have not been translated into an auditory format. If you have a disability and/or have difficulty accessing any material in this document, please contact us by mail, email, or telephone, and we will work with you to make all reasonable accommodations. Please indicate 1) the nature of the accessibility need; 2) your preferred format; 3) the material you are trying to access and its location within this document; and 4) how to reach you if questions arise while fulfilling your request. You can direct your requests to:

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Table of Contents

1 Introduction 1
1.1 Project Background 1
1.2 Scope of Work 2
2 Nearshore Sediment Placement 3
2.1 Sediment Quantities and Construction Method 3
2.2 Sediment Characteristics 3
2.3 Sensitive Habitat Areas 7
2.4 Proposed Nearshore Placement Areas 8
3 Historical Beach Profiles and Shoreline Changes 10
4 Nearshore Mound Dispersal Modeling 13
4.1 Delft3D FM 13
4.2 Model Mesh and Grids 13
4.2.1 Flow Model Mesh 13
4.2.2 Wave Model Grids 15
4.3 Model Topography and Bathymetry 15
4.4 Boundary Conditions 16
4.4.1 Water Level 16
4.4.2 Wind 16
4.4.3 Waves 17
4.4.4 Morphological Time Scale Factor 22
4.5 Model Scenarios and Parameters 22
4.5.1 Model Scenarios 22
4.5.2 Model Parameters 26
4.6 Initial Sediment Distribution and Thickness 27
4.7 Model Calibration 29
4.7.1 Flow and Wave Model Calibration 29
4.7.2 Morphology Model Calibration 39
4.8 Model Results 45
4.8.1 Long-term Morphology Changes 45
4.8.2 Post-Storm Morphology Changes 52
4.8.3 Armoring at Site 56
5 Conclusions and Recommendations 60
5.1 Recommended sediment placement site 60
5.2 Q&A 61
6 References 63

List of Figures

Figure 1.1: Project Location and Nearshore Placement Boundary 2
Figure 2.1: Illustration of Nearshore Sediment Placement Area and Construction Route 3
Figure 2.2: Sediment Sampling Locations 4
Figure 2.3: Grain Size DISTRIBUTION Curves for borehole Samples 6
Figure 2.4: Grain Size Distribution Curves for Surface grab Samples 7
Figure 2.5: Biological Habitat Types and Species of Interest 2022-2023 (Coastal Resources Management Inc. 2023) 8
Figure 2.6: Revised Sediment Placement Boundary 9
Figure 3.1: CCSTWS Beach Profile Locations in the Project Area 10
Figure 3.2: Estimated Annual Net Alongshore Sediment Transport Rates of Surrounding Beaches (USACE, 2009) 10
Figure 3.3: Historical Shoreline Changes at Four Transects WithIn the Study ARea (CoastSat, 2023) 12
Figure 4.1: Model Domain and Flexible Mesh of Delft3D FM Flow Model 14
Figure 4.2: Flexible Mesh of Zoomed in Lagoon Area 14
Figure 4.3: Structured Model grids of Delft3D FM wave Model 15
Figure 4.4: Model topobathy for morphology calibration 16
Figure 4.5: Tidal Boundary Conditions at Offshore 17
Figure 4.6: Wave Height Rose at WIS Station 84072 18
Figure 4.7: Overview of OPTI-method procedure modified from Van Rijn (2012) 19
Figure 4.8: Delft3D Grid and Target Area for Wave Schematization 19
Figure 4.9: Representative Wave Boundary Conditions in a Typical Year at Offshore 22
Figure 4.10: Modeled Bathymetry at the oRIGINAL Site with Uniform Mound Height 23
Figure 4.11: Modeled Bathymetry at the Revised West Sites and Mound Cross Sections 24
Figure 4.12: Modeled Bathymetry at the Revised East Sites and Mound Cross Sections 25
Figure 4.13: Initial Sediment Thickness Map – Revised East Site with Uniform Mound Height 28
Figure 4.14: Map of Data Locations Used in FLOW and wave Model Calibration 30
Figure 4.15: Comparison of Modeled and Measured Currents at NDBC46268 32
Figure 4.16: Event 1 - Comparison of Modeled Wave Conditions at NDBC46268 34
Figure 4.17: Event 1 - Comparison of Modeled and CDIP Hindcast Significant Wave Height at MOP L0808 35
Figure 4.18: Event 2 - Comparison of Modeled and Measured Wave Conditions at NDBC46268 37
Figure 4.19: Event 2 - Comparison of Modeled and CDIP Hindcast Wave Conditions at MOP L0808 38
Figure 4.20: Potential Net Annual Longshore Sediment Transport Rates 40
Figure 4.21: Elevation Differences between 2009 and Original 2014 Lidar 41
Figure 4.22: Elevation Differences between 2009 and Lowered 2014 Lidar 42
Figure 4.23: Modeled Morphology Changes after 1 year 42
Figure 4.24: Modeled Morphology Changes after 5 year 43
Figure 4.25: Cross-shore Transects – Model Cross-shore Grid Lines 44
Figure 4.26: Volume Changes near Topanga Lagoon above -24ft-NAVD (Modeled vs Lidar) 44
Figure 4.27: Sediment Deposition 1-year and 5-year Post-Construction - Initial Proposed Site 46
Figure 4.28: Marine Biological Habitat Maps (2022 vs. 2023) 47
Figure 4.29: Sediment Deposition 1-year and 5-year Post-Construction - West Site A 49
Figure 4.30: Sediment Deposition 1-year and 5-year Post-Construction - West Site B 50
Figure 4.31: Sediment Deposition 1-year and 5-year Post-Construction - East Site A 51
Figure 4.32: Sediment Deposition 1-year and 5-year Post-Construction - East Site B 52
Figure 4.33: Deepwater Wave and Water Level Conditions During 1988 Storm (WIS ST84072) 53
Figure 4.34: Sediment Deposition Post-1988 Storm – Initial Proposed Site 53
Figure 4.35: Sediment Deposition Post-1988 Storm –West Sites 54
Figure 4.36: Sediment Deposition Post-1988 Storm – East Sites 55
Figure 4.37: Percentages of Remaining Sediment within the Sites By Years Post-Construction 56
Figure 4.38: Sediment Thickness Changes by Sediment Classes – West Site B 1-year Post -Construction 58

List of Tables

Table 2.1: Grain Size Distribution Percentages for borehole Samples 5
Table 2.2: Average Percentages of Lagoon Excavated Sediments by Grain Sizes 7
Table 2.3: Dimensions of the Modeled Sediment Mounds 9
Table 4.1: Nearshore ocean Topo-Bathy Data Sources 16
Table 4.2: Full Wave Climate Classes at Model Offshore Boundary 20
Table 4.3: Wave Schematization Results from OPTI-method and Morfac 21
Table 4.4: Model Scenarios for Nearshore Sediment Dispersal Analysis 23
Table 4.5: Model Parameters of Flow and Wave Coupled Model 26
Table 4.6: Morphological Model Parameters in Delft3D FM 26
Table 4.7: Data Used in Flow and Wave Model Calibration 29
Table 5.1: Pros and Cons of the Four Revised Placement Sites 61

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Glossary

2D	Two-dimensional
3D	Three-dimensional
CCSTWS	California Coastal Storm Tide and Wave Study
CDIP	Coastal Data Information Program
CRM	Coastal Resources Management, Inc.
cy	Cubic yards
DEM	Digital Elevation Model
EFH	Essential Fish Habitat
FM	Flexible Mesh
HAPC	Habitat Areas of Particular Concern
ft	Feet
Lidar	Light Detection and Ranging
m	Meters
mm	Millimeters
MHHW	Mean higher high water
M&N	Moffatt & Nichol
MOP	Monitoring and Prediction (MOP)
morfac	Morphological Time Scale Factor
NAVD88	North American Vertical Datum of 1988
NCMP	National Coastal Mapping Program
NDBC	National Data Buoy Center
NOAA	National Oceanic and Atmospheric Administration
PCH	Pacific Coast Highway
RCDSMM	Resource Conservation District of the Santa Monica
SLR	Sea Level Rise
WIS	Wave Information Study
USACE	U.S. Army Corps of Engineers
USGS	United States Geological Survey

1 Introduction

Moffatt & Nichol (M&N) is contracted with Resource Conservation District of the Santa Monica Mountains (RCDSMM) to provide modeling analysis of the nearshore mound dispersal, as part of the Topanga Lagoon Restoration Project. This report documents the numerical modeling effort of simulating how the nearshore mound sediment transport will be over time and whether it will benefit the surrounding shoreline and impact the sediment transport within the littoral cell.

1.1 Project Background

Topanga Lagoon is at the mouth of lower Topanga Creek State Park, which drains an 18-square-mile watershed in the Santa Monica Mountains and empties into the Pacific Ocean in Los Angeles County, California. The Topanga Lagoon restoration project aims to expand the lagoon and associated habitat areas, restore it to a more natural and closer to the historical conditions, and be more resilient to rising sea level. The restoration of Topanga Lagoon requires sediment removal in the lagoon. The sediment excavated from the lagoon is proposed to be placed nearshore to benefit the surrounding sand-starving coastal region by nourishing the beach while minimizing the impacts to the sensitive habits. Figure 1.1 depicts the project extent of Topanga Lagoon restoration project and the proposed boundary of the nearshore sediment placement. The sediment is proposed to be placed offshore of Topanga Beach that is also called Topanga Cove where the Topanga Canyon Blvd meets the Pacific Coast Highway (PCH). The Topanga Beach stretches from Topanga Lagoon to the west to Mastro's Point to the east. Topanga Point is a popular surf point and attracts all levels of surfers year-round. The coast of the study area is mostly sand-limited narrow to non-existent pocket sandy beaches littered with boulders, cobbles, and other debris except a wider beach at the Topanga Canyon Creek mouth, based on conversations with staff of Coastal Resources Management, Inc who performed nearshore habitat surveys.

Since 2021, the east side of Topanga Beach and east of Matro's Point all the way to Sunset Blvd. has experienced beach erosion and retreat. Placing the material in the nearshore location proposed can be beneficial, as it allows naturally driven processes (waves, longshore drift, and tidal currents) to disperse sand to in the littoral zone and surrounding beaches, nourishing them with additional sand and pebbles/cobbles, while silts and clays move farther offshore.

Four lagoon restoration alternatives were proposed for the restoration project and studied, named Alternative 1 through Alternative 4. Alternative 1 is the existing lagoon conditions (no action). Alternatives 2-4 are the proposed project alternatives. Alternative 2 provides the maximum increase in lagoon area, wetland, riparian and transitional habitats, thus has the largest amount of sediment to be excavated (estimated at 256,000 cy). Alternative 3 has limited lagoon habitat expansion excavating approximately 166,000 cy, but still increases habitat. Alternative 4 has similar lagoon habitat expansion at 210,000 cy, realigns the PCH bridge to the north, provides the maximum amount of beach within the limited space and is considered a managed retreat. The grading footprints for all proposed project alternatives are above +14 feet (ft) North America Vertical Datum 1988 (NAVD88), except for a pilot channel west of the existing Topanga Creek thalweg under the proposed PCH bridge. The pilot channel is on a historical creek thalweg. No grading surrounding the existing lagoon below +10-ft contour is proposed to protect existing sensitive resources. The differences in lagoon grading among the alternatives do not impact the nearshore mound sediment movement because the movement is mainly driven by the wind, wave breaking, and tide change induced nearshore currents. Therefore, the modeling of the nearshore mound dispersal used the largest sediment quantities and lagoon grading footprint from Alternative 2.

The excavated material will be transported from the lagoon to the Topanga Beach via truck along the beach approximately 0.5 miles, fluidized by mixing with seawater, then pumped to the nearshore placement area with seabed elevations between -15ft NAVD88 and -30ft NAVD88. An initial placement site with seabed elevations between -15ft and -25ft was modeled. The agencies recommended two deeper sites after they were presented with the initial site modeling results on September 7, 2023 to reduce impact on the nearshore sensitive habitats. Hence, a total of three sediment placement sites within the proposed dispersal boundary, as shown in Figure 1.1, were modeled. Two placement thicknesses were also modeled for the two new sites. The findings from the numerical modeling are presented in this report.

FIGURE 1.1: PROJECT LOCATION AND NEARSHORE PLACEMENT BOUNDARY

1.2 Scope of Work

The proposed study includes the following tasks:

- Review publicly available data and studies relevant to the study to define seasonal and annual wind, wave, current and sediment conditions;
- Develop the nearshore flow, wave and sediment transport using the coupled Delft3D flexible mesh (FM) model suite;
- Conduct model calibration based on available data; and
- Simulate the sediment transport and morphology changes of the proposed placement for two periods: 1-year and 5-year after placement.

The model results include figures showing where the placed sediment will go and the duration of mound dispersal in light of beach renourishment as well as potential impacts to sensitive habitat areas. The ultimate goal is to answer the following questions:

- Where will the material go once placed?
- How much time will it take for the mound to disperse/reach equilibrium?
- How much coarse material is expected to remain at the placement location (area, thickness, volume)?
- Which areas would be expected to change substrate (e.g., sandy bottom to gravely bottom)?
- Is direct placement on east Cove beach or within the swash zone along the Cove beach feasible?

2 Nearshore Sediment Placement

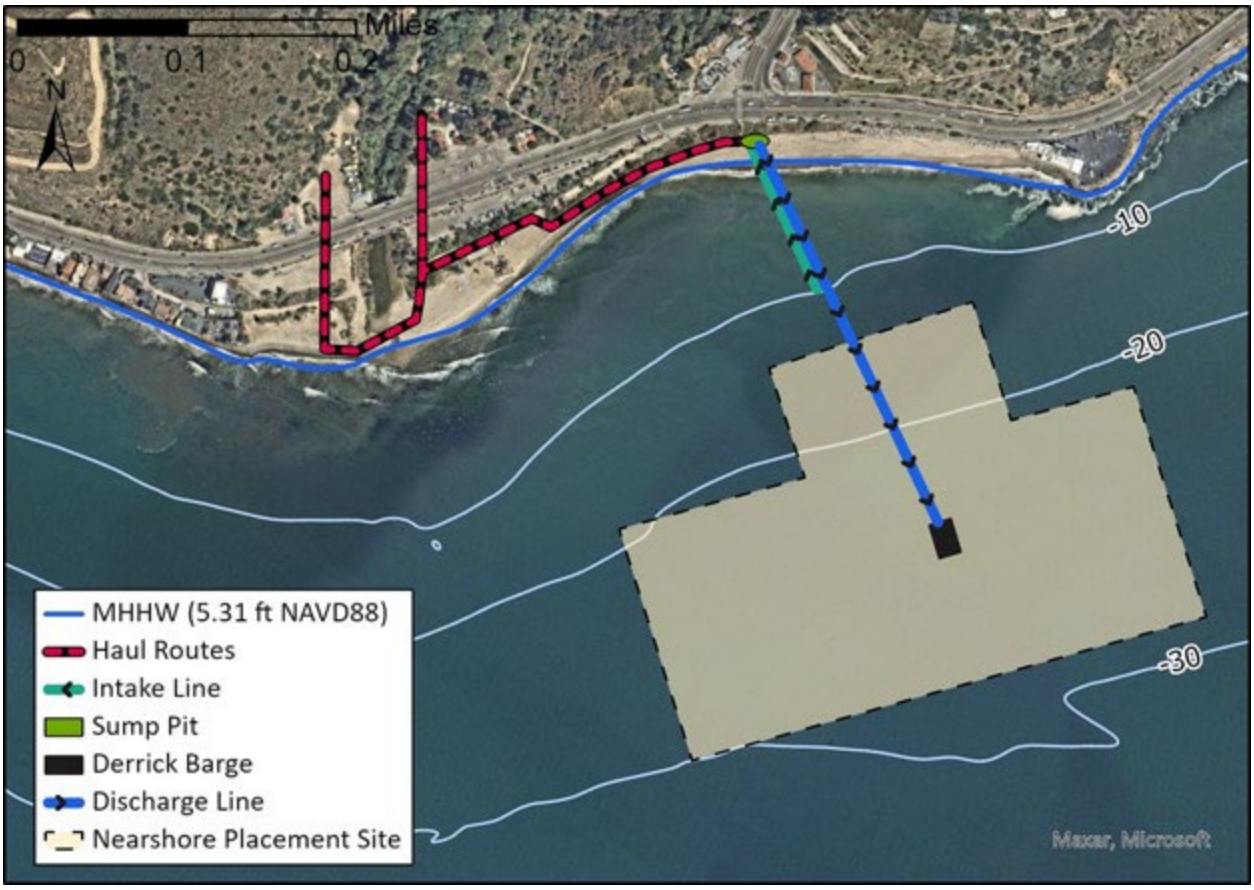
2.1 Sediment Quantities and Construction Method

According to the 30 percent design, the amount of sediment to be excavated from the lagoon varies with proposed alternatives. The maximum amount of sediment to be excavated is 256,000 cubic yards (cy) per Alternative 2. This amount is used in estimating the size of the modeled nearshore sediment mound and modeled. The placement details are discussed in Section 2.4.

The excavated materials are proposed to be placed in the sediment placement area using an excavator that will excavate the material, and a loader and/or trucks will transport material to the pump off location in Topanga Beach. Submersible hydraulic pumps will transport slurries directly to the sediment placement area.

Figure 2.1 illustrates the proposed sediment placement area, the truck haul routes, and the discharge lines proposed.

FIGURE 2.1: ILLUSTRATION OF NEARSHORE SEDIMENT PLACEMENT AREA AND CONSTRUCTION ROUTE



2.2 Sediment Characteristics

Sediment samples were collected in two ways: (1) nearshore surface sediment grabs and (2) boreholes within the planned excavation area. As shown in Figure 2.2, eight boreholes named T-1 through T-8 are marked in green. The nearshore surface sediment samples were grabbed along two transects. These two transects are perpendicular to the shoreline, extending from the beach at an elevation of +11.8ft NAVD88 (+12ft MLLW) to the intertidal zone at an elevation of -30.2ft NAVD88 (-30ft MLLW). The grabbed samples are named A-1 through A-8 and B-1 through B-8 along the two transects, respectively. Figure 2.3 is a photo

of the collected samples from lagoon (Sample T-7) and beach (Sample A-1). The lagoon sediments are a good mix of gravel to fine sand with darker color. The beach sediments are lighter colored sand.

Sieve grain size analysis was performed for the collected sediment samples. The sediment sizes and percentages of the eight boreholes (T-1 through T-8) were used to determine the initial mound material components, as these boreholes are located where excavation will occur, and the excavated materials will be disposed of at the nearshore sediment placement area. The grain size distributions of the eight samples are listed in Table 2.1 and graphed in Figure 2.4. The surface grabbed samples were used to define the sediment classes for the existing shoreline and seabed as model initial conditions. Figure 2.5 shows the grain size distribution curves for these sixteen surface-grabbed sediment samples. The grabbed samples consist of mainly medium to fine sand, finer than the sediment in the lagoon fill to be excavated. The grain size distributions of the two types of samples are consistent with what is observed from the sample photos.

FIGURE 2.2: SEDIMENT SAMPLING LOCATIONS

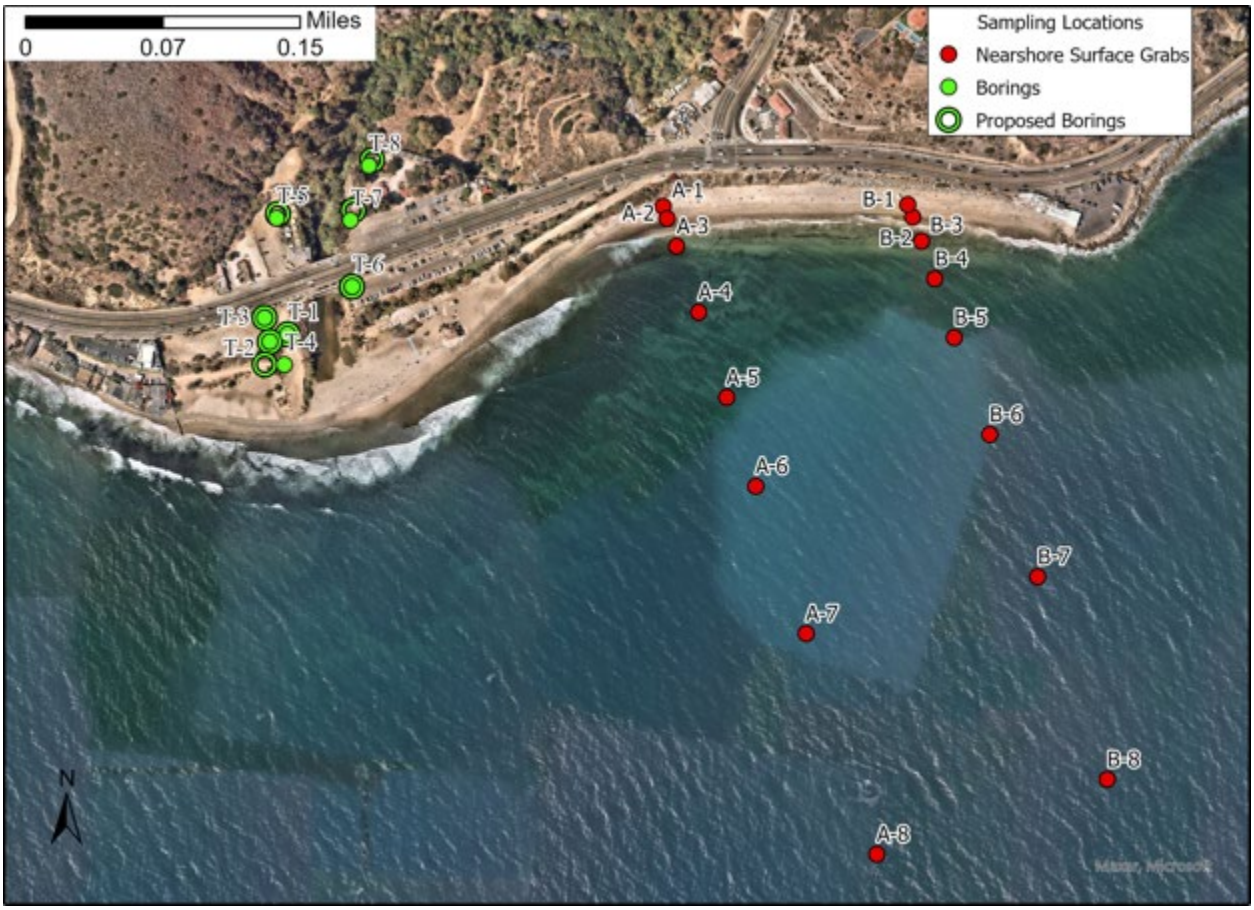


FIGURE 2.3: PHOTO OF LAGOON AND BEACH SAMPLES

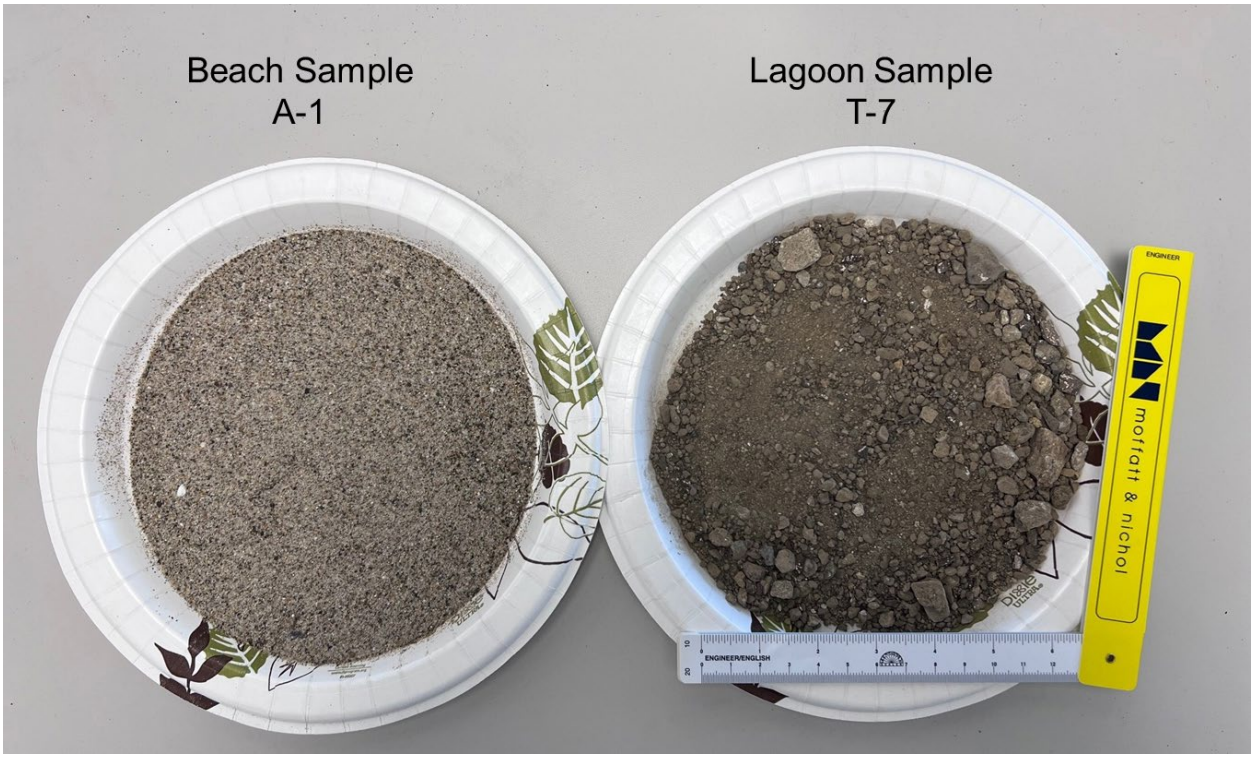


TABLE 2.1: GRAIN SIZE DISTRIBUTION PERCENTAGES FOR BOREHOLE SAMPLES

Grain Size	Sieve #	Sieve Sizes (mm)	T-1-COMP	T-2-COMP	T-3-COMP	T-4-COMP	T-5-COMP	T-6-COMP	T-7-COMP	T-8-COMP
Gravel	1-1/2'	37.5	100	100	100	100	100	100	100	100
Gravel	1"	25	89	100	100	100	97	100	100	100
Gravel	3/4"	19	88	99	98	100	89	99	94	86
Gravel	1/2"	12.5	87	96	95	100	81	96	88	80
Gravel	3/8"	9.5	84	92	93	99	78	94	85	75
Gravel	#4	4.75	78	86	85	94	70.0	88	74	67
Gravel	#8	2.36	72	80	76	93	65	81	64	60
Very Coarse	#10	2	70	79	74	81	64	79	61	59
Very Coarse	#16	1.18	64	75	69	75	60	74	55	55
Very Coarse	#30	0.6	55	68	61	64	54	65	47	48
Coarse Sand	#40	0.425	49	63	56	59	49	58	43	43
Coarse Sand	#50	0.3	43	58	50	53	44	51	39	39
Medium Sand	#60	0.25	40	54	47	50	41	47	36.0	36
Medium Sand	#100	0.15	33	46	38	44	35	39	30	31
Silt	#200	0.075	26	33	28	37	26.0	30	22	24.0

FIGURE 2.4: GRAIN SIZE DISTRIBUTION CURVES FOR BOREHOLE SAMPLES

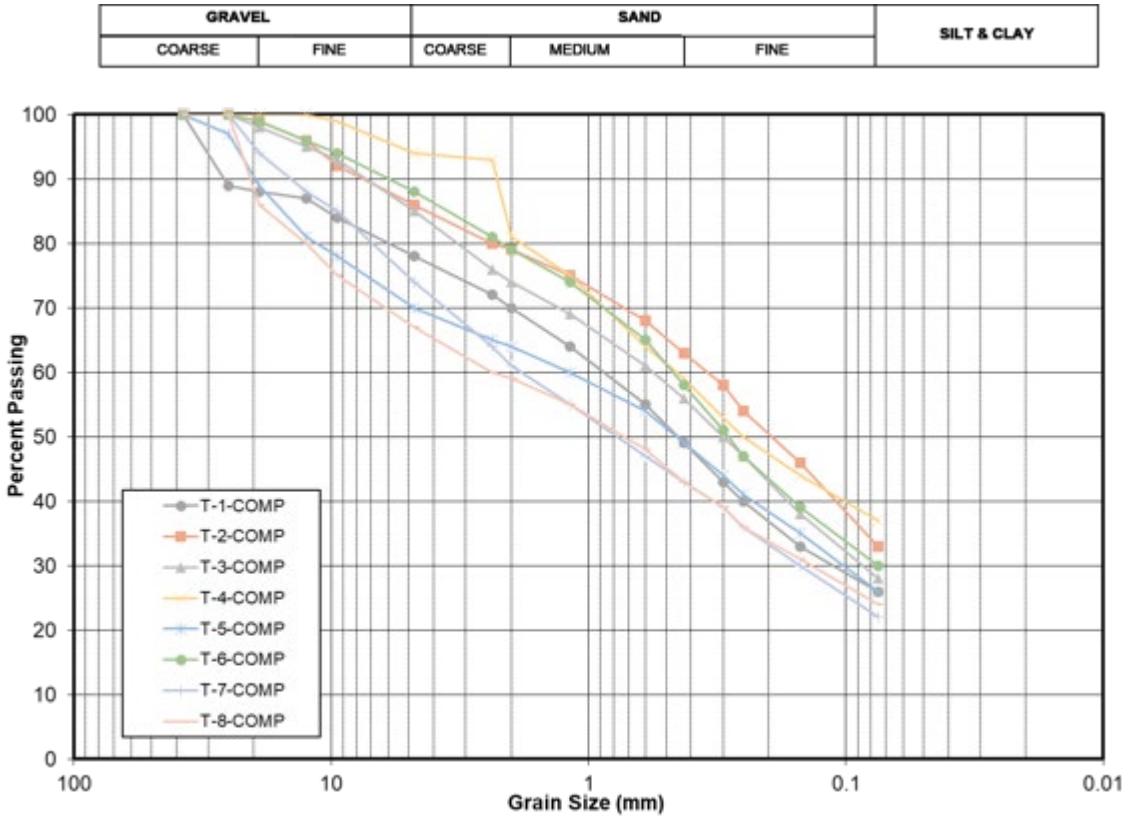
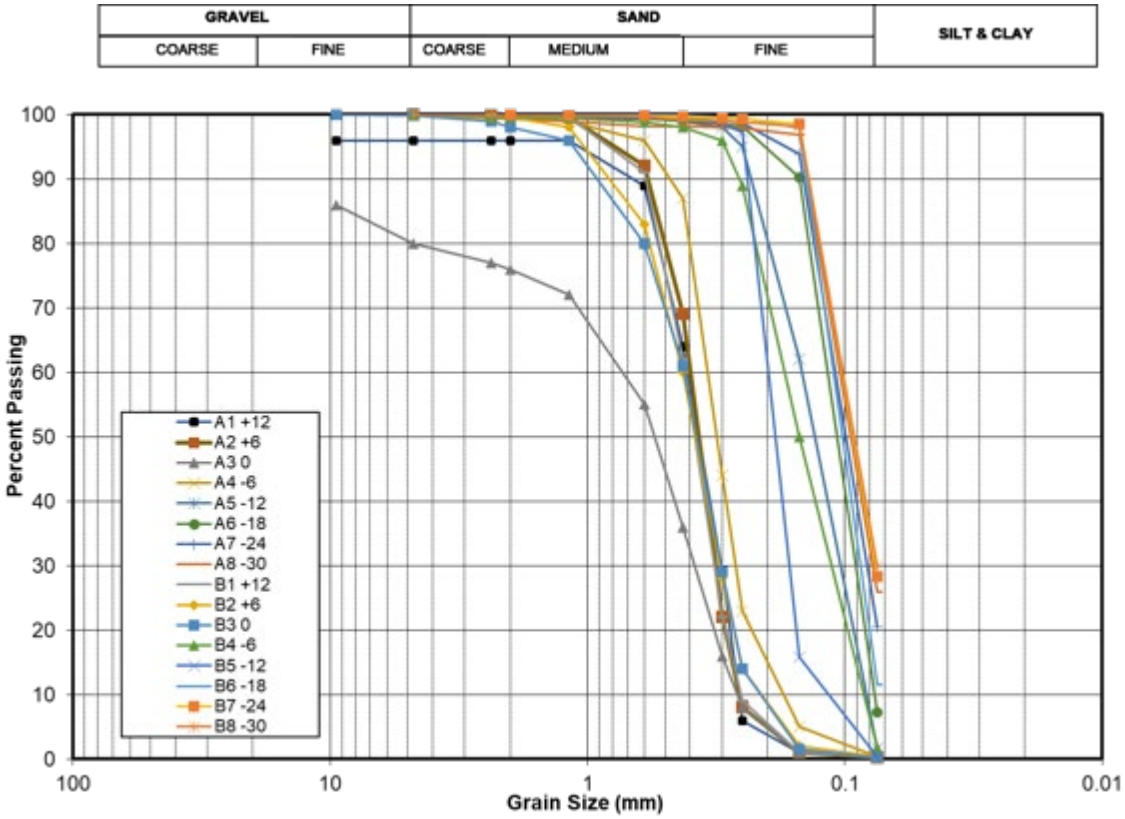


FIGURE 2.5: GRAIN SIZE DISTRIBUTION CURVES FOR SURFACE GRAB SAMPLES



The average percentage of individual sediment size class of lagoon fill materials were calculated and listed in Table 2.2. The sieve grain size results of T-1 to T-8 samples were analyzed by the proposed sediment classes in the morphology model, ranging from 0.15mm to 12.5mm. This provides a good coverage of the sediment from fine, medium, and coarse sand to pebbles. The existing sediment size and distribution within a 30-ft depth along the shoreline were provided by the latest seafloor survey (Coastal Resources Management, Inc., 2022). The sediment sizes and distributions applied in the morphology model are discussed in Section 4.6.

TABLE 2.2: AVERAGE PERCENTAGES OF LAGOON EXCAVATED SEDIMENTS BY GRAIN SIZES

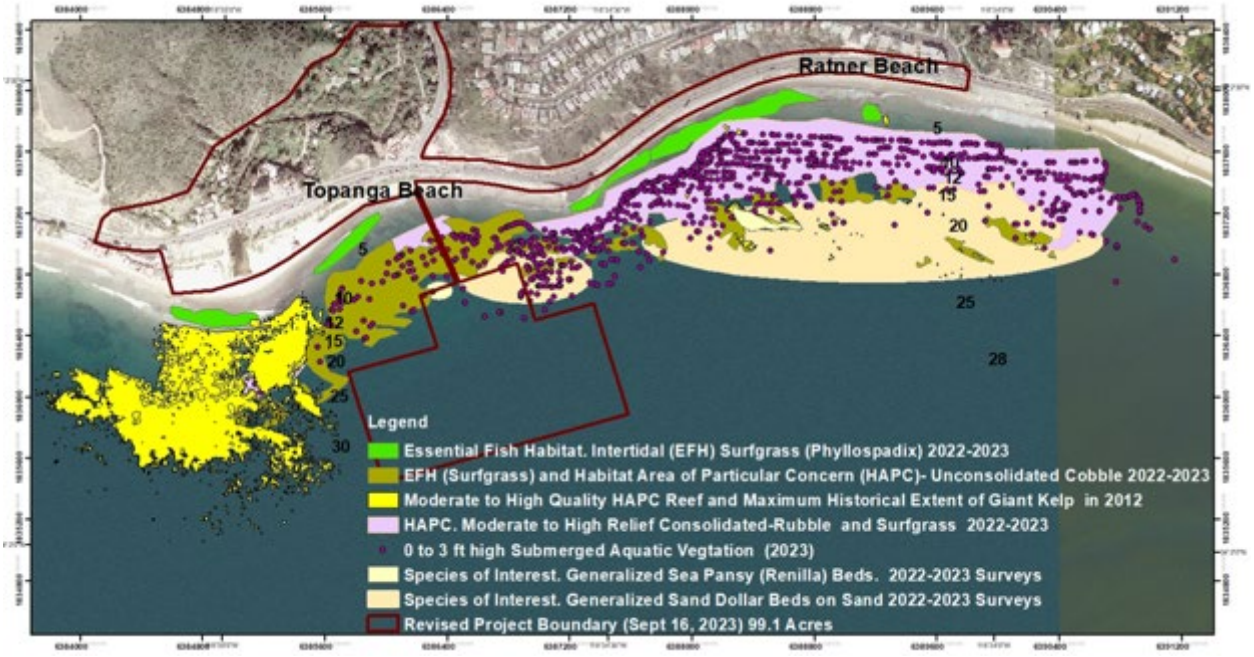
Modeled Sediment Class	Grain Size Range	Average Percentage of T-1 to T-8 (%)
12.5mm	9.5-37.5mm	17.0
3mm	1.18-4.75mm	21.7
0.4mm	0.3-0.6mm	14.3
0.15mm	0.15-0.25mm	18.0
silt (not modeled)	0.075mm	29.0

2.3 Sensitive Habitat Areas

Coastal Resources Management, Inc. (CRM) conducted two marine habitat surveys in the vicinity of the proposed material placement area. The survey area covers a 0.54-mile stretch of shoreline, starting from the Topanga Lagoon, east along Topanga Beach, around Mastro's Point, along Ratner's Beach and ending near Coastline Dr. The survey covers the shoreline to a depth of -29.80ft NAVD88 (-30ft MLLW). The habitat map provided by CRM on October 17, 2023, is presented in Figure 2.5. The proposed sediment placement

area is also included in the figure and shown in dark red lines. The sensitive biological habitats are located between 5ft to 25ft depth and extend to 30ft depth offshore of the Topanga Lagoon. This map is used to evaluate the nearshore mound placement impacts on the sensitive biological habitats, especially the Essential Fish Habitats (EFHs).

FIGURE 2.6: BIOLOGICAL HABITAT TYPES AND SPECIES OF INTEREST 2022-2023 (COASTAL RESOURCES MANAGEMENT INC. 2023)



Note: Depths in ft, relative to MLLW, 0.2 ft below NAVD88.

2.4 Proposed Nearshore Placement Areas

The nearshore placement area was selected to minimize both the (1) potential impact to nearby subtidal and intertidal habitats and (2) the required transportation distance from the sediment source location(s) to the nearshore placement site. Additional factors that drove the selection of these locations were based on the nearshore bedform characteristics, impacts to tourism and recreational use, and potential protective benefits to the surrounding coastline from continued erosion. Placement on the beach was not deemed feasible due to above mentioned incompatibility with existing beach sand characteristics. Placement in the swash zone east of Mastro's was considered, but not selected because of constructability issues from potential wave damage to pipelines and a much higher cost.

The placement area was initially proposed as a 9-acre area approximately one-quarter mile off Topanga Beach centered around the -20 ft NAVD88 contour between -12 to -25 ft NAVD88. The site was determined based on the 2022 habitat survey (Coastal Resources Management, Inc., 2022). During the modeling of the initial site, the second habitat survey conducted between June to July 2023 became available (Coastal Resources Management, Inc., 2023). The initial placement site turns out to cover a few sensitive habitats, such as sand dollar and sand pansy beds. After presenting the modeling results of the initial site to the state and federal agencies, two new sediment placement sites further offshore in depth between -25 to -35 ft NAVD88 were recommended. The nearshore placement boundary shown in Figure 2.1 and Figure 2.5 is the outer boundary of both initial and revised placement areas.

Figure 2.6 illustrates the three modeled sites: the initial site, the revised west site, and the revised east site. The sizing of the three sites was based on the largest sediment quantity among the three proposed lagoon restoration alternatives (256,000 cy). The silt (grain size < 0.15mm) is assumed to disperse immediately after placement, and thus is not included in the total volume when calculating the sediment mound sizes

for inputs into the model. Per Table 2.2, the average percentage of silt is 29% of the entire sediment. The estimated mound sizes for the three sites are listed in Table 2.3. The revised east site has the largest footprint, approximately 18.4 acres, among the three sites, and will result in the lowest mound height of 5.8 ft. The original site has the smallest area of 9 acres, requiring a height of 9.2 ft. The side slope was assumed to be 10H:1V. An additional side slope of 30H:1V was considered later in the modeling for the revised west and east sites. Details are discussed in Section 4.5.

FIGURE 2.7: REVISED SEDIMENT PLACEMENT BOUNDARY

TABLE 2.3: DIMENSIONS OF THE MODELED SEDIMENT MOUNDS

Parameters	Initial Site	Revised West Site	Revised East Site
Targeted Volume (cy)	256,000	256,000	256,000
Width (ft)	660	790	1063
Length (ft)	594	751	755
Area (acre)	9.0	13.6	18.4
Mound Height with 1:10 slope (ft)	9.2	8.1	5.8

Note:

1. Slope is within the overall sediment placement boundary shown in Figure 2.1 and Figure 2.5.

2. It assumes silt will be dissipated right away during the placement process, and it is subtracted from the total volume when calculating the mound sizes. The average percentage of silt is about 29%.

3. The revised west and east sites each has two alternative placements, Site A and Site B. Details are discussed in Section 4.5.1.

3 Historical Beach Profiles and Shoreline Changes

The most recent data available from the California Coastal Storm Tide and Wave Study (CCSTWS) by U.S. Army Corps of Engineers (USACE)documented 16 beach profiles in Topanga and the adjacent coast over 70 years from 1935 to 2005 (USACE, 2009). Figure 3.1 shows eight profile locations within this project's study area. The CCSTWS estimated annual net alongshore transport rates of the surrounding beaches are shown in Figure 3.2. Within Santa Monica Bay, the net alongshore transport direction is easterly. The alongshore transport rate at Topanga is approximately 109,000 cy/year. Besides the historical beach profiles, the 2009 and 2014 USACE NCMP Topobathy Lidar DEMs are available and used for this study. These topobathy data were used in setting up the model's initial condition and calibrating the morphology model.

FIGURE 3.1: CCSTWS BEACH PROFILE LOCATIONS IN THE PROJECT AREA

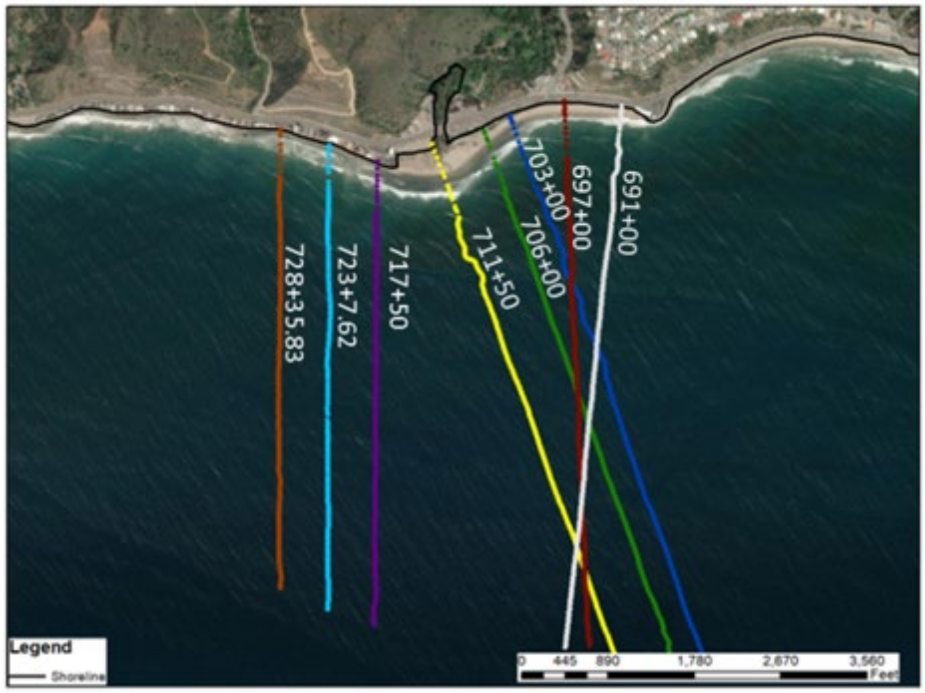


FIGURE 3.2: ESTIMATED ANNUAL NET ALONGSHORE SEDIMENT TRANSPORT RATES OF SURROUNDING BEACHES (USACE, 2009)

The CoastSat data from the United States Geological Survey (USGS) and the University of New South Wales provide satellite-derived shoreline position changes for the past 38 years from 1984 to 2021 (Vos K., 2019). Figure 3.3 presents CoastaSat analysis transects in the project area with erosional shoreline reaches highlighted in red. The color of the transect lines indicates the long-term shoreline change rate at the transect location. Warm color indicates erosion with a negative shoreline change rate, and cold color indicates accretion with a positive shoreline change rate. A neutral color close to white means a relatively stable shoreline with a shoreline change rate close to 0. Per CoastSat data (in other words, based on the analysis of historical shoreline images), the following conclusions can be derived for the study reach from west to east:

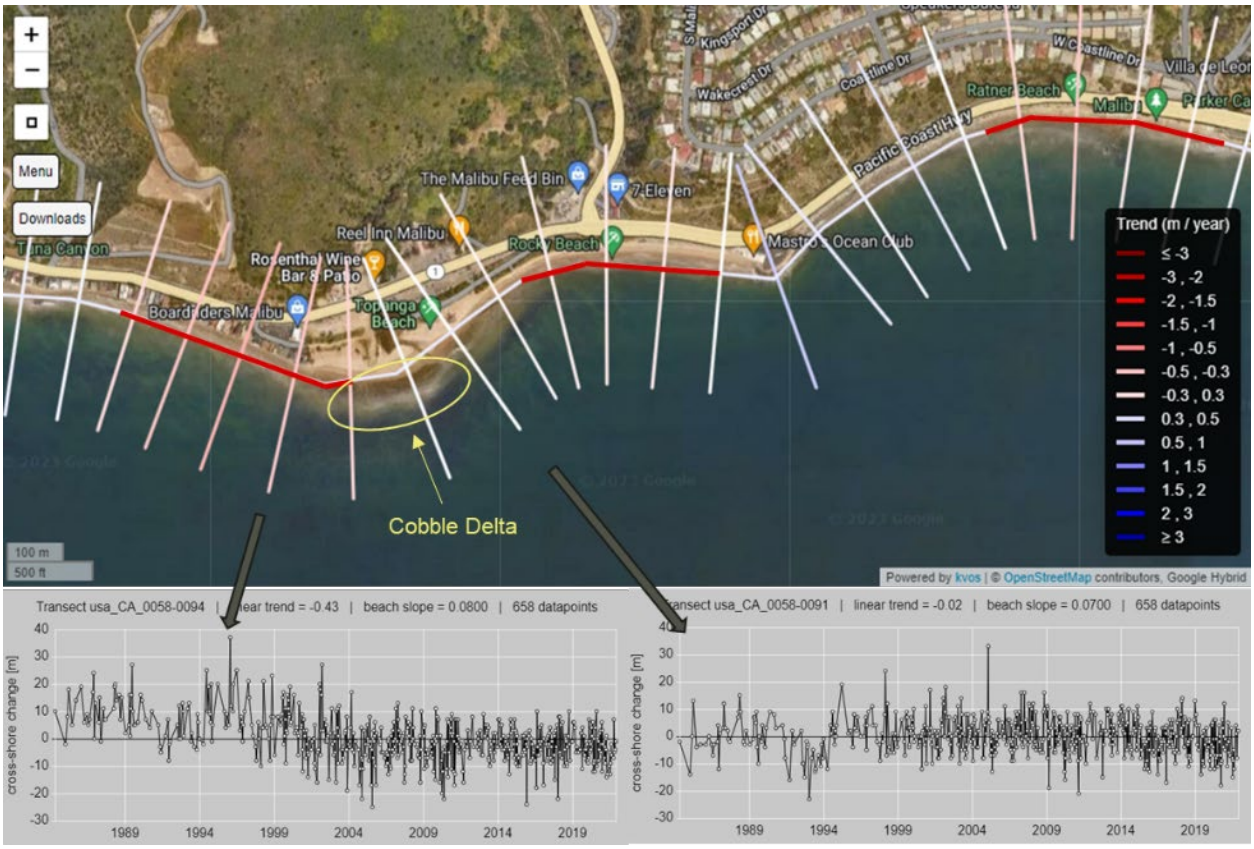
1) The southwest facing reach west of the Topanga Point has the highest erosion rate compared to other reaches within the studied area, due to its exposure to south and southwest waves.
2) The Topanga Point is stable due to the large cobble delta presence as shown in Figure 3.3.
3) The reach immediately east of the Topanga Point is stable due to sheltering of the Topanga Point, which blocks the direct westerly wave impacts.
4) The south to southwest facing Cove beach is retreating due to its exposure to direct south to southwest wave impacts.
5) The reach from Mastro's Point to east is stable due to the presence of Mastro's Point. Positive shoreline accretion is seen at Mastro's Point as the eastly moving sand is retained by the Mastro's Point. The reach immediately to the east is stable due to sheltering effect of Mastro's Point.
6) The most east segment of the study area (called "Ratner Beach") is retreating due to its exposure to direct south to southwest wave impacts similar to the Cove Beach.

In general, all southwest facing shorelines retreat over the past 38-years, due to their exposure to southwesterly wave impacts. Topanga Point due to the large cobble delta presence and Mastro's Point due to the rock protection are stable. Reaches immediately east of the two features are stable due to sheltering of the two features.

It is worth pointing out that beach width changes seasonally and periodically. Beaches are typically narrower in the winter through spring due to winter coastal storm impacts and recover and become wider again in the summer and fall. The cross-shore change in the two lower plots of Figure 3.3 shows beach width seasonal changes. A negative value indicates retreat, and a positive value indicates accretion. This seasonal width change can be up to 20 to 30 ft as shown in the two lower plots in Figure 3.3. The beach width is also subjected to other meteorological impacts such as El Nino and fluvial storms. El Nino brings larger coastal storms and erodes beaches; however, fluvial storms bring more sand to the beaches and nourish beaches. This kind of event occurs periodically. Hence, beach widths also change periodically.

The beneficial reuse of excavated materials from the lagoon grading and placing sediment nearshore will help slow down the erosion and nourish the sand starving beach east of Mastro's Point.

FIGURE 3.3: HISTORICAL SHORELINE CHANGES AT FOUR TRANSECTS WITHIN THE STUDY AREA (COASTSAT, 2023)



4 Nearshore Mound Dispersal Modeling

Two-dimensional (2D) hydrodynamics, waves, sediment transports, and morphological change numerical modeling were performed to investigate potential impacts on the sensitive biological habitat by placing sediment in the nearshore and how these sediments will be dispersed and transported in near-term (1-yr) and long-term (5-yr) time frames. Modeling results among the sediment placement sites were compared. This section describes the selected Delft3D FM model suite, the model domain, setup, calibration, and model results.

4.1 Delft3D FM

The open-source Delft3D FM model suite developed by Deltares, Netherlands was selected to study hydrodynamics, wave transformation, sediment transports and morphological changes in the nearshore sediment placement site and its adjacent shoreline areas. It is the successor of the Delft3D suite. Like Delft3D, the Delft3D FM suite can simulate storm surges, hurricanes, tsunamis, detailed flows and water levels, waves, sediment transport and morphology, water quality and ecology in coastal, estuarine and river environments, and is capable of handling the interactions between these processes. Unlike structured grids used in Delft3D, Delft3D FM applies flexible meshes which can vary in size and shape and can better simulate the complex shoreline features and water bodies.

The FLOW module of Delft3D FM is a multi-dimensional (2D or 3D) hydrodynamic and transport simulation program that calculates non-steady flow and transport phenomena resulting from tidal and meteorological forcings (Deltares, 2023). The WAVE module is used to simulate wave transformation, wave generation by wind, non-linear wave-wave interaction and dissipation for a given bottom topography, wind field, water level and current field in waters of deep, intermediate and finite depth (Deltares, 2023). The standard option within Delft3D FM is the third-generation SWAN wave model (Booij, 1999) (Ris, 1999). The FLOW and WAVE modules are fully coupled for the automatic transfer of relevant data back and forth between them. The MOR module computes sediment transport (both suspended-load and bed-load) and morphological changes for an arbitrary number of cohesive and non-cohesive fractions. Both currents and waves act as driving forces and a wide variety of transport formulae have been incorporated. An essential feature of the MOR module is the dynamic feedback with the FLOW and WAVE modules.

4.2 Model Mesh and Grids

The horizontal projection of the model mesh and grid is the California State Plane, Zone 5, and the vertical datum is the NAVD88.

4.2.1 Flow Model Mesh

In Delft3D FM, the flexible meshes can include orthogonal curvilinear and triangle elements. Figure 4.1 shows the flow model mesh which starts from Big Rock Beach in the west and ends at Gladstones Beach in the east. The model lateral boundaries are set far away from the project area to eliminate potential boundary condition induced effects on model results in the interested area. The model domain is extended 1.4 miles offshore of Topanga Lagoon. The upstream boundary is at the downstream side of the current PCH bridge location. The flexible mesh adjacent to the Topanga Lagoon is presented in Figure 4.2.

Most of the model mesh consists of orthogonal curvilinear elements (rectangle is a special case of curvilinear element), triangle elements are only applied when connecting different resolutions of curvilinear elements. The mesh sizes range from 20m (66ft) offshore and 2.5m (8ft) nearshore.

FIGURE 4.1: MODEL DOMAIN AND FLEXIBLE MESH OF DELFT3D FM FLOW MODEL

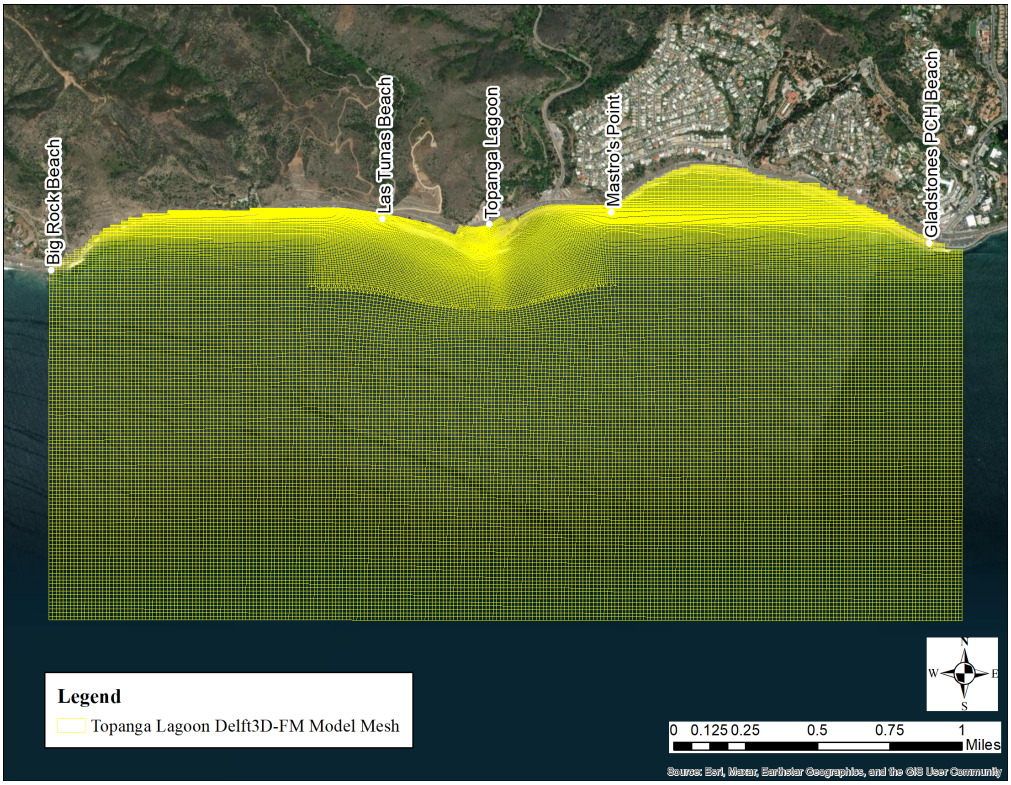
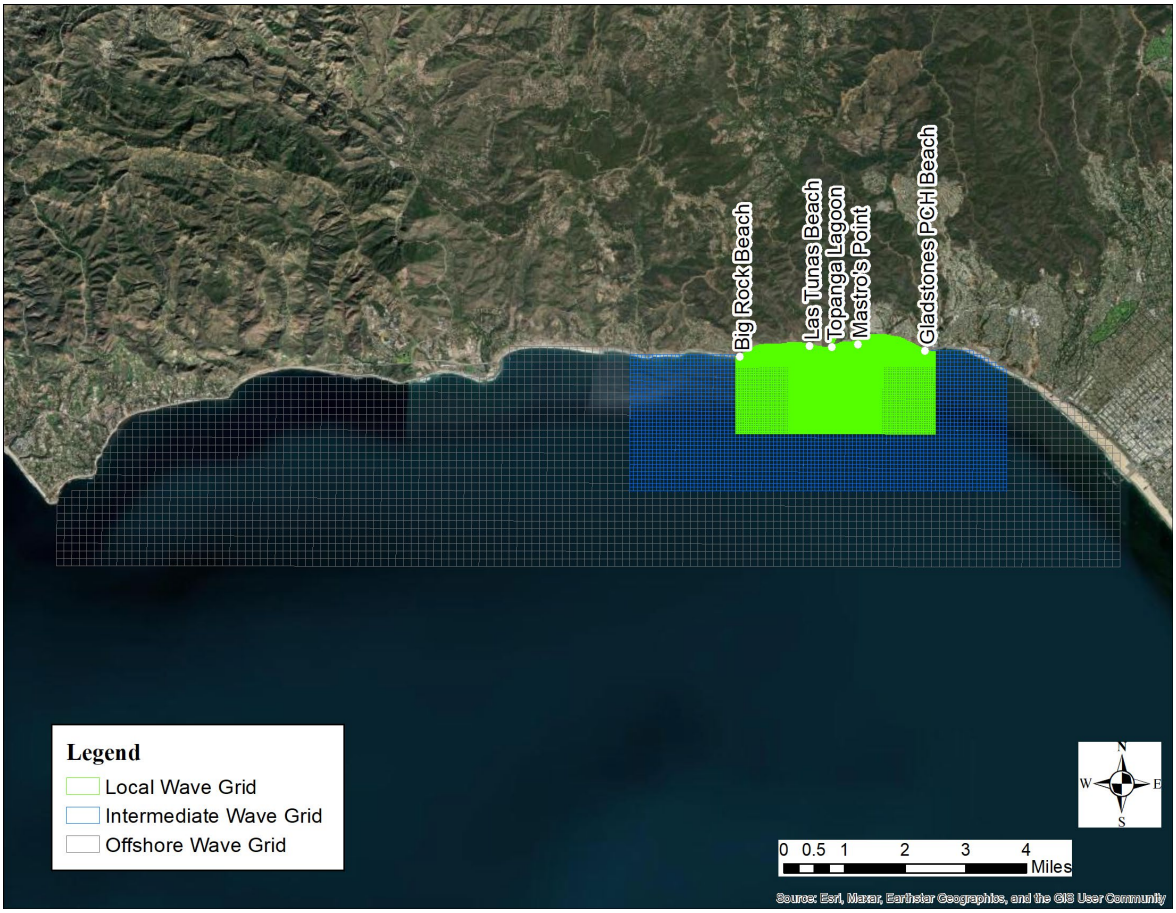


FIGURE 4.2: FLEXIBLE MESH OF ZOOMED IN LAGOON AREA

4.2.2 Wave Model Grids

In the current stage of Delft3D FM development, curvilinear structured grids were still used for the Wave module. Figure 4.3 presents the wave model grids developed for this project. A nested grid approach was selected to save computation time. The offshore wave grid has a resolution of 200m (656ft), covering Santa Monica Bay from Point Dume in the west to Santa Monica in the east with offshore boundary aligned with USACE Wave Information Study (WIS) hindcast wave stations. The local wave grid has an identical extent as the Flow model mesh, with finer resolutions in the middle section of the model domain alongshore wise and nearshore region cross-shore wise. An intermediate wave grid with a resolution of 100m (328ft) was added between the coarse offshore wave grid and the fine local wave grid.

FIGURE 4.3: STRUCTURED MODEL GRIDS OF DELFT3D FM WAVE MODEL



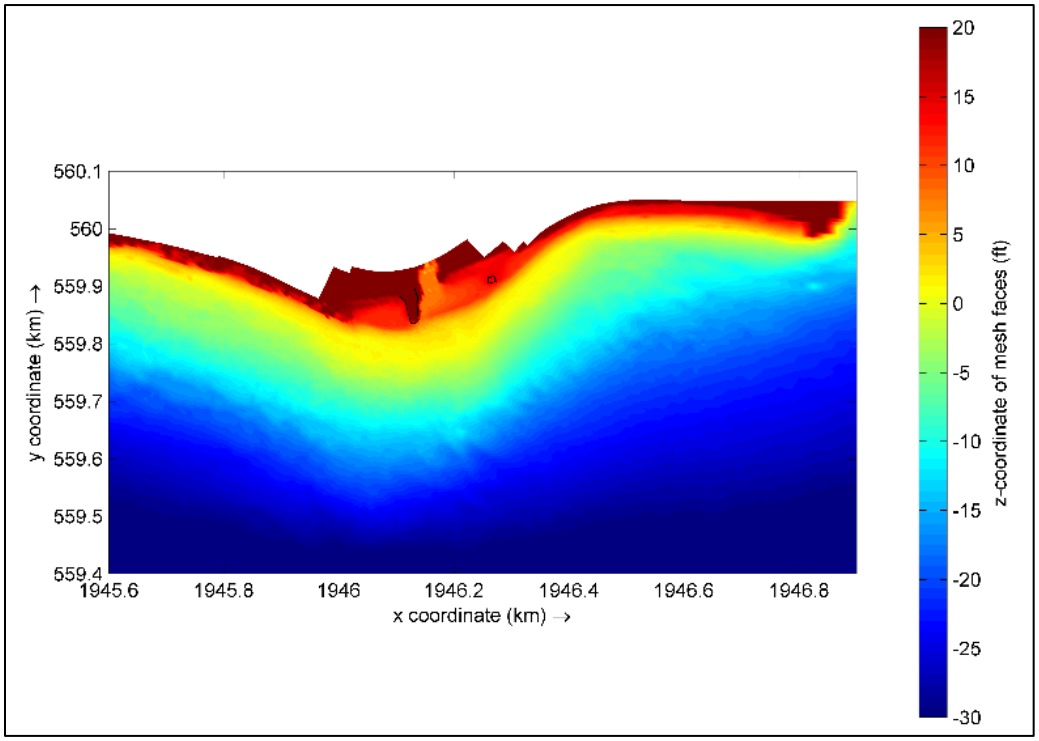
4.3 Model Topography and Bathymetry

Topographic and bathymetric (Topobathy) data from several sources were compiled and processed to cover the entire computational domain. The vertical datum of all datasets was adjusted to NAVD88. The data sources used in the model developments are listed in Table 4.1. The 2009 USACE Topobathy Lidar DEM was used for the morphology model calibration, whereas the 2014 USACE Topobathy Lidar DEM was applied when developing model topobathy for the post-construction condition after the nearshore mound is placed. In the offshore region where the Lidar DEMs were absent, the Santa Monica 1/3 arc-second DEM was used. The model initial topobathy for morphology calibration is presented in Figure 4.4 for the Topanga Lagoon neighborhood. The existing sheet pile groin at the west end of the beach west of the helipad (as shown in Figure 3.5) was included in the model as a “thin dam,” which is a sub-grid feature blocking the flow exchange.

TABLE 4.1: NEARSHORE OCEAN TOPO-BATHY DATA SOURCES

Dataset	Source
2014 USACE NCMP Topobathy Lidar DEM: California	NOAA NCEI
2009 USACE NCMP Topobathy Lidar DEM: California	NOAA NCEI
Santa Monica, California 1/3 arc-second MHW Coastal Digital Elevation Model, 2010	NOAA NCEI

FIGURE 4.4: MODEL TOPOBATHY FOR MORPHOLOGY CALIBRATION



4.4 Boundary Conditions

4.4.1 Water Level

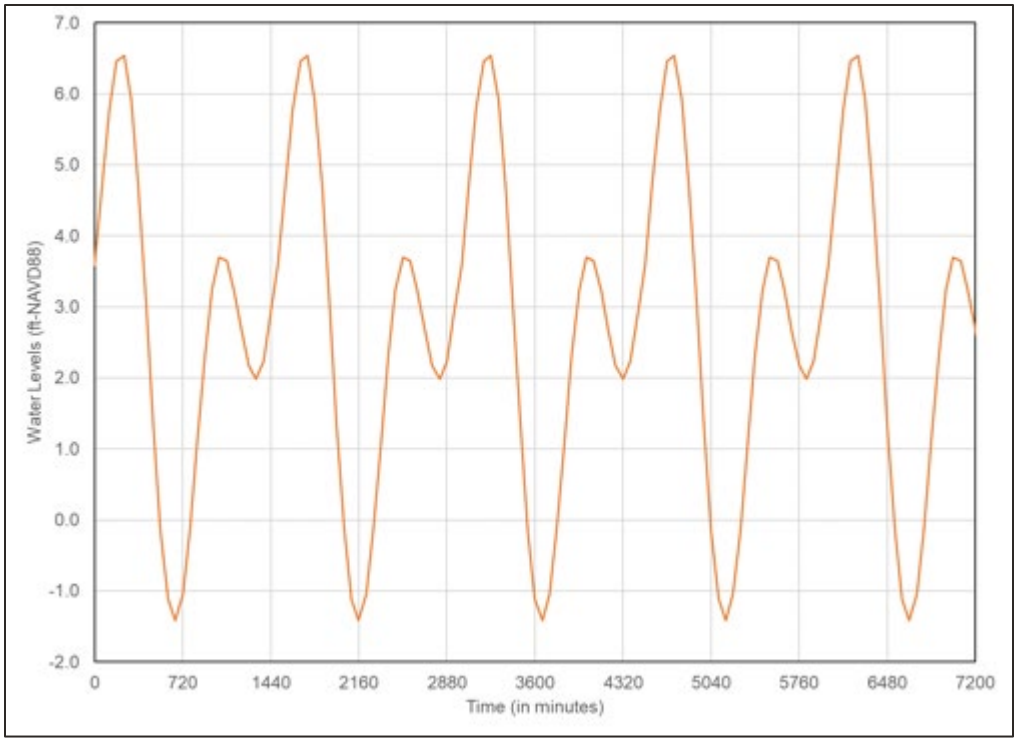
The flow module was forced by the water level time series applied on the offshore boundary on the south. The water level time series was based on the NOAA tide gauge measurements at Santa Monica (Station 9410840). The tide gage location and other measurement and hindcast stations will be discussed in Section 4.7 and in Figure 4.14. The east and west boundaries (cross-shore boundaries) were applied as a Neumann boundary. The Neumann boundary helps to avoid unrealistic high or low velocities on the open boundary. No inflow from Topanga Creek was assumed, since winter storms are very rare events in Southern California and fluvial storms would have negligible impacts to the mound dispersion due to the long distance between the inlet and placement area. For the flow and wave model calibration, the measured water-level time series during the events were applied. During the morphological simulations, a one-day peak spring tidal cycle was selected and repeated, as illustrated in Figure 4.5. This is a conservative approach for morphology modeling because of the largest tidal range captured in this peak spring tidal cycle.

4.4.2 Wind

Time-varying wind from NOAA gauge 941080 Santa Monica was applied in the entire domain during the calibration of flow and wave models. During the morphological simulations, wind-generated currents and wind-wave growth were not considered because of the short distances from both flow and wave boundaries

to the coastline. However, the bottom friction in the wave model was turned off to compensate for the lack of wave growth due to winds.

FIGURE 4.5: TIDAL BOUNDARY CONDITIONS AT OFFSHORE



4.4.3 Waves

The wave model was forced by wave hindcast data from USACE WIS Station 84072 along the offshore wave grid's south boundary. Figure 4.6 is the wave rose of all available 42-year data at WIS station 84072 from 1980 to 2021. Approximately 90% of the offshore waves come from southwest and west directions.

Modeling long-term sediment transport and shoreline morphology in Delft3D FM using a real-time series of waves as input would lead to unsustainably long run times. Instead of running with real-time series, the USACE's WIS data from Station 84072 were analyzed to develop a limited but representative set of wave conditions for wave inputs to the morphological model. The goal is to reduce the wave classes as much as possible without losing much accuracy in the morphological development of these waves compared to the full wave time series.

In this study, the wave class selection for the wave climate schematization with multiple classes was based on the OPTI-method (Mol, 2007). The overall procedure of the OPTI-method is visualized in Figure 4.7. The offshore wave data were divided into 1-m magnitude and 10-degree directional classes, which resulted in 64 totally different combinations of wave height and direction. The mean wave height, mean wave period and mean wave direction were calculated and used as the representative wave condition for each wave class. All the wave classes are listed in Table 4.2.

The OPTI tool can only work with model outputs from Delft3D, not for the new Delft3D FM. Thus, a separate structured curvilinear grid (as shown in Figure 4.8) covering the same domain as the Delft3D FM flexible mesh was developed for this purpose. For each wave class, a coupled flow and wave model run with sediment transport but without morphology updating was conducted for one diurnal tidal cycle in Delft3D. Thus, a total of 64 individual runs were made. The surf zone median sediment grain size of 0.4mm was considered for wave schematization model runs, and plenty of bed sediment was assumed to be available. The "target" dataset used for the OPTI-method was total sediment transport rates at each grid point inside

the nearshore area surrounding Topanga Lagoon as shown in Figure 4.8. After conducting the OPTI analysis, the final selected nine wave classes are listed in Table 4.3. Figure 4.9 presents the offshore boundary wave sequences constructed from these representative waves mimicking seasonal wave variations in a typical year.

FIGURE 4.6: WAVE HEIGHT ROSE AT WIS STATION 84072

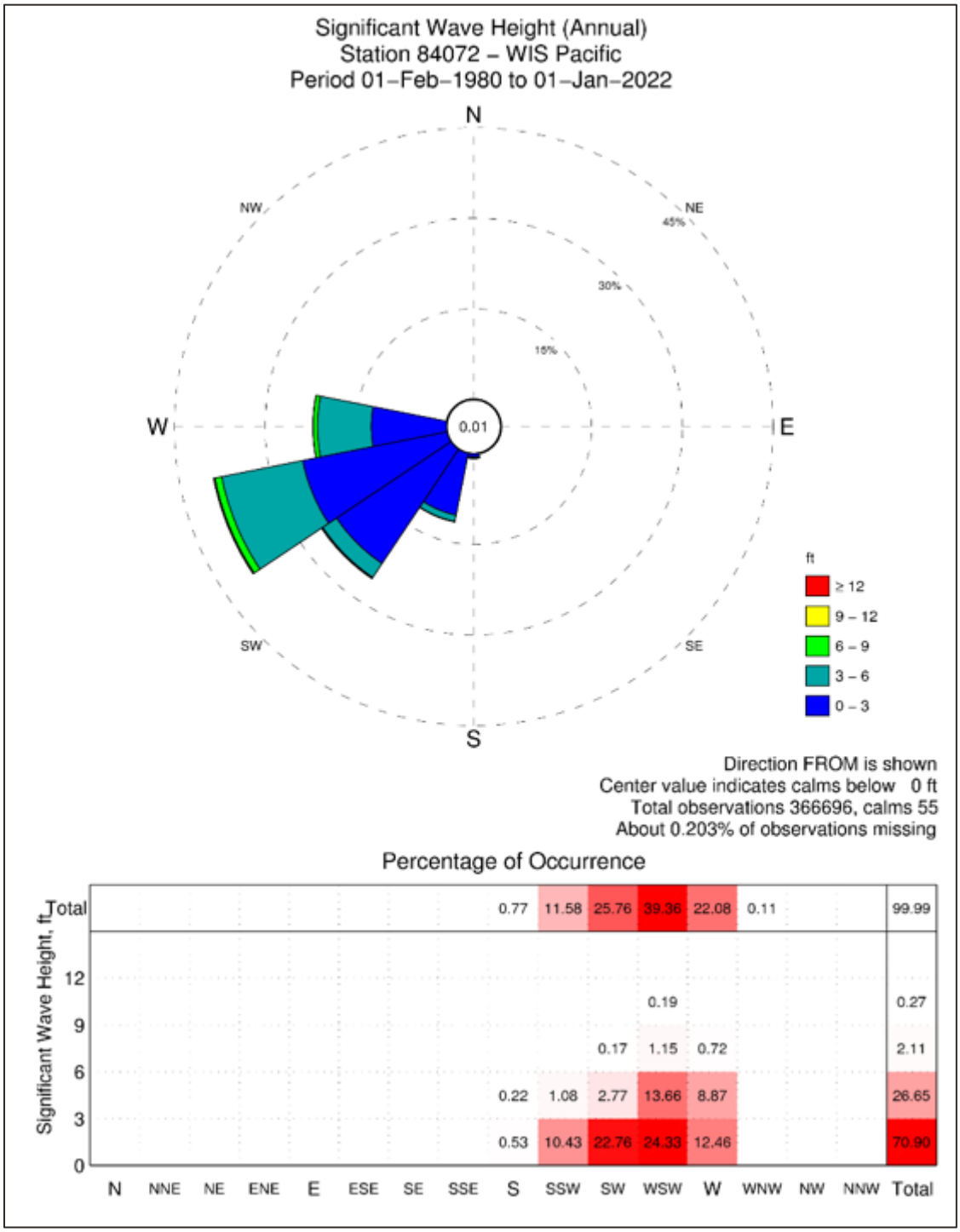


FIGURE 4.7: OVERVIEW OF OPTI-METHOD PROCEDURE MODIFIED FROM VAN RIJN (2012)

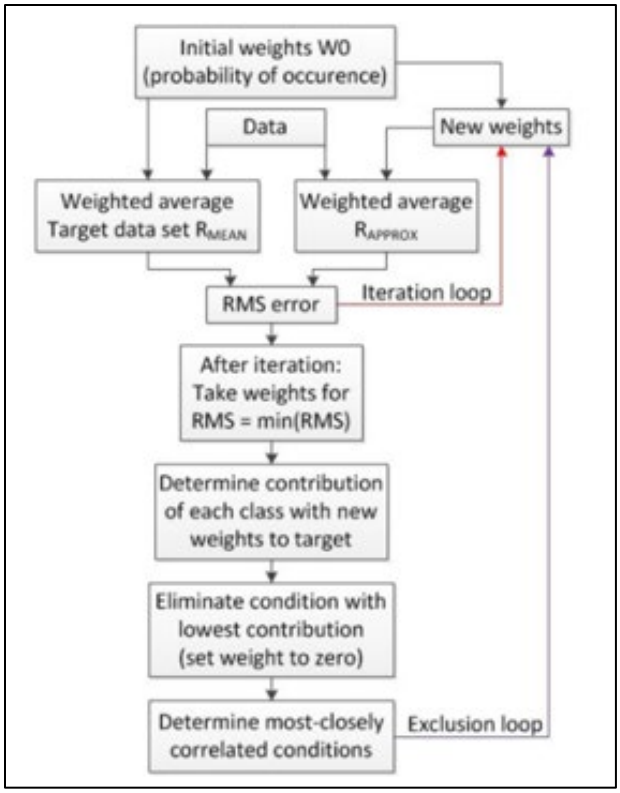


FIGURE 4.8: DELFT3D GRID AND TARGET AREA FOR WAVE SCHEMATIZATION

TABLE 4.2: FULL WAVE CLIMATE CLASSES AT MODEL OFFSHORE BOUNDARY

No. wave class	Significant wave height (ft)	Peak wave period (s)	Mean wave direction (°N)	Joint Probability of Occurrence (%)
1	2.3	14.2	91.1	0.01369
2	2.1	12.5	100.3	0.01369
3	2.1	13.7	111.1	0.01369
4	2.1	14.0	121.0	0.01173
5	2.1	13.5	129.4	0.01062
6	2.1	12.5	139.9	0.00671
7	4.5	6.5	141.9	0.00307
8	6.8	6.3	143.2	0.00084
9	2.0	11.8	150.1	0.01090
10	4.9	6.5	152.8	0.00419
11	7.4	6.7	150.4	0.00056
12	2.1	11.8	160.0	0.01118
13	4.7	6.6	160.8	0.00950
14	8.2	6.9	161.0	0.00028
15	2.4	10.5	171.6	0.03073
16	4.4	8.2	170.6	0.02067
17	7.0	7.4	173.1	0.00447
18	2.5	11.1	180.8	0.14276
19	4.3	8.7	180.1	0.04889
20	7.2	7.3	178.3	0.00643
21	2.4	13.1	191.4	0.75321
22	4.0	11.5	190.3	0.10421
23	7.3	7.5	190.7	0.00866
24	10.1	10.7	190.5	0.00028
25	2.1	14.1	201.1	3.84707
26	3.8	13.4	199.9	0.21289
27	7.8	8.7	199.7	0.02151
28	11.8	9.6	200.8	0.00335
29	2.0	14.6	210.4	7.81315
30	3.9	13.6	210.4	0.31095
31	7.8	9.1	210.8	0.02235
32	11.1	9.7	210.9	0.00335
33	14.2	11.0	209.1	0.00112
34	2.0	14.6	220.1	10.21806
35	4.0	13.1	220.4	0.50763
36	7.9	9.8	220.1	0.05448
37	10.9	11.7	220.6	0.01146
38	14.2	11.2	221.5	0.00196
39	2.1	14.5	230.0	11.14225

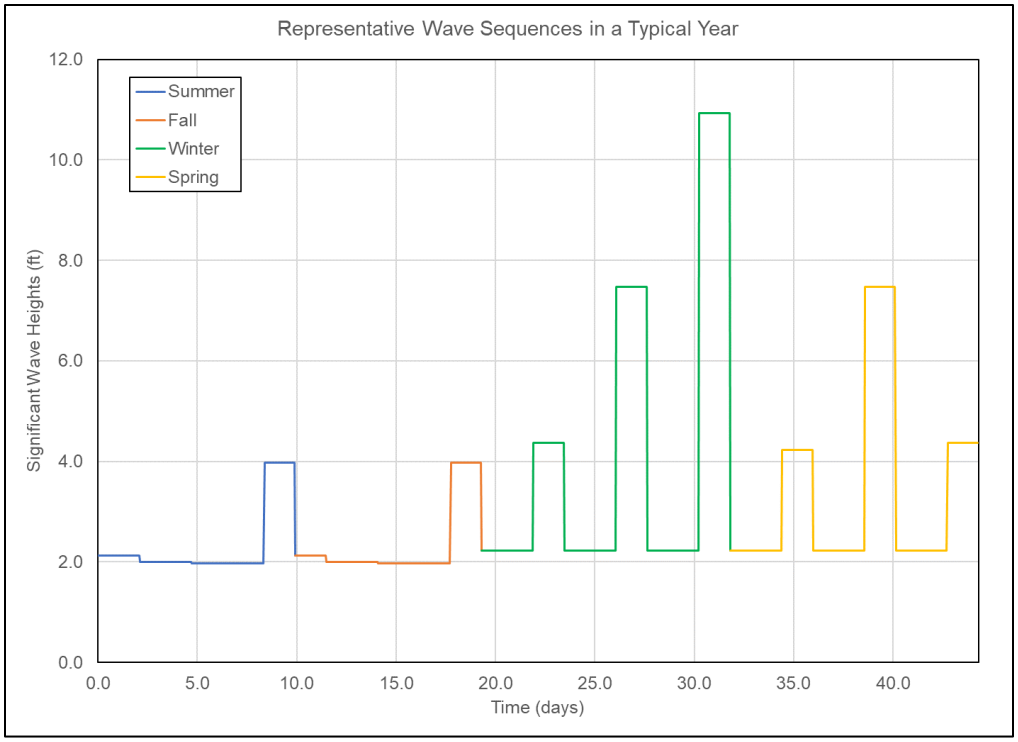
No. wave class	Significant wave height (ft)	Peak wave period (s)	Mean wave direction (°N)	Joint Probability of Occurrence (%)
40	4.0	13.6	230.7	0.88452
41	7.9	10.6	230.4	0.06593
42	10.8	12.2	230.7	0.01341
43	14.1	15.6	231.7	0.00810
44	2.2	13.9	240.0	12.00805
45	4.0	12.1	240.8	2.53314
46	8.0	11.3	240.7	0.15031
47	10.9	13.4	240.8	0.04330
48	14.1	14.1	240.1	0.01118
49	2.2	13.4	250.0	12.50618
50	4.2	11.1	250.6	5.93264
51	7.7	12.5	250.9	0.43835
52	11.0	13.8	248.8	0.05420
53	14.1	16.1	246.8	0.00782
54	18.0	14.7	249.7	0.00112
55	2.3	13.2	259.8	10.65668
56	4.4	10.8	259.9	7.20410
57	7.5	10.3	259.3	0.59760
58	10.6	11.7	258.9	0.03213
59	14.8	16.0	261.2	0.00084
60	18.3	16.6	260.4	0.00251
61	19.7	17.1	258.5	0.00056
62	2.3	12.8	269.3	7.28820
63	4.1	12.2	268.1	3.08687
64	7.4	8.9	268.1	0.08689

TABLE 4.3: WAVE SCHEMATIZATION RESULTS FROM OPTI-METHOD AND MORFAC

Significant wave height (ft)	Peak wave period (s)	Mean wave direction (°N)	OPTI calculated weight (%)	Morfac
2.1	14.1	201.1	5.96	10.4
2.0	14.6	210.4	14.58	12.8
2.0	14.6	220.1	21.76	12.7
4.0	13.6	230.7	3.09	5.4
2.2	13.4	250.0	42.59	12.4
4.2	11.1	250.6	1.41	4.9
11.0	13.6	244.8	0.35	1.2
4.4	10.8	259.9	3.01	5.3
7.5	10.3	259.3	3.55	8.3

Morfac: Morphological Time Scale Factor

FIGURE 4.9: REPRESENTATIVE WAVE BOUNDARY CONDITIONS IN A TYPICAL YEAR AT OFFSHORE



4.4.4 Morphological Time Scale Factor

Morphological developments occur on a time scale several times longer than typical flow changes. For example, tidal flows change significantly in hours, whereas it may take weeks, months, or years for significant morphological changes in a coastline. Simulating long-term morphological changes in real time is not practical from a computational point of view. To address this problem, Delft3D FM adopted a technique called “morphological time scale factor” (morfac), whereby the speed of the changes in the morphology is scaled up to a rate that begins to have a significant impact on the hydrodynamic flows (Deltares, 2023). The implementation of the morfac is achieved by simply multiplying the erosion and deposition fluxes to and from the bed by the morfac at each computational time step. This allows accelerated bed-level changes to be incorporated dynamically into the morphological calculations.

For this study, the time-varying morfac method was used. For each representative wave condition, the morfac applied depended on the percentage occurrence of that particular wave condition. The morfac applied to each wave condition is indicated in Table 4.3.

4.5 Model Scenarios and Parameters

4.5.1 Model Scenarios

All modeled mounds are located within the nearshore placement boundary (per discussions and feedback from agencies on the 9/7/2023 meeting) and sized towards the targeted 256,000 cy sediments. The original mound simulated is located between -15ft to -25ft NAVD88 elevation with a uniform mound height of 9.2-ft (illustrated in Figure 4.10). After sharing the modeled results with RCDSMM and other agencies, revised mounds located further offshore centered around -20ft NAVD88 elevation were recommended to avoid impacts on sensitive marine habitats. Figure 4.11 and Figure 4.12 illustrate the modeled bathymetries including the mound for the following four revised sites.

- West site A: a constant 8.1-ft depth placement, 10H:1V spreading side slope.
- West site B: fill up to -13.5ft NAVD88, 30H:1V side slope.
- East site A: a constant 5.8-ft depth placement, 10H:1V side slope.

- East site B: fill up to -15ft NAVD88, 30H:1V side slope.

Each of the four revised mounds was modeled for 1-year and 5-year post-construction to simulate long-term morphology impacts due to the placement of the mound. Besides that, the January 1988 storm event with a 100-year return period was selected to evaluate the morphologic impacts if a 100-year storm event were to occur after the construction.

Modeling assuming the entire mound to be placed all at once is conservative, since the material will be placed at the site over five months (assuming a rate of 2,500 cy per day) rather than in one big instantaneous plunk. Fine and medium sediments will start to disperse during the construction period, and organisms will have time to react, adapt and migrate.

TABLE 4.4: MODEL SCENARIOS FOR NEARSHORE SEDIMENT DISPERSAL ANALYSIS

Parameters	Modeled Scenarios
Mound Location	• Original Site (-15ft to -25ft NAVD88) • Revised West Site (-20ft to -30ft NAVD88) • Revised East Site (-20ft to -30ft NAVD88)
Mound Template	• Uniform Mound Height, 10H:1V Side Slope • Fixed Mound Top Elevation, 30H:1V Side Slope
Coastal Hydrodynamic Condition	• 1-year Post-Construction, Typical Annual Waves • 5-year Post-Construction, Typical Annual Waves • Post-Construction, Storm Event

FIGURE 4.10: MODELED BATHYMETRY AT THE ORIGINAL SITE WITH UNIFORM MOUND HEIGHT

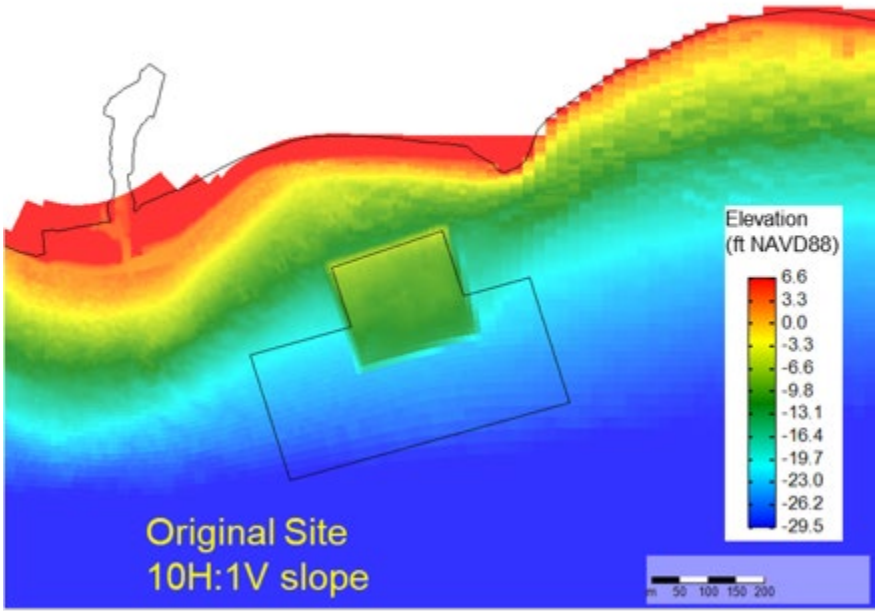
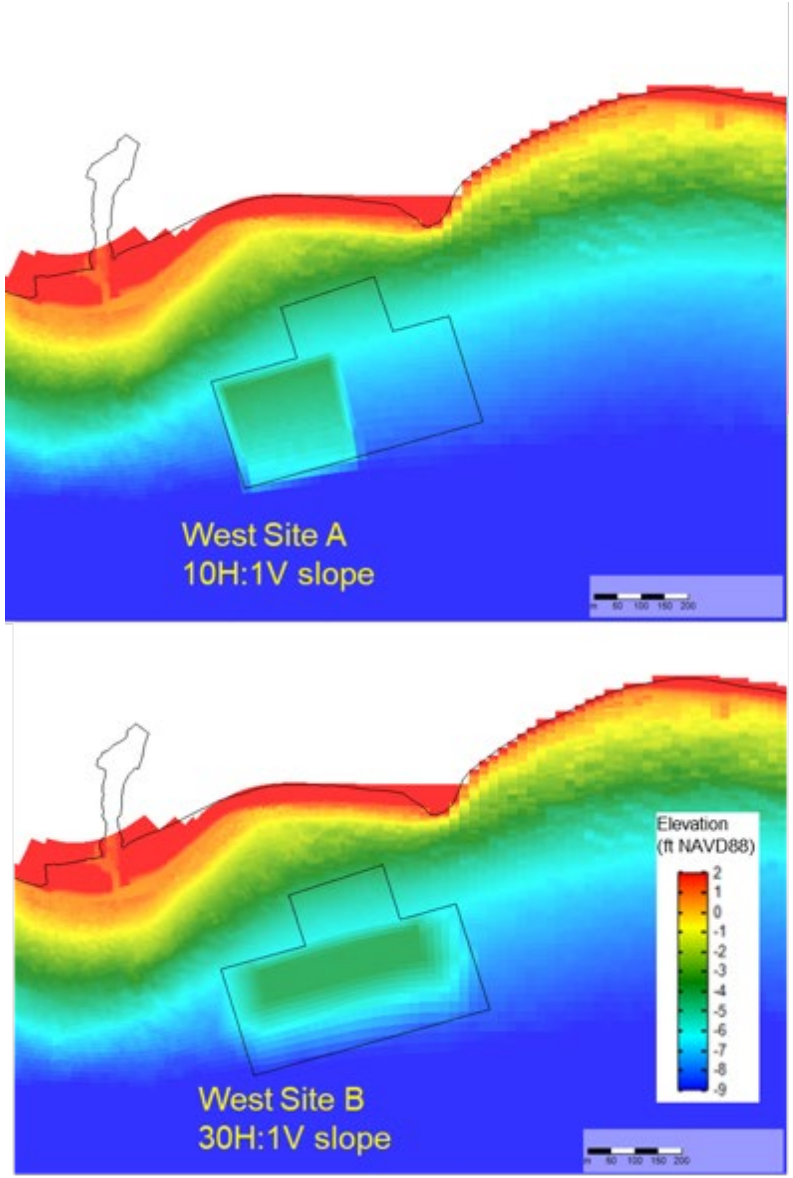


FIGURE 4.11: MODELED BATHYMETRY AT THE REVISED WEST SITES AND MOUND CROSS SECTIONS



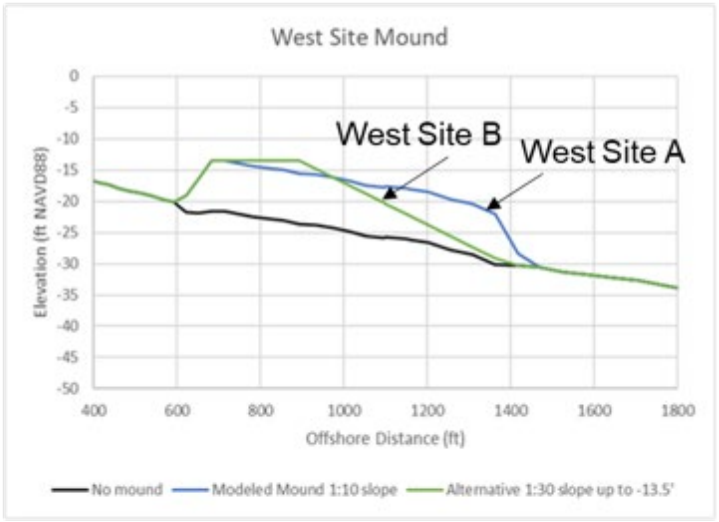
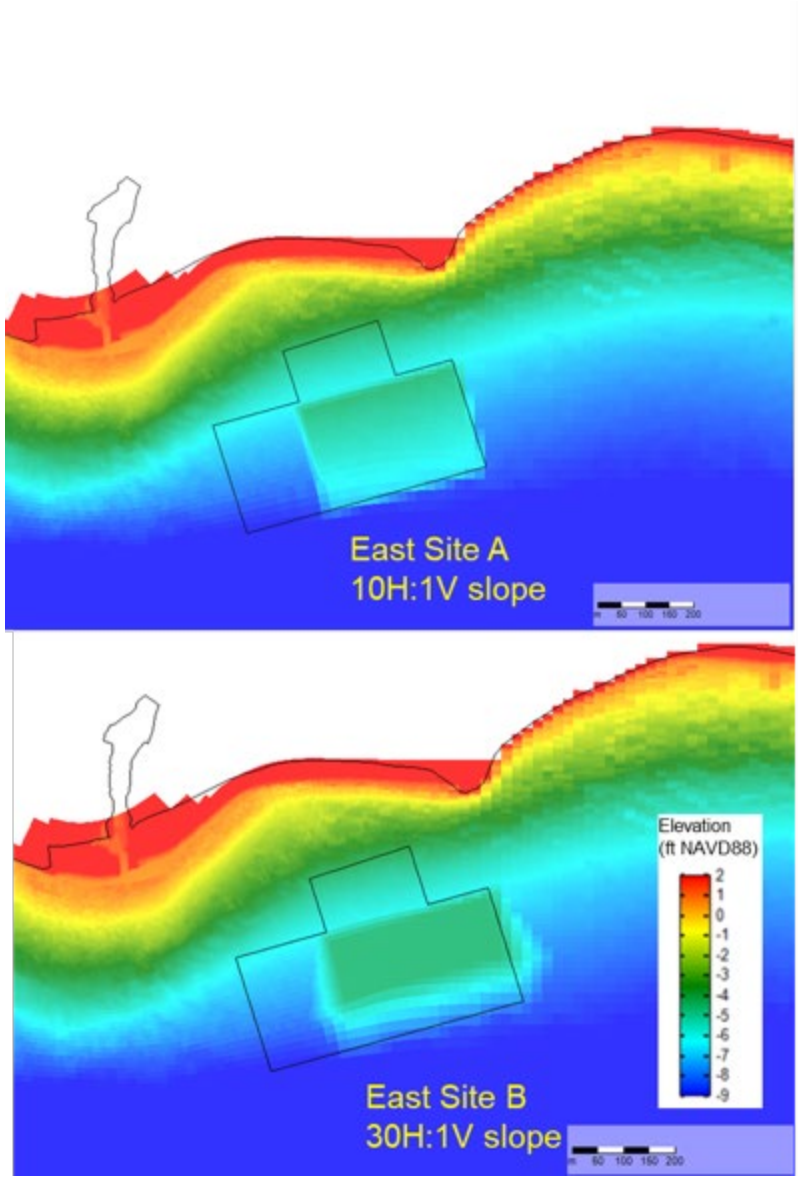
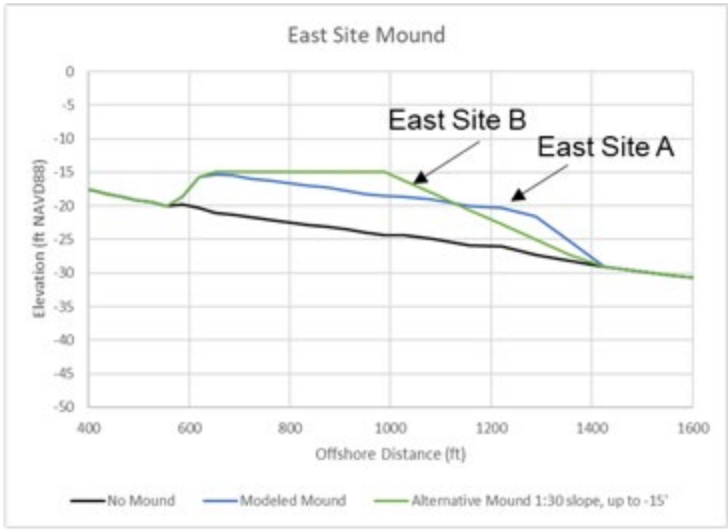


FIGURE 4.12: MODELED BATHYMETRY AT THE REVISED EAST SITES AND MOUND CROSS SECTIONS





4.5.2 Model Parameters

As a flow and wave coupled model, the wind, water level and velocity from the smallest nested domain (local wave domain) interact with the flow model during the simulation. Table 4.5 lists the key parameters used in the flow and wave model. Values of model parameters not iteratively adjusted/calibrated during the calibration process were determined from the published literature and/or recommendations of Delft3D model developers.

TABLE 4.5: MODEL PARAMETERS OF FLOW AND WAVE COUPLED MODEL

Flow Model Parameter	**Value**
Manning Bottom Friction Coefficient	0.02 s/m1/3
Water Density	1025 kg/m3
Horizontal Eddy Viscosity	1 m2/s
Horizontal Eddy Diffusivity	1 m2/s
Wind Drag Coefficient	0.001255 (wind speed<7m/s); 0.002425 (wind speed>25m/s); linear variation between the two wind speeds
Wave Model Parameters	**Value**
Wave Spectral Discretization	24 direction bins, 24 frequency bins, from 0.03 to 1Hz
Bed Friction	JONSWAP (1973), bed friction coefficient = 0.067 m^2/s^3
Depth-induced Breaking	Battjes and Janssen (1978), breaker parameters Alpha = 0.05, Gamma = 0.73
White Capping	Komen et al. (1984)

The sediment transport formula of van Rijn 2007 for the non-cohesive sediments was used for this study. Similar to model parameters in flow and wave model, the morphological model parameters were determined either through the model calibration process or values recommended by the model developer. The primary sediment transport parameters adjusted in the calibration of the morphology model were:

- Sus – Multiplication factor for suspended sediment reference concentration
- Bed – Multiplication factor for bed-load transport vector magnitude
- SusW – Wave-related suspended sediment transport factor
- BedW – Wave-related bed-load sediment transport factor

Sus and Bed are parameters related to current-induced sediment transport. The sediment transport magnitudes increase when Sus and Bed become larger. SusW and BedW are related to waves and were recommended to be close to zero for the Delft3D application by Deltares. Table 4.6 lists the parameters associated with the morphological model.

TABLE 4.6: MORPHOLOGICAL MODEL PARAMETERS IN DELFT3D FM

Parameter	**Value [unit]**	**Description**
MorFac	variable	Morphological scale factor
Thresh	0.05 [m]	Threshold sediment thickness for transport and erosion reduction
SedThr	0.1 [m]	Minimum water depth for sediment calculations
MorUpd	TRUE	Update bathymetry during FLOW simulation
DensIn	FALSE	Include effect of sediment concentration on fluid density
ISlope	2	Bed slope formulation (2 - Bagnold formulation)
AlfaBs	1.0	Longitudinal bed gradient factor for bedload transport
AlfaBn	1.5	Transverse bed gradient factor for bed load transport
IHidExp	2	Hiding and exposure formulation number (2 - Egiazaroff formulation)
Sus	1.0	Multiplication factor for suspended sediment reference concentration
Bed	1.0	Multiplication factor for bed-load transport vector magnitude

Parameter	Value [unit]	Description
SusW	0.1	Wave-related suspended sed. transport factor
BedW	0.0	Wave-related bed-load sed. transport factor
SedThr	0.1 [m]	Minimum water depth for sediment computations
ThetSD	0.5	Global / maximum dry cell erosion factor
HMaxTH	0.05 [m]	Max depth for variable THETSD. Set < SEDTHR to use global value only

4.6 Initial Sediment Distribution and Thickness

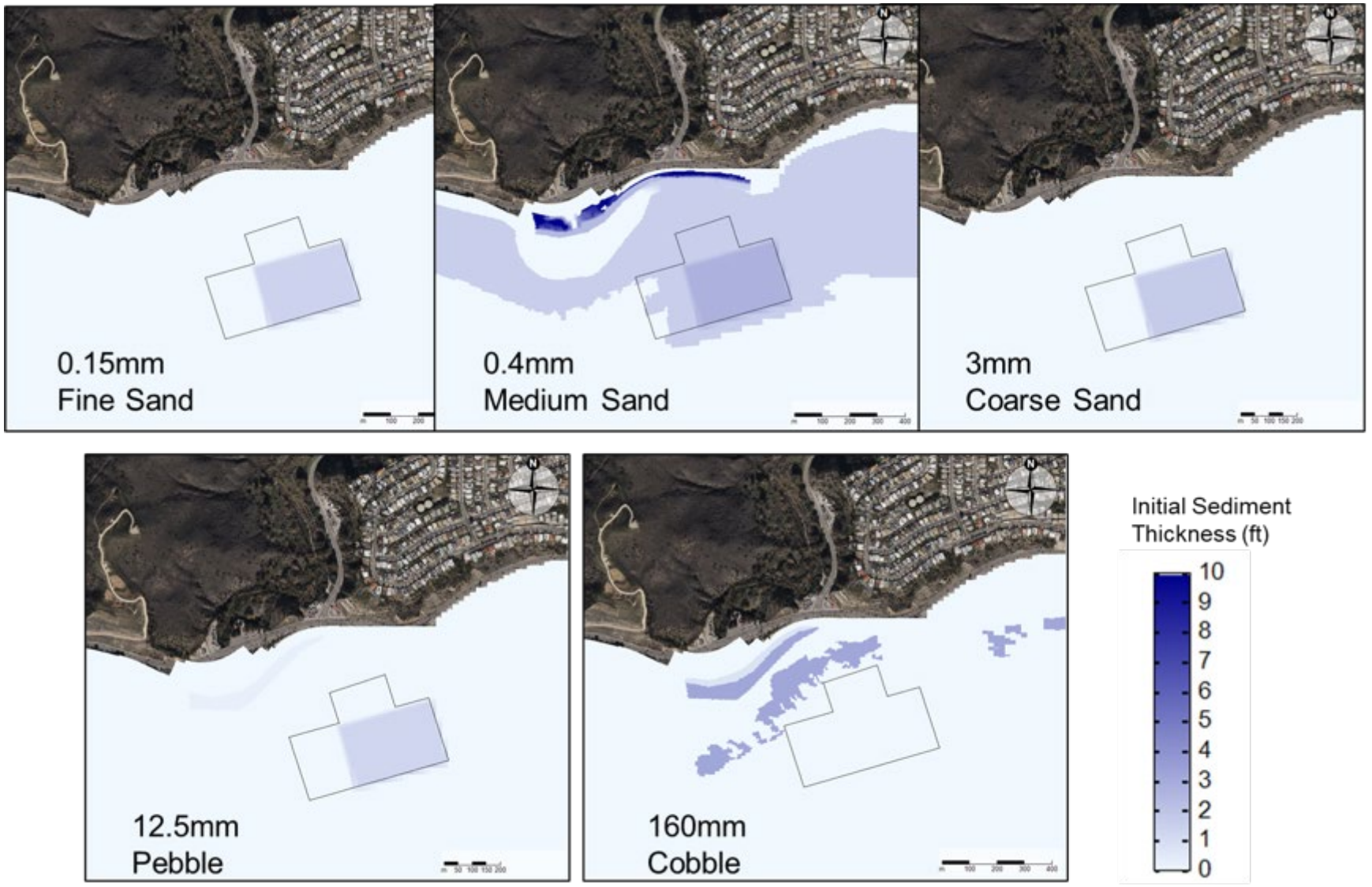
The coast of the study area is mostly sand-limited narrow to non-existent pocket sandy beaches littered with boulders, cobbles, and other debris except a wider beach at the Topanga Canyon Creek mouth, based on conversations with staff of Coastal Resources Management, Inc who performed nearshore habitat surveys. Three sediment classes modeled for the existing seabed sediments as the model initial condition are sand (0.4mm), pebble (12.5mm), and cobble (160mm). These sediment sizes were determined based on nearshore surface grabbed samples along two transects as shown in Figure 2.2. The four sediment classes selected based on the boreholes in the lagoon excavation area to represent the placement materials are: fine sand (0.15mm), medium sand (0.4mm), coarse sand (3mm) and pebble (12.5mm). Therefore, five sediment classes were considered in the modeling of the nearshore mound dispersal by combing the sediment classes together.

Detailed information on the sediment size distributions and their thicknesses on the seabed in the model domain is unavailable. They were developed based on the following available data and engineering judgments:

- Sediment distributions from boreholes within the proposed excavation area as presented in Section 2.2 (for sediment distribution at the mound).
- Sediment distributions from nearshore surface grabbed samples as presented in Section 2.2 (for existing sediment on beach and seafloor).
- Topanga State Park biological habitat surveys by CRM (Coastal Resources Management, Inc., 2022). Note that the initial sediment thickness maps were developed based on earlier preliminary maps sent by CRM before the CRM 2023 report was released to M&N, so there are slight differences in the seafloor characterizations. In fact, CRM observed up to 1 ft sand level changes in some area.

Outside the CRM study area, only sediment with a grain size of 0.4mm was assumed to be available in a limited nearshore area based on aerial photos in Google Earth. Otherwise, a non-erodible hard bottom was assumed. The initial thickness of the existing sediments was validated through the model calibration process with several trial-and-error iterations. The sediment thickness of the mound after construction was added to the existing sediment distribution for each modeled grain size. For example, Figure 4.13 depicts the initial sediment distributions of the revised east site with a constant mound height of 5.8ft. The figure includes the thickness maps of the five modeled sediment classes.

FIGURE 4.13: INITIAL SEDIMENT THICKNESS MAP – REVISED EAST SITE WITH UNIFORM MOUND HEIGHT



4.7 Model Calibration

4.7.1 Flow and Wave Model Calibration

This section describes the calibration of the Delft3D FM flow and wave coupled model. Two historical storm events were selected for the calibration. The calibration event needs to be within the period when the available measurements at NDBC buoy for calibration overlap with USACE's WIS hindcast waves to force the model. The overlapped period covers 2020 and 2021 winter storms; thus two representative storm events were selected as listed below:

- Event 1: December 28, 2020 to December 30, 2020
- Event 2: December 14, 2021 to December 16, 2021

The water level, currents, and wave measurements and hindcast data used in the calibration are summarized in Table 4.7. Figure 4.14 illustrates the location of these data.

TABLE 4.7: DATA USED IN FLOW AND WAVE MODEL CALIBRATION

Station Name	Location	Data Period	Data Type	Purpose
NOAA Station 9410840 Santa Monica	118°30' W 34°0.5' N	04/2009 to current	Wind and water level measurements	Boundary Condition
USACE WIS Station 84072	118°36.6' W 33°59.4' N	02/1980 to 12/2021	Wave hindcast data	Boundary Condition
NDBC Station 46268 Topanga Nearshore	118°34.7' W 34°1.3' N	08/2020 to current	Wave and ocean current measurements	Calibration
CDIP MOP Site L0808 Topanga at 10m depth	118°34.77' W 34°2.01' N	01/2000 to current	Wave hindcast data	Calibration

FIGURE 4.14: MAP OF DATA LOCATIONS USED IN FLOW AND WAVE MODEL CALIBRATION

4.7.1.1 Hydrodynamic Calibration Results

As listed in Table 4.7, the measured currents at NDBC Buoy 46268 were used to calibrate the flow model. Figure 4.15 presents the comparisons of current speeds and directions at the NDBC Buoy 46268 for the two selected events. Measured currents are shown in black dots and the modeled currents from Delft3D FM model are in red dots. The wave events were generally captured by the model well. The quality of model prediction highly depends on available data and in this case, only one measurement station was available. The model boundary was forced by USACE's model predictions, and this is a common practice when there is no other data available.

- Event 1: December 28, 2020 to December 30, 2020

The modeled currents capture the first peak flow just past December 29, 2020 12 AM, with the current direction towards the east. The second peak flow in the afternoon of December 29, 2020, was under-predicted by 0.2ft/s. This could be due to the limitation of wind data. Local wind variations or gusts at the NDBC gauge may be different than those measured winds at Santa Monica's NOAA station. However, the small difference caused by localized wind impacts should not impact the model prediction of sediment dispersal. Overall, the modeled currents matched well with the measurements. The current speed does not exceed 0.5ft/s during Event 1, mostly from west to east.

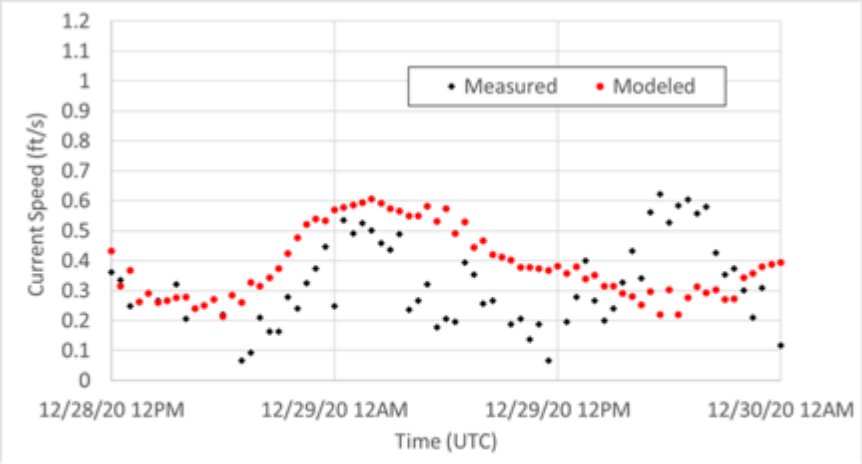
- Event 2: December 14, 2021 to December 16, 2021

The modeled current speed generally follows the trend of measured data. The peak current that occurred on December 14, 2021, 2 PM is 0.3ft/s lower than the modeled current. The modeled current direction matches the measurements for the first half of the event, but it rotates more from the south and east, while the measurements are mostly from west. The discrepancies in currents are likely because the uniformly applied wind field in the model domain may not represent the localized wind variations and conditions.

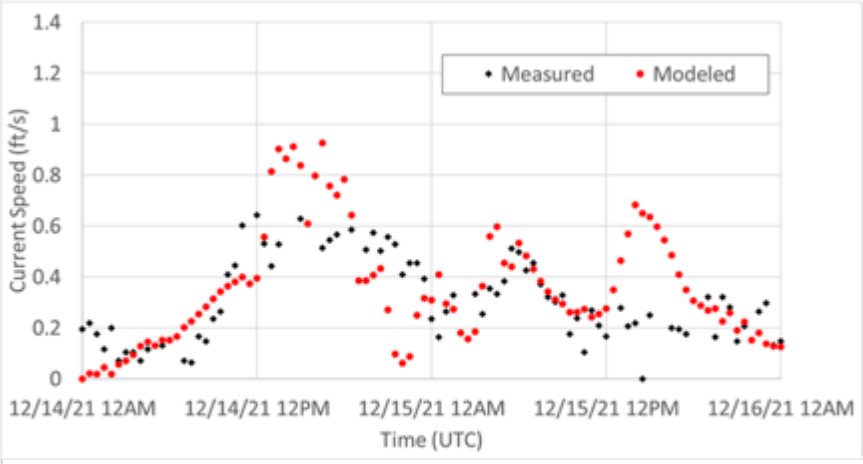
Overall, the current speed at NDBC 46268 does not exceed 1ft/s during storm events. And the Delft3D FM flow model produces reasonable currents at NDBC 46268. During the time of model calibration, there are no nearshore current measurements available that are close to the project site.

In terms of calibration, it is easier to match waves than currents. Measuring currents is much more difficult and costly than measuring waves since currents change vertically. Also, currents are impacted by more factors such as tide, wind and wave and boat wakes, etc. It's very challenging to acquire quality current data for model calibration.

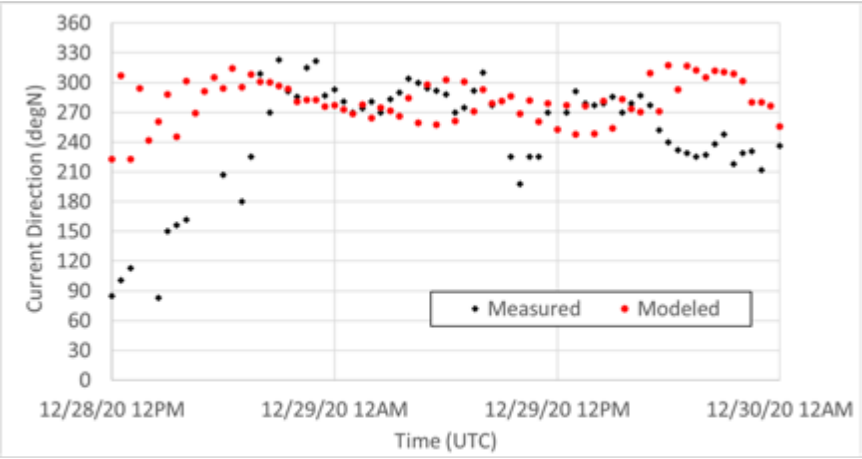
FIGURE 4.15: COMPARISON OF MODELED AND MEASURED CURRENTS AT NDBC46268



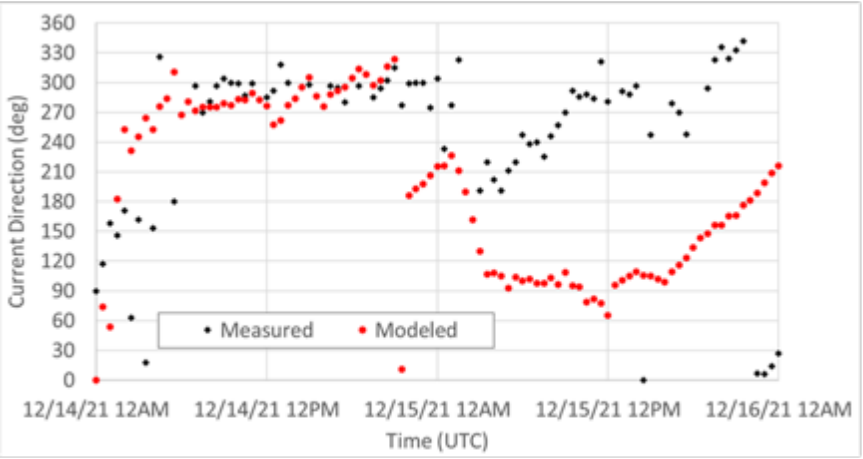
Event 1 – Current Speed at NDBC 46286



Event 2 – Current Speed at NDBC 46286



Event 1 – Current Direction at NDBC 46286



Event 2 – Current Direction at NDBC 46286

4.7.1.2 Wave Calibration Results

The modeled wave conditions during the two selected storm events are compared at two locations: NDBC Buoy 46268 and CDIP's MOP hindcast wave output station L0808. The NDBC buoy is at a water depth of 67ft, and the MOP station is at a depth of 33ft.

- Event 1: December 28, 2020 to December 30, 2020

Figure 4.16 plots comparisons of significant wave height, peak wave period and mean wave direction at NDBC 46268 during Event 1. The Delft3D FM model captures the wave height increase and decrease during the event with slight underestimate of the peak, by 0.5ft lower than the measurements. The modeled wave periods and directions matched very well with those measured at NDBC 46268.

Figure 4.17 presents comparisons of wave parameters predicted by Delft3D model with those hindcasted by CDIP at MOP L0808. Note this is a comparison between two models, CDIP model and Delft3D model for the project. The Delft3D modeled significant wave height at MOP L0808 overall matches well with the hindcast data. The Delft3D model predicted slightly lower peaks in significant wave height. This is likely due to the discrepancy between buoy measurements used to force the CDIP model and the hindcast WIS database used to force the Delft3D model during the event. The wave period and directions at MOP L0808 show less variation than Delft3D FM results. Delft3D model predicted wave periods are closer to the measurements than CDIP hindcast at MOP L0808 as shown in Figure 4.17. This could be due to the coarser resolution of the CDIP model, as its model domain covers the entire state of California.

FIGURE 4.16: EVENT 1 - COMPARISON OF MODELED WAVE CONDITIONS AT NDBC46268

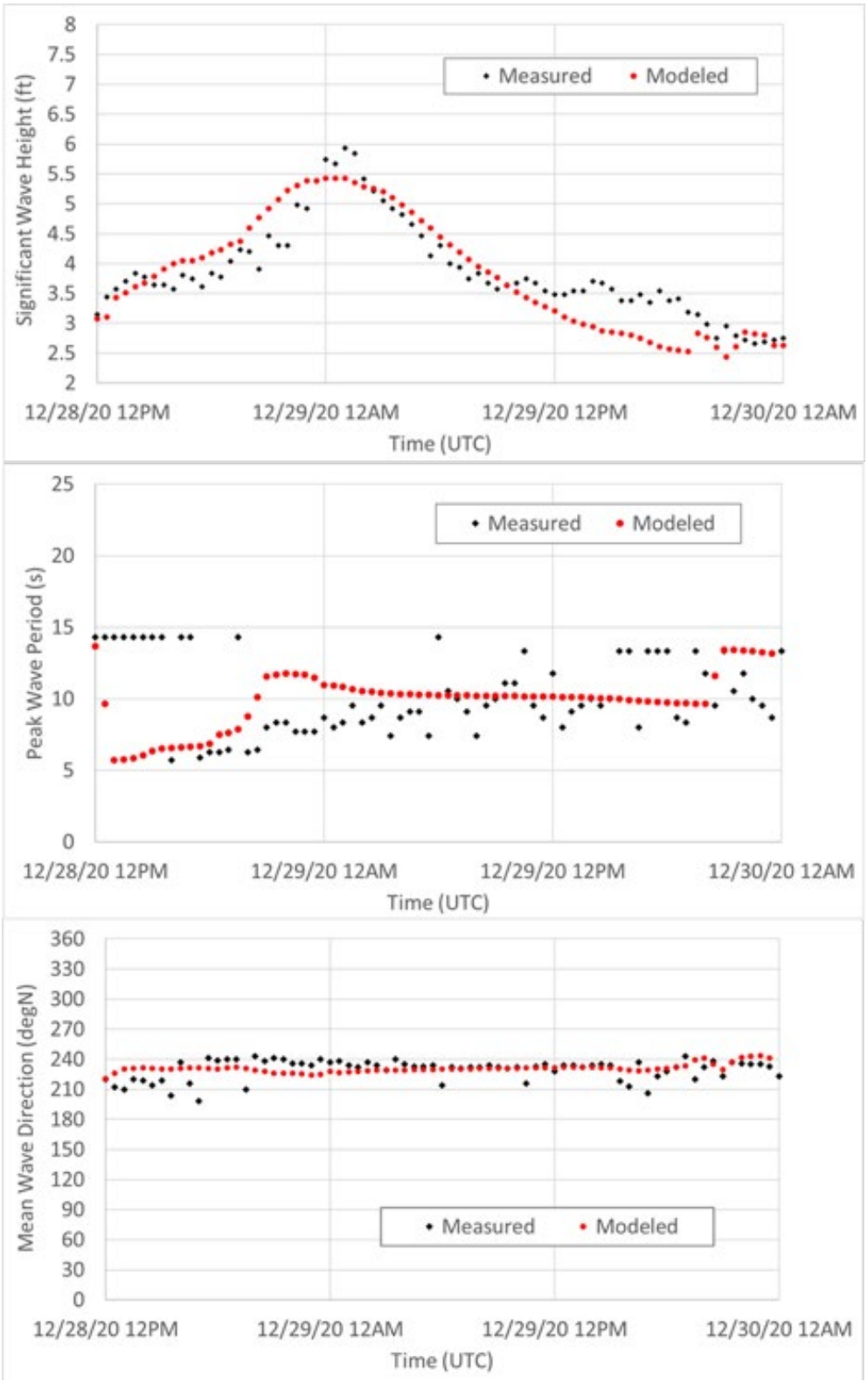
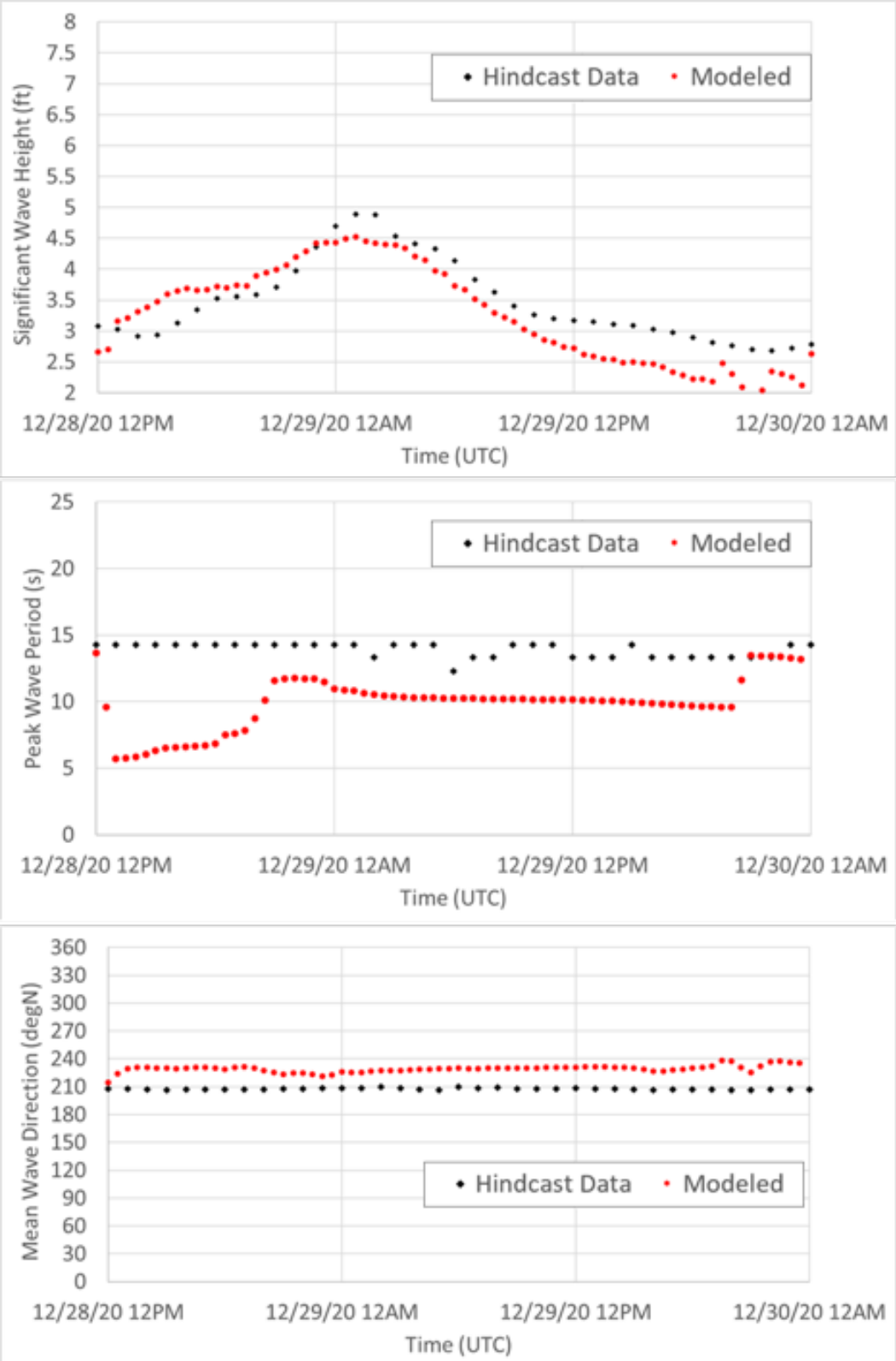


FIGURE 4.17: EVENT 1 - COMPARISON OF MODELED AND CDIP HINDCAST SIGNIFICANT WAVE HEIGHT AT MOP L0808

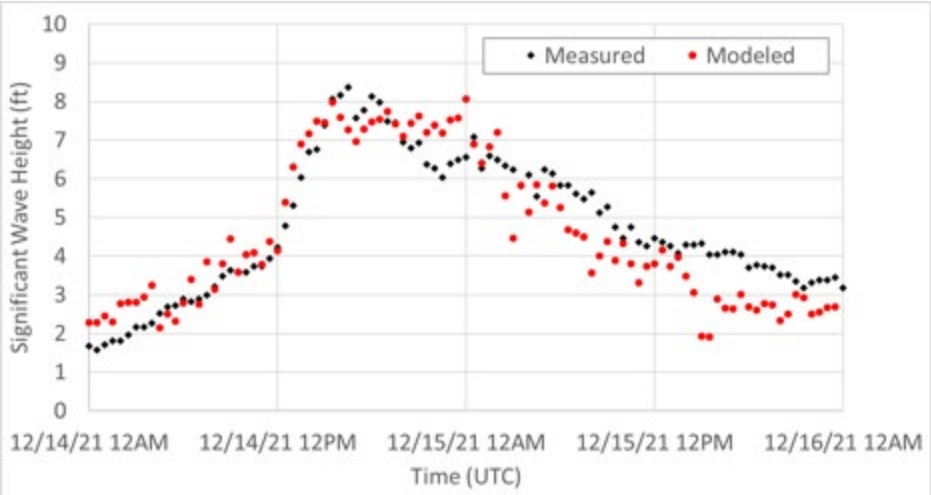


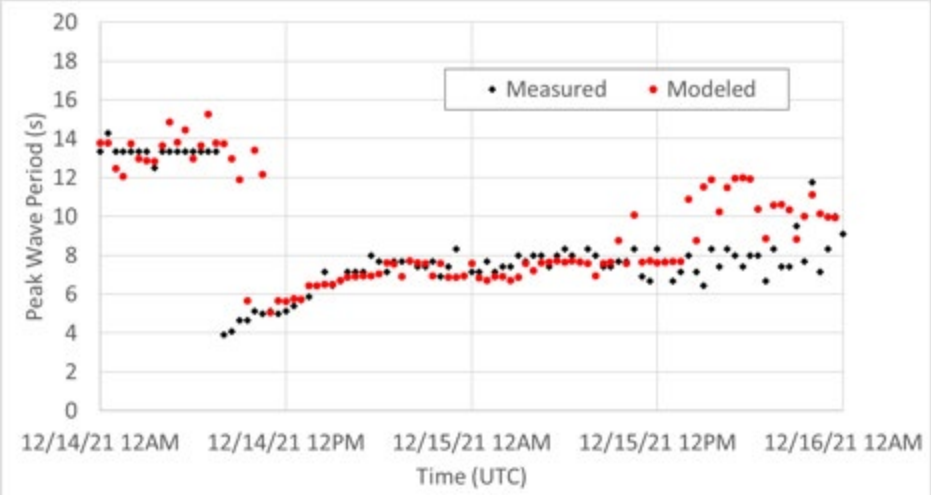
- Event 2: December 14, 2021 to December 16, 2021

Figure 4.18 presents comparisons of significant wave height, peak wave period and mean wave direction at NDBC 46268 during Event 2. Figure 4.19 shows comparisons of the same wave parameters at MOP L0808. The modeled significant wave height, peak wave period and mean wave direction match very well with the measurements at NDBC 46268 as well as the hindcast data at MOP L0808. The Delft3D model captured the wave height rise and fall, the wave period changes from swell (longer than 12-seconds) to wind waves (shorter than 12 seconds), and the direction throughout the modeling period.

In summary, the Delft3D FM wave model predicted the wave conditions very well at the two calibration locations with water depths of 67ft and 33ft. The comparison plots illustrate good agreement between the Delft3D FM model and the measurements/hindcast data for both events. The model is well calibrated for use in alternative impact assessment.

FIGURE 4.18: EVENT 2 - COMPARISON OF MODELED AND MEASURED WAVE CONDITIONS AT NDBC46268





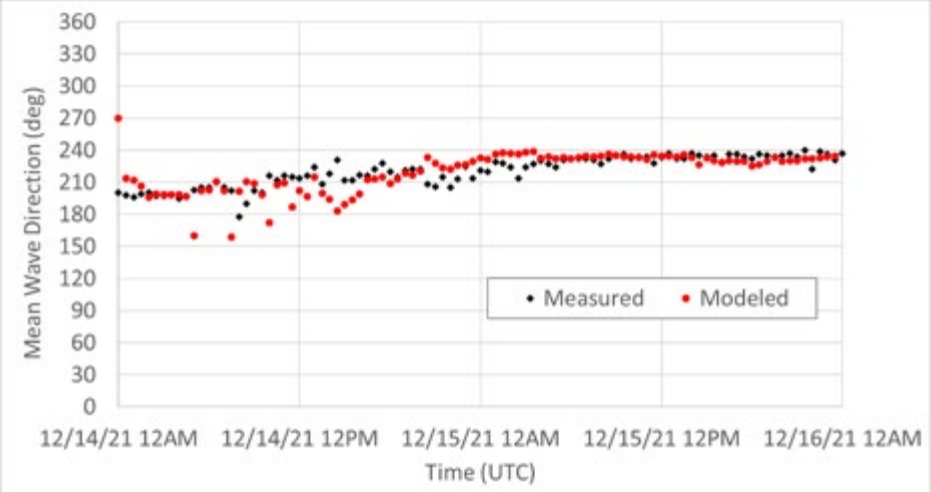
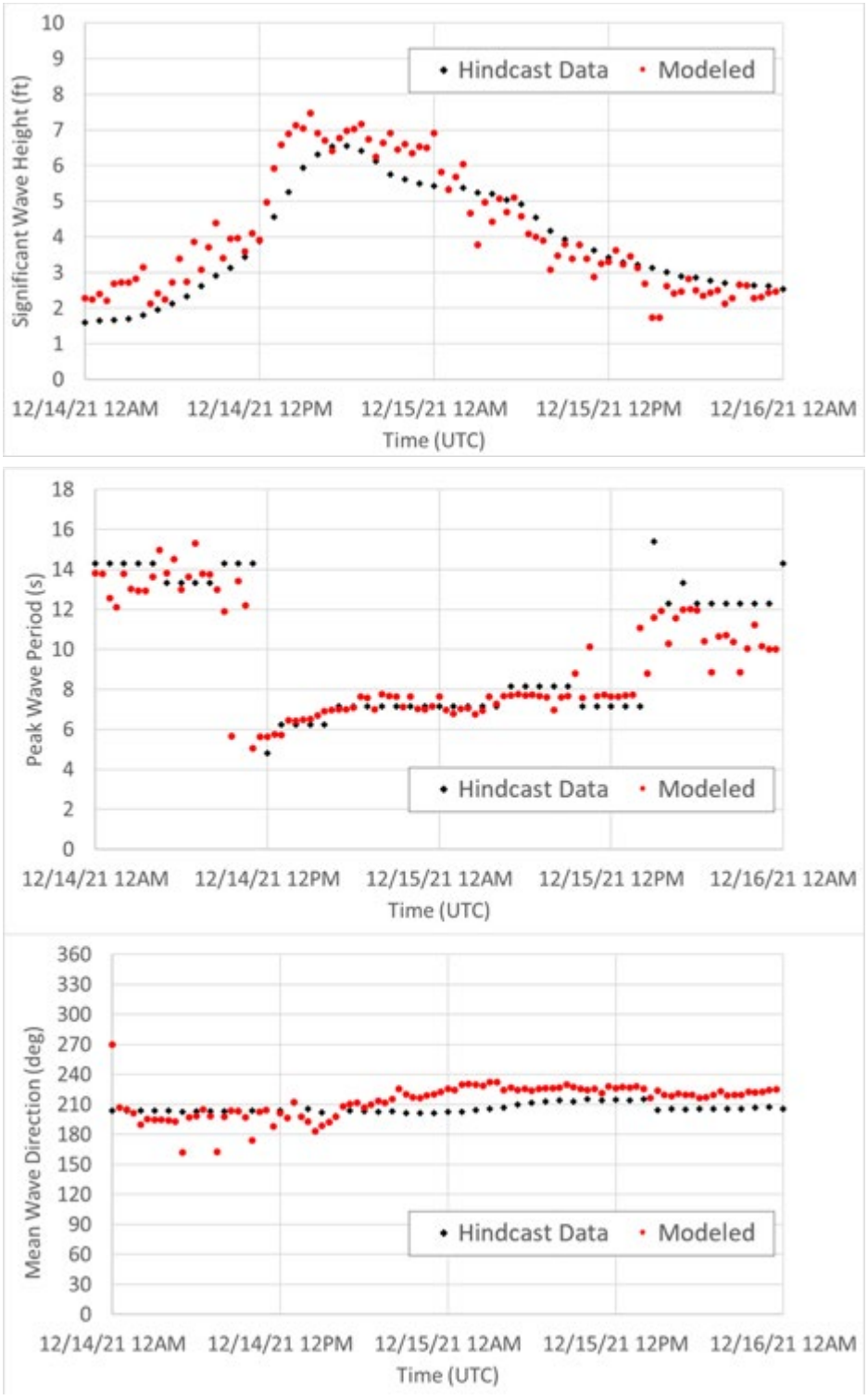


FIGURE 4.19: EVENT 2 - COMPARISON OF MODELED AND CDIP HINDCAST WAVE CONDITIONS AT MOP L0808



4.7.2 Morphology Model Calibration

For the morphology model calibration, the sediment from the nearshore placement was not included. The model predicts the beach volumetric changes with the existing sediment and the results were compared against measured volumetric changes from historical profile surveys and Lidar surveys.

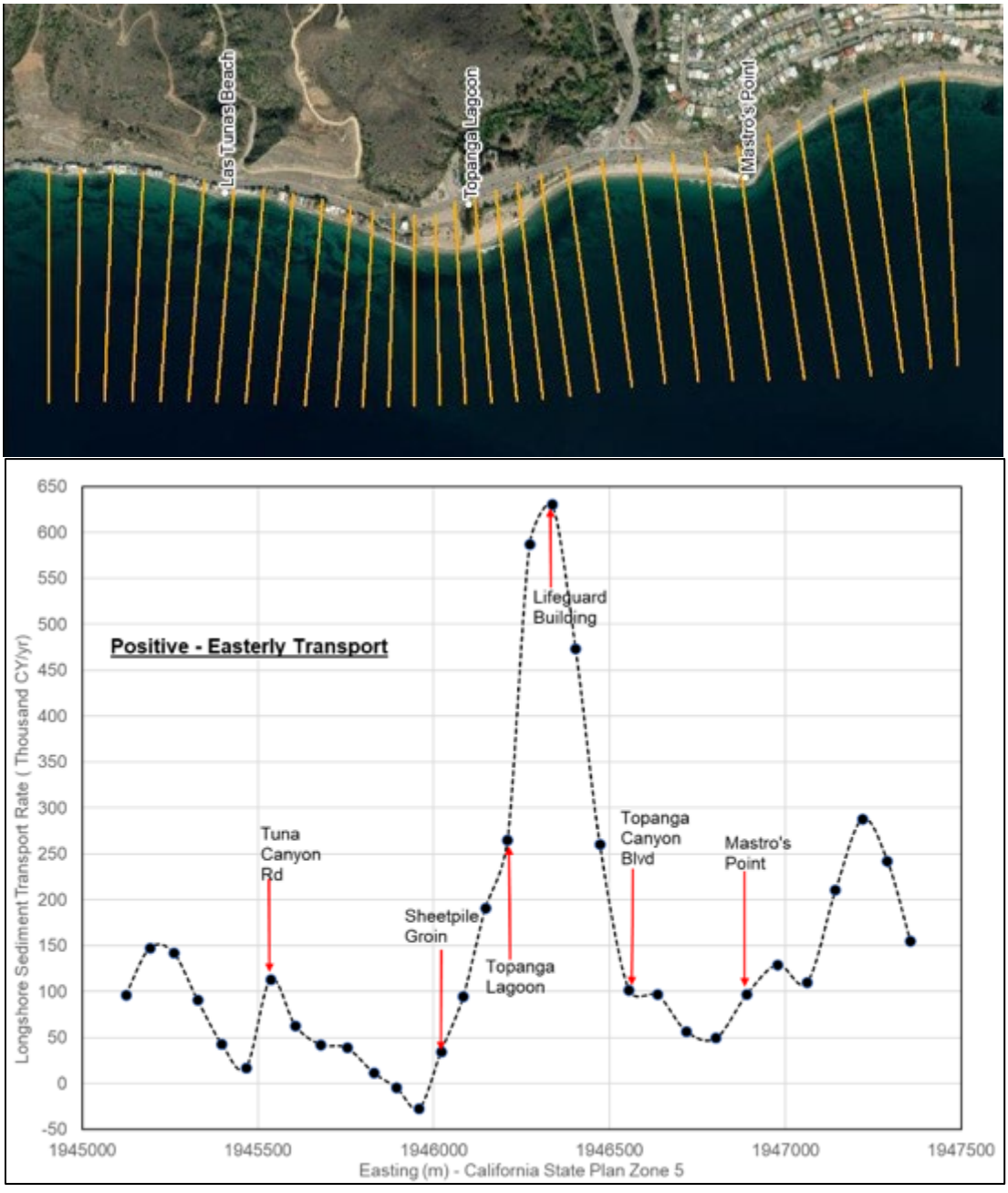
4.7.2.1 Annual Potential Longshore Sediment Transports

During the wave schematization process discussed in Section 4.4.3, potential net annual longshore sediment transport rates were calculated along several cross-shore transects using “Detran,” a MATLAB toolbox from OpenEarthTools. It is again worth noting that: (1) there were no morphology updates in those short time Delft3D runs; (2) The surf zone median sediment grain size of 0.4mm was used with unlimited availability because of limited budget, short turnaround time, and long computer simulation time for each model run; and (3) the morphological model parameters applied were mostly default values, not the fully calibrated values as shown in Table 4.6.

Figure 4.20 illustrates the cross-shore transects that were computed for the potential net annual longshore transport rates and the results. In general, the predicted net longshore transport direction is eastward (shown as a positive value). The transport rate is the largest along the shoreline section east of Topanga Lagoon, indicating sediment starving water after passing the cobble delta of the Topanga Point is very erosive and threatening the lifeguard building. However, most of the shoreline in this section was covered by pebbles/cobbles instead of sand; thus, the actual sediment transport rates are generally considerably less than these values due to their larger sizes thus harder to be mobilized than sands.

The net longshore sediment transport rates calculated are in a similar order of magnitude to those of the CCSTWS for the Los Angeles County estimated using the shoreline model GENESIS with a median grain size of 0.48mm in the Topanga Beach Reach (Noble Consultants, 2010). The potential net easterly transport rate was estimated to range from 109,000 cy/year to 149,000 cy/year for shoreline orientations of 45 deg and 90 deg, respectively.

FIGURE 4.20: POTENTIAL NET ANNUAL LONGSHORE SEDIMENT TRANSPORT RATES



4.7.2.2 Morphology Calibration Results

Because of the limited information about the extent of existing sandy materials horizontally and vertically, the initial state of beach conditions for morphology calibration is unknown as no documented data are available. It is also challenging to numerically simulate sediment transport and long-term morphological changes on beaches with mixed sandy and rocky materials.

The available historical beach profiles and topobathy data used in model calibration are discussed in Section 3. It is an advantage to use good quality Lidar data for morphological model calibration due to the continuous coverage. However, after carefully examining the Lidar data, it appears the 2014 Lidar

bathymetric data had some issues, as shown by the elevation differences between the 2009 and 2014 Lidar in Figure 4.21. The bed elevations in the 2014 Lidar are mostly higher than the 2009 Lidar below the Mean Higher High Water (MHHW) line (1 to 1.5ft on average). In reality, it is not expected that the sea floor would change that much in areas deeper than 20ft. Figure 4.22 presents the elevation differences between the 2009 and revised 2014 Lidar after lowering the 2014 lidar elevations by 1.3ft. The 1.3-ft adjustment of 2014 lidar was determined after comparing the profile data along the survey transects shown in Figure 3.1 between 2009 and 2014 lidar data along with available profile surveys in 2002 and 2005. After lowering the 2014 lidar by 1.3 ft, the profiles are better matched in the offshore area deeper than 20 ft. Most of the areas show erosion in this case. It demonstrates the importance of good-quality data. These two Lidar datasets were still used for the morphology calibration since no other better data are available but need to be interpreted with caution .

FIGURE 4.21: ELEVATION DIFFERENCES BETWEEN 2009 AND ORIGINAL 2014 LIDAR

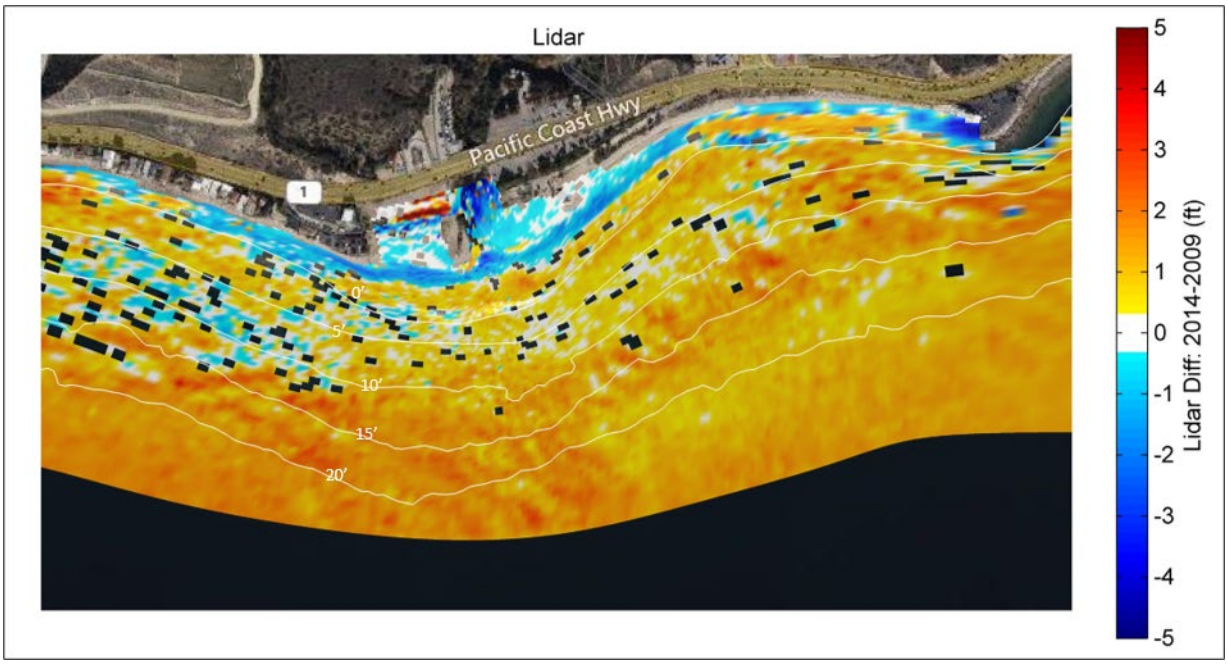


FIGURE 4.22: ELEVATION DIFFERENCES BETWEEN 2009 AND LOWERED 2014 LIDAR

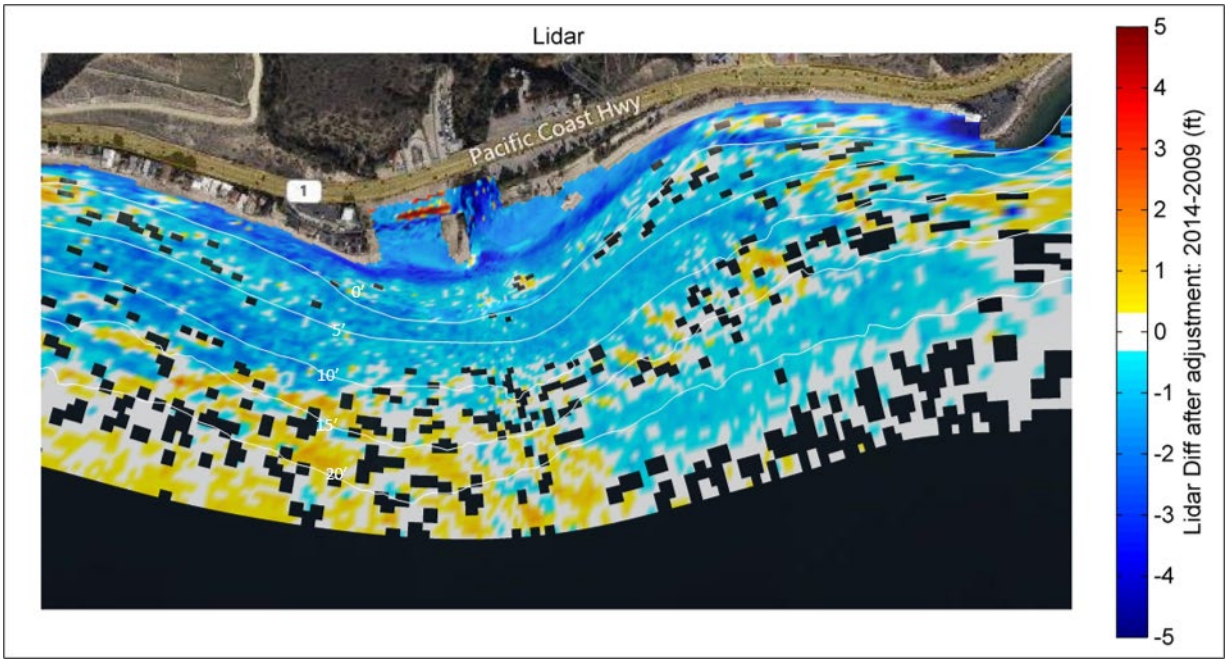


Figure 4.23 and Figure 4.24 present the morphological changes predicted by Delft3D FM (with representative waves discussed in Section 4.4.3 and initial sediment thickness map presented in Section 4.6) after 1 year and 5 years, respectively. The model results show erosion in the shallower nearshore area and deposition in the deeper area. After 1 year, most of the erosion occurs above the -10ft NAVD88 contour and is then continuously transported offshore in the subsequent years. The pebbles and cobbles at the Topanga Point barely moved under typical annual wave conditions with a maximum wave height of 11ft.

FIGURE 4.23: MODELED MORPHOLOGY CHANGES AFTER 1 YEAR

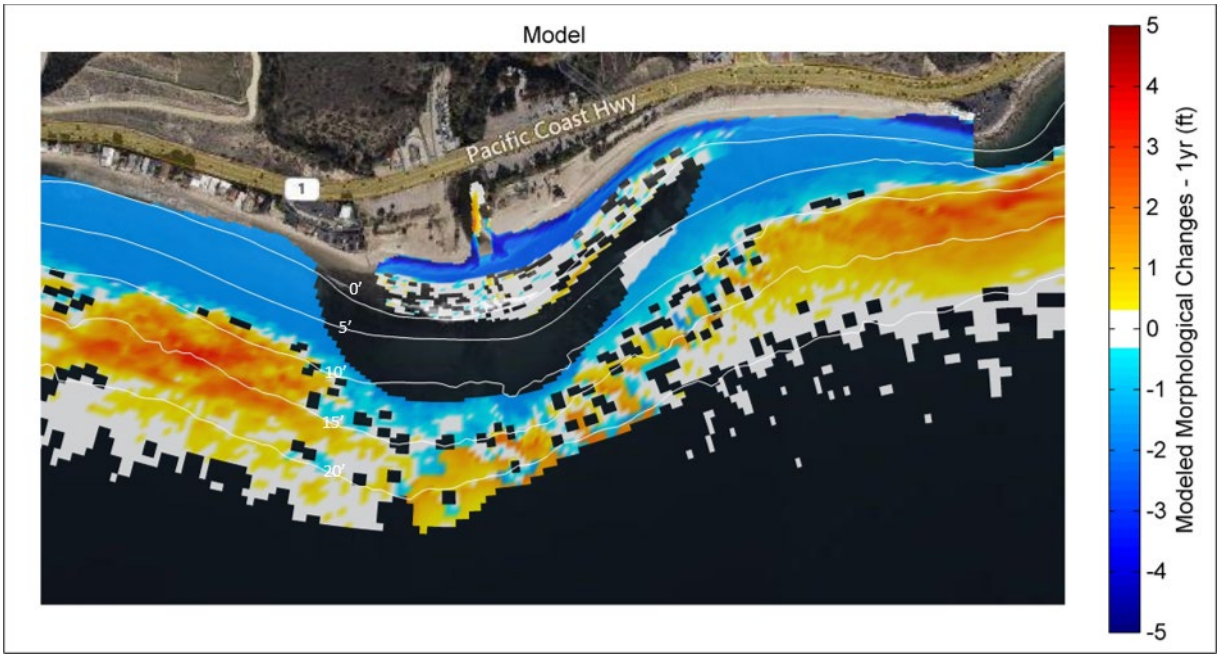
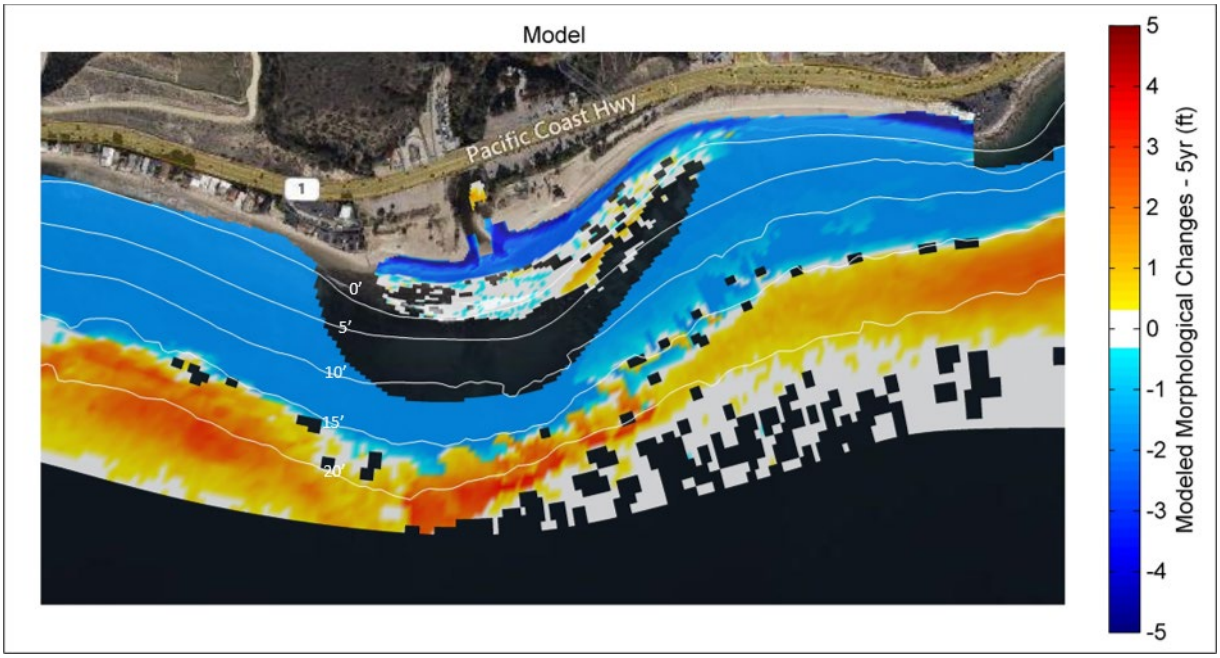


FIGURE 4.24: MODELED MORPHOLOGY CHANGES AFTER 5 YEAR



Volume changes along cross-shore transects were calculated from both the model results and lidar data. These transects are not the historical survey transects, but rather follow the model grid lines in the cross-shore direction as shown in Figure 4.25. Figure 4.26 presents the total volume changes per unit area between the model results and Lidar data. Volume changes from both original and lowered 2014 Lidar data relative to 2009 Lidar are included. The actual volume changes between 2009 and 2014 are probably in-between. The model results show a fairly good agreement with the lowered 2014 Lidar data.

In general, sediment transport model calibration is very challenging as there is often no good quality data available for model calibration. In this case, the initial ocean floor sediment data (grain size and thickness) were based on visual observation, imagery and model testing runs. There are only two Lidar data sets (2009 and 2014) available, and the 2014 data has some issues as described above. Hence, it is often considered acceptable if the prediction is within 50% of the measurement, and agreement shown in Figure 4.26 is considered a very good agreement.

FIGURE 4.25: CROSS-SHORE TRANSECTS – MODEL CROSS-SHORE GRID LINES

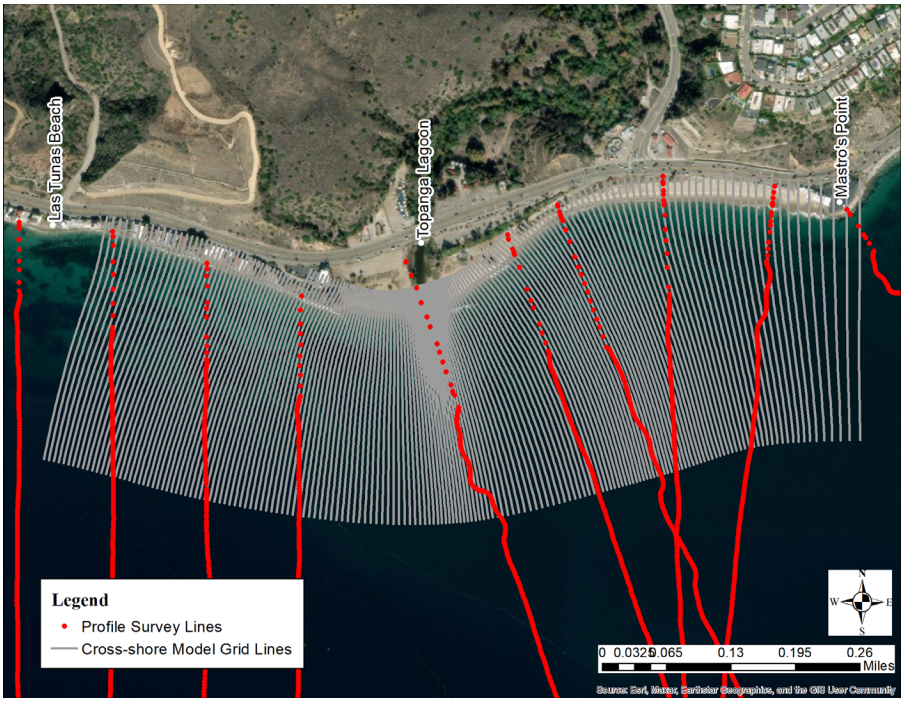
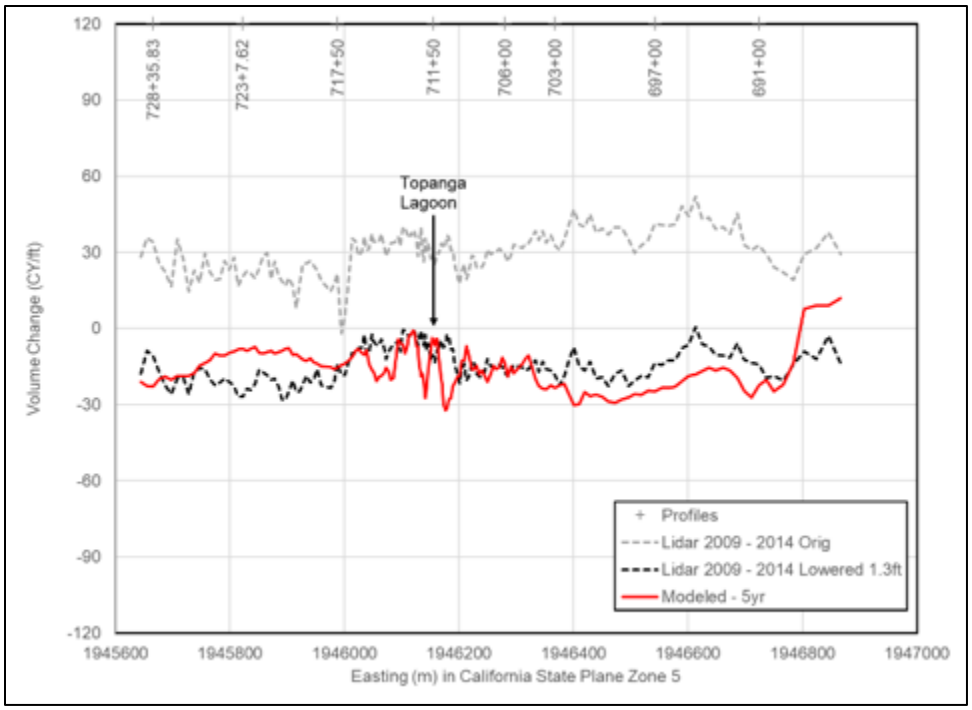


FIGURE 4.26: VOLUME CHANGES NEAR TOPANGA LAGOON ABOVE -24FT-NAVD (MODELED VS LIDAR)



4.8 Model Results

4.8.1 Long-term Morphology Changes

The hydrodynamics, sediment transport, and morphology changes at the Topanga nearshore area were modeled for 1-year and 5-years after the proposed mound is placed. The modeling results help understand the long-term morphological changes due to the sediment mound and answer two questions: (1) whether it can benefit the littoral cell by bringing sediments to nourish the beach; (2) whether there will be significant impacts to the existing marine habitats (e.g., EFH). This section discusses the model results of the initial proposed site and the four revised sites. The 1-year and 5-year wave climates are constructed by the representative waves mimicking seasonal wave variations in a typical year (see Section 4.4.3).

4.8.1.1 Initially Proposed Site

The sediment placement site was initially proposed to be in a depth between -15ft to -25ft NAVD88 nearshore and to the east of Topanga Lagoon. Figure 4.27 presents the model predicted sediment deposition depths of the initially proposed sediment mound at the 9-acre site 1-year and 5-year post-construction. These deposition values are the differences in bathymetry with and without placed material under typical annual wave conditions. The biological marine habitats mapped in CRM's 2023 survey are also included in Figure 4.27 to show the impacts of the nearshore mound placement. Figure 4.28 compares the differences between the CRM's 2022 and 2023 habitat maps. More marine habitats are mapped in the 2023 survey in depths of -15ft to -20ft. The initial site boundary in 2022 is also marked in the black box in the 2023 survey map. As seen in the figure, placed material stays outside of the habitat boundaries in the 2022 survey, but in the 2023 survey, this is not the case. The site overlaps with EFH, Habitat Areas of Particular Concern (HAPC), sea dollar and sea pansy beds. These marine habitats will be immediately covered by feet of sediments right after the construction.

Within a year, some of the sediments move towards the shore. The northeast corner of the mound erodes fastest as it is in the shallowest depth. The highest accumulative deposition outside the site is the area next to the eastern boundary, about 3.5 to 4ft deep. However, the thickness of sediment deposition is limited to this localized area. Most of the deposition depth is less than 2ft one year after construction. It is worth noting that sediment transport and deposition occurs gradually over a year period. This allows the marine habitats to adapt and migrate. Most of the sediment will be transported to Mastro's point and east of it, which will benefit the starving coast east of the Mastro's point.

The 5-year post-construction results show a similar deposition pattern but with less deposition thickness and sediment traveling alongshore to the east. This suggests that over time, sediment at the mound will be eroded by waves and currents. There will be some local dispersion around the mound, and more will be transported to the east towards shore. This is a slow process, as after 5 years, there is still 4 to 7ft of sediment remaining at the site. The deeper the sediment sits, the more difficult it is to move. The erosion rate of the mound also gets slower when the mound height reduces. However, it will be mobilized and moved when a larger storm occurs than is modeled. Hence, the nourishment benefit to the downcoast beaches will extend beyond 5 years.

FIGURE 4.27: SEDIMENT DEPOSITION 1-YEAR AND 5-YEAR POST-CONSTRUCTION - INITIAL PROPOSED SITE

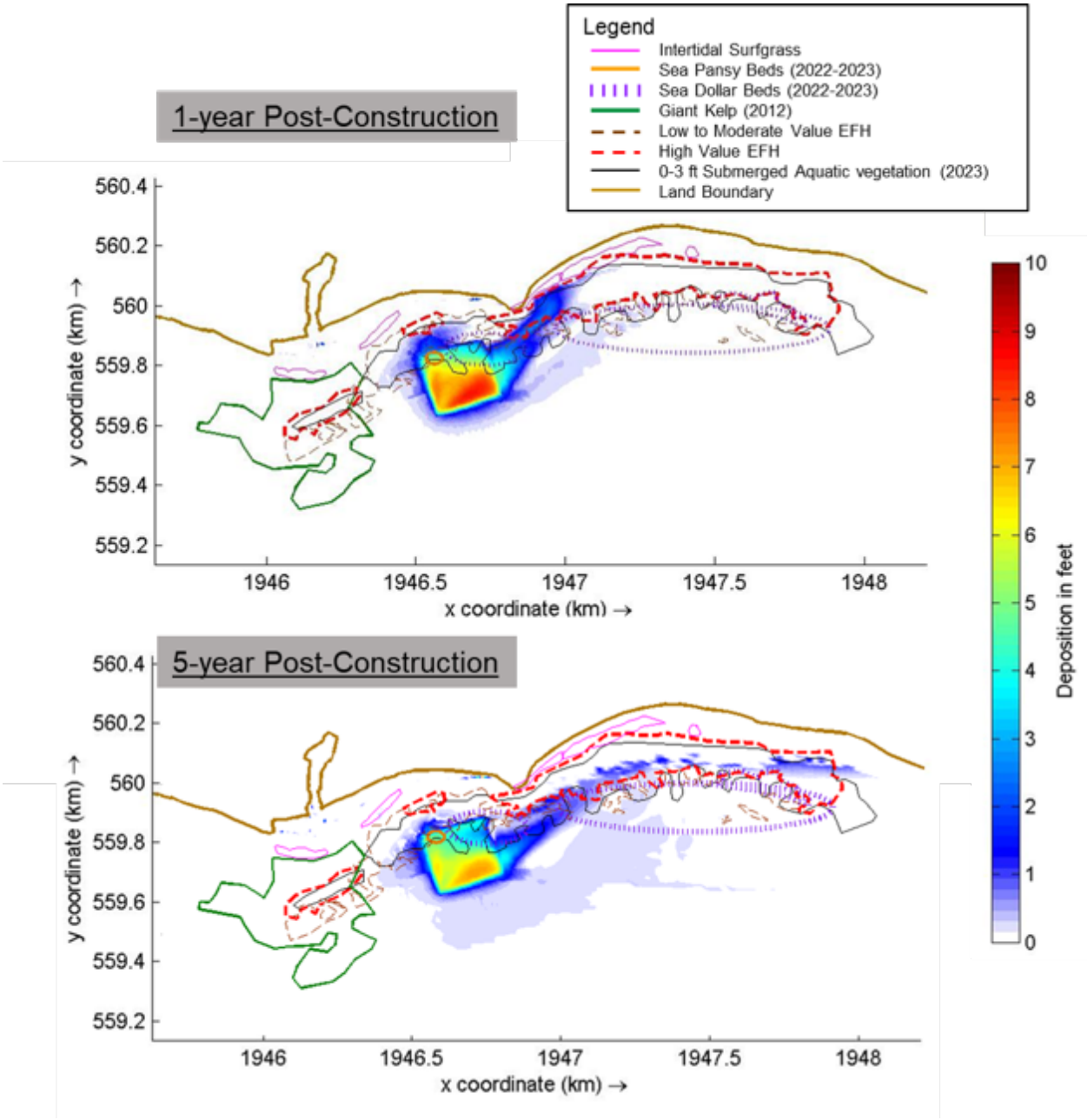
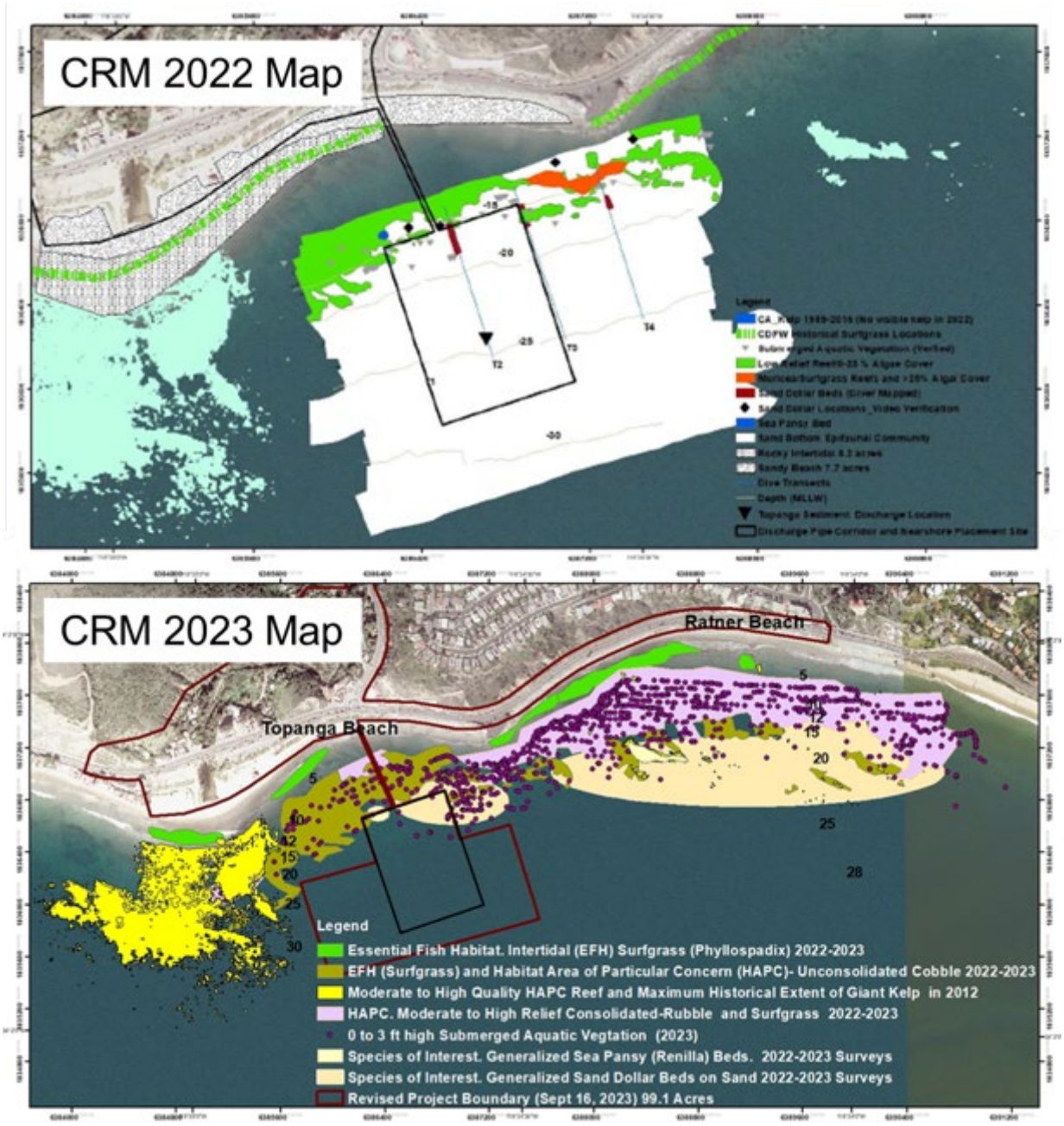


FIGURE 4.28: MARINE BIOLOGICAL HABITAT MAPS (2022 VS. 2023)



4.8.1.2 Revised Placement Sites

Since the initial proposed placement site covers and impacts the marine habitats on its northern side, it was recommended that the placement site be moved further offshore to a depth between -20ft to -30ft NAVD88 to avoid the sensitive habitat areas. Figure 4.29 through Figure 4.32 illustrate the predicted sediment placement (depth and area) of the four revised placement sites: West Site A, West Site B, East Site A and East Site B. The differences among these four sites are discussed in Section 4.5.1. The deposition values in the figures are the differences in bathymetry with and without the placed material for 1-year and 5-year post-construction. It shows the long-term morphological changes due to the placement of the proposed mounds. The findings from the modeled morphology changes are as follows. Compared to the initial site,

the revised sites avoid sediment deposition in the sensitive marine habitats. The revised sites will certainly reduce the initial placement and after-placement impacts to the habitats. The initial mound height varies from 6 to 8ft for uniform mound scenarios. Details are shown in model bathymetry figures in Section 4 and the mound height is shown in Figure 4.19 to Figure 4.32.

- The deposition is generally 2ft or less after one year among all four alternative sites proposed. The magnitude of depth change is within the seasonal changes observed in the area (Coastal Resources Management, Inc., 2023). Note the deposition occurs over a year period, so organisms will have time to adapt and migrate.
- A similar trend is observed between the 1-year and 5-year results. The mound erodes gradually over time. After one year, the eroded sediment from the mound moves towards the shore on both sides of Mastro's Point. Because of the wave refraction around Mastro's Point, no sediment is expected to be deposited around Mastro's Point, and it also hinders alongshore sediment transport passing Mastro's Point; despite that limitation, the east side of Mastro's Point at Ratner's Beach will receive sediment from the mound. The sediment thickness within the mound further reduces after 5 years. The deposition depth outside of the placement site boundary increases slightly after 5 years and the sediment is transferred further alongshore to the east. This is consistent with the overall sediment transport direction within the Santa Monica littoral cell indicated in USACE's 2009 study (see Figure 3.2).
- The two west sites will likely have impacts on surfing as they are located closer to the Topanga Point. According to the surfing study, surfers typically take off immediately offshore of the lagoon mouth and stop west of the proposed west placement site. There are habitat presences immediately west of the two west sites, leading to a higher risk of potential impacts to the habitat.
- The east sites have "buffer areas" on both sides, and it is generally outside of the popular surfing area.

In summary, the deposition from the revised sites is generally less than 2 feet five years after the construction, within the seasonal changes observed in the area. There was no significant deposition within the marine habitats as surveyed in 2023. The east sites avoid the potential impacts to surfing, compared to the west sites. Compared to the initially proposed site, the benefit of nourishing the beach of the new proposed sites is significantly reduced as most of the placed material will remain at the placement sites instead of moving down coast.

FIGURE 4.29: SEDIMENT DEPOSITION 1-YEAR AND 5-YEAR POST-CONSTRUCTION - WEST SITE A

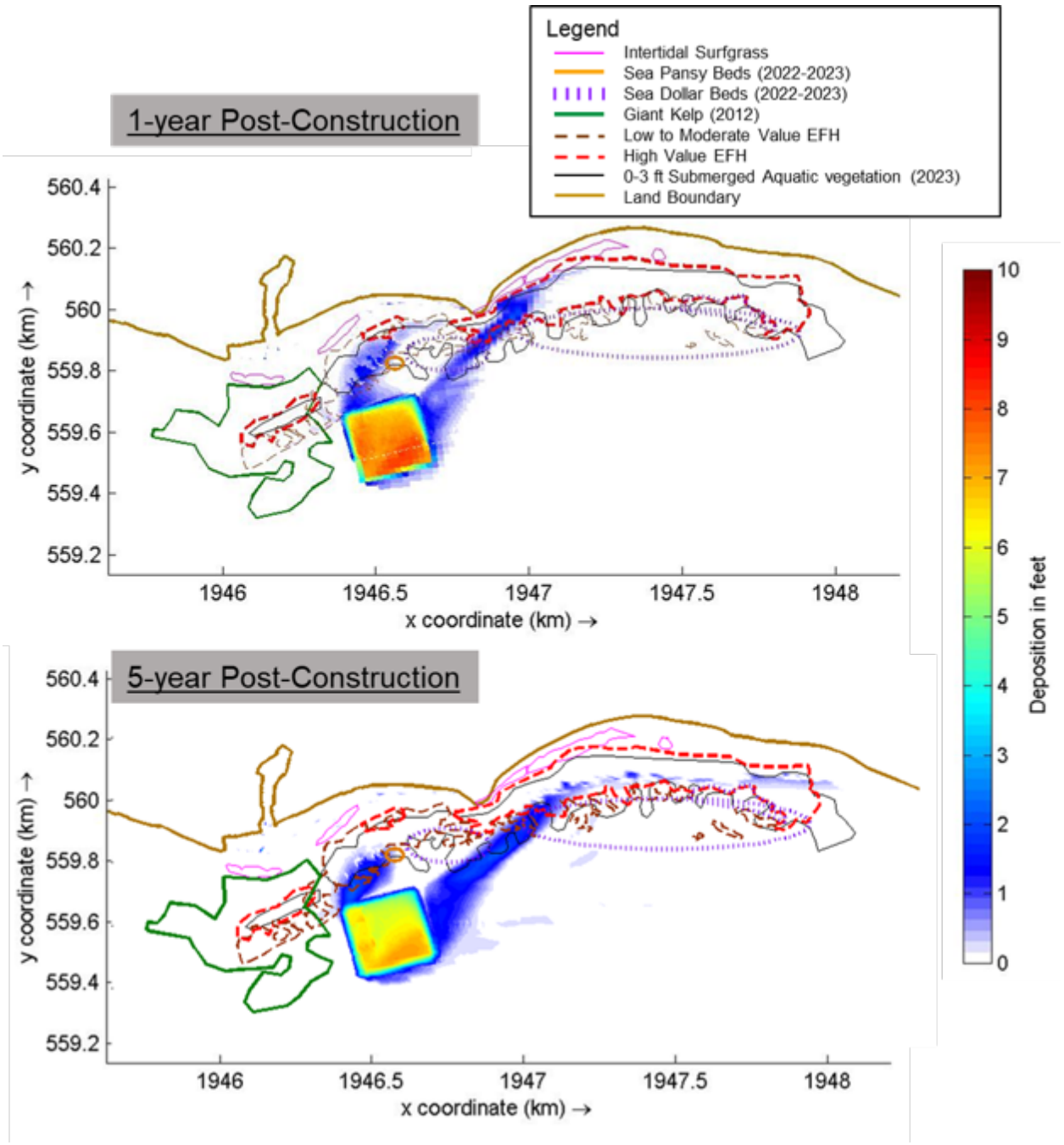


FIGURE 4.30: SEDIMENT DEPOSITION 1-YEAR AND 5-YEAR POST-CONSTRUCTION - WEST SITE B

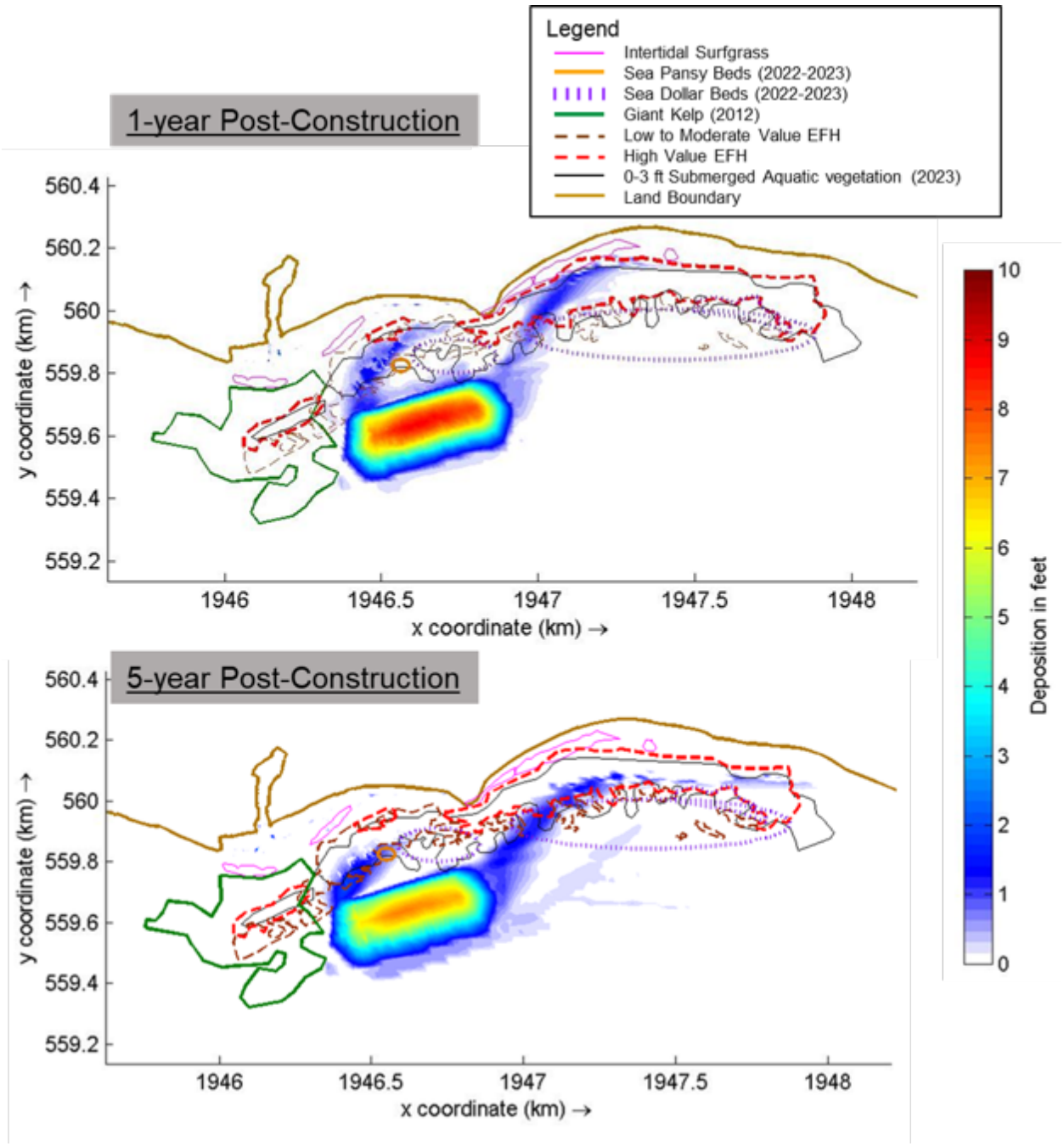


FIGURE 4.31: SEDIMENT DEPOSITION 1-YEAR AND 5-YEAR POST-CONSTRUCTION - EAST SITE A

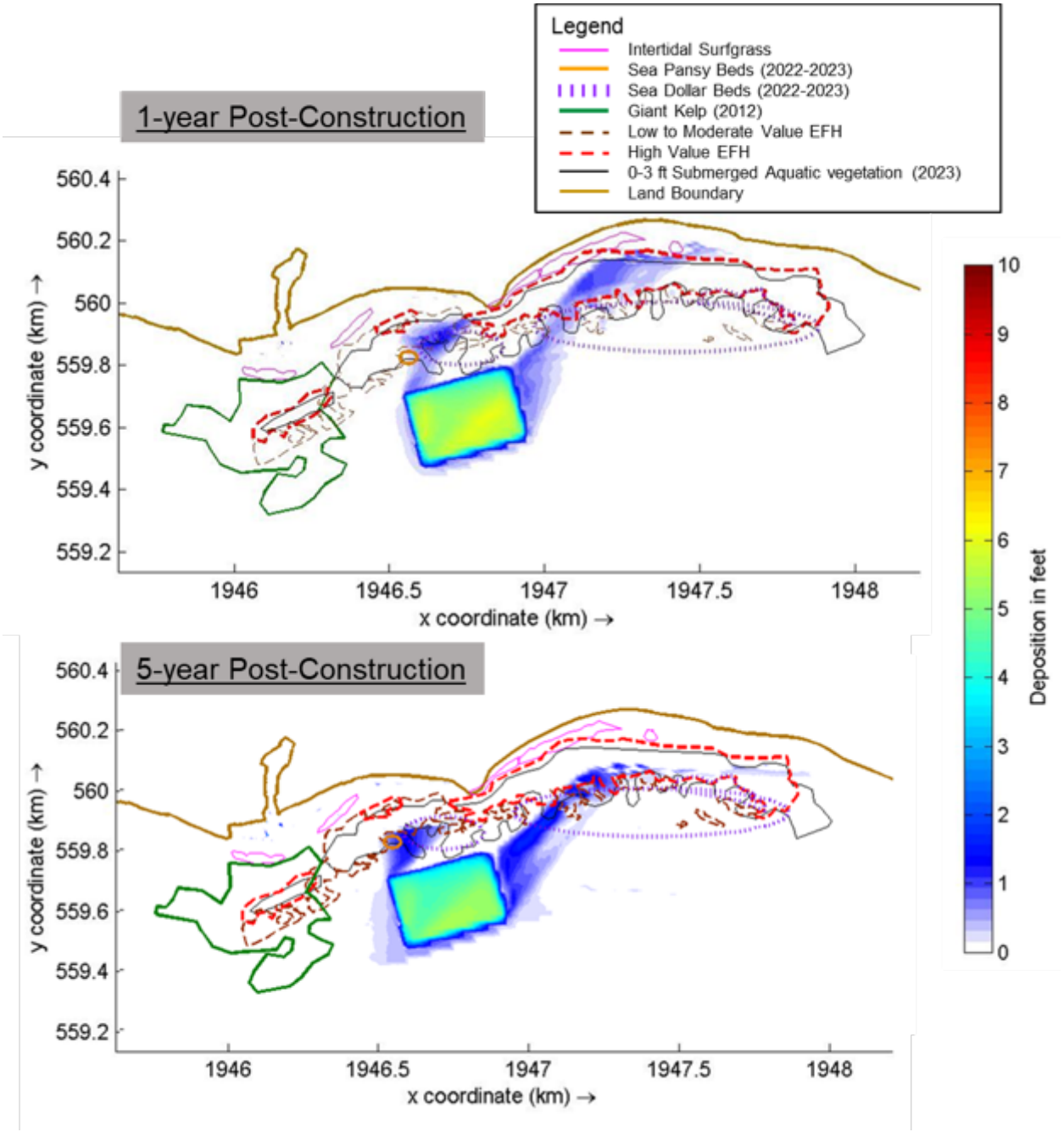
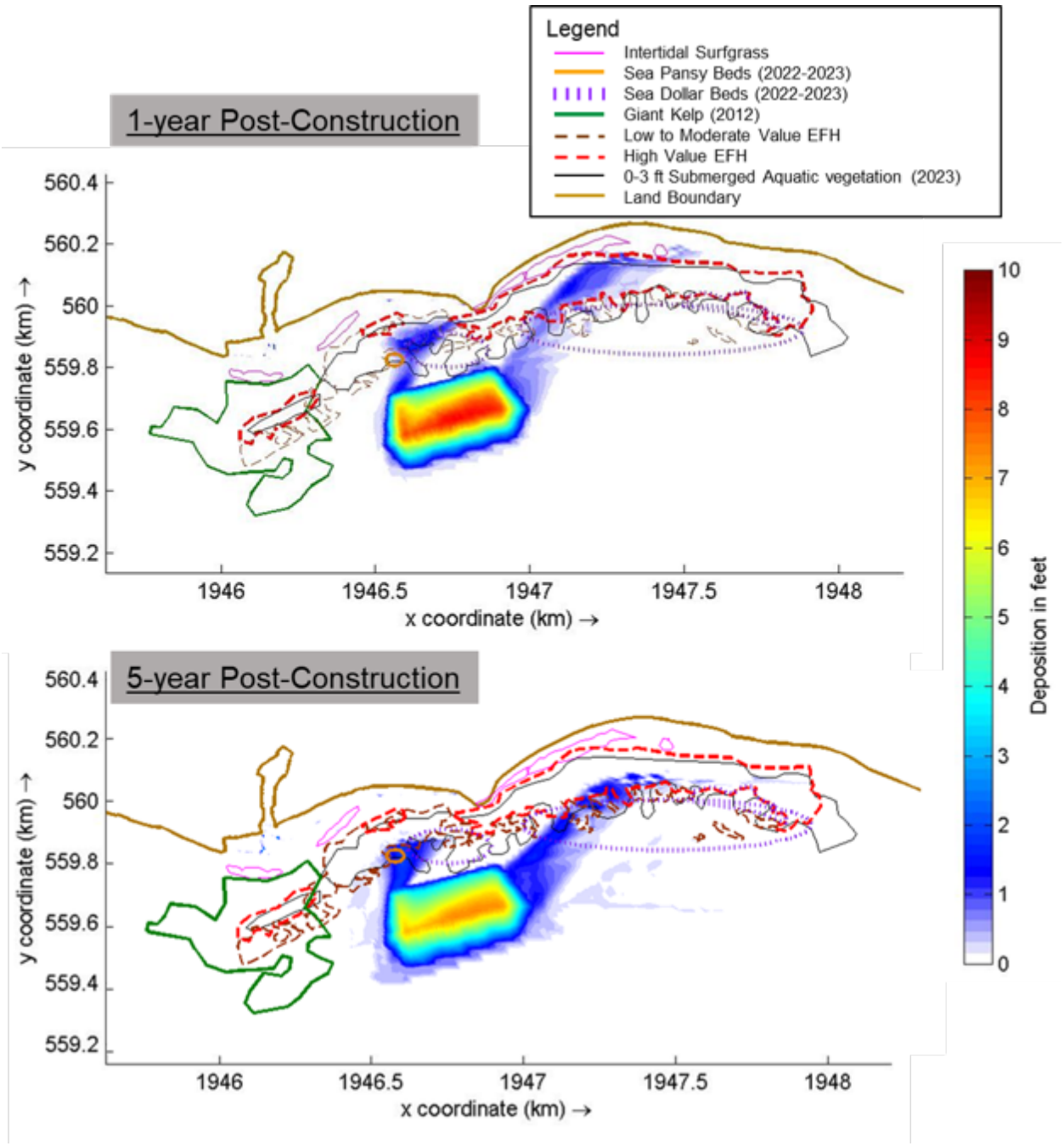


FIGURE 4.32: SEDIMENT DEPOSITION 1-YEAR AND 5-YEAR POST-CONSTRUCTION - EAST SITE B



4.8.2 Post-Storm Morphology Changes

Besides the long-term impacts, the proposed placement sites were also modeled for sediment transport and morphology changes after a significant storm. The January 1988 storm was selected as it is equivalent to a 100-year wave event in the area (per wave data at WIS Station ST84072). Figure 4.33 plots the deepwater significant wave height and water level time series during the selected January 1988 event. The deepwater significant wave height reaches 20ft. The post-storm sediment deposition depths right after the construction are presented in this section.

Figure 4.34, Figure 4.35 and Figure 4.36 depict the sediment depositions post-1988 storm at the initial proposed site, two west sites and two east sites, respectively. The pattern of the sediment dispersion from

the mound is similar to what we have seen from the long-term morphology modeling results. The sediments disperse around the placement boundaries, the sediments being pushed onshore and towards the east. The initial site has more sediment dispersion than the revised sites due to its exposure to higher wave and tidal currents at a shallower depth. The revised sites have depositions less than 2ft and these deposited sediments are expected to migrate over time. Note the January 1988 storm occurred during mid-tide, the sediment transport will be more if a storm occurs during the spring low tide as the water depth will be a few feet shallower and more sediment can be mobilized.

FIGURE 4.33: DEEPWATER WAVE AND WATER LEVEL CONDITIONS DURING 1988 STORM (WIS ST84072)

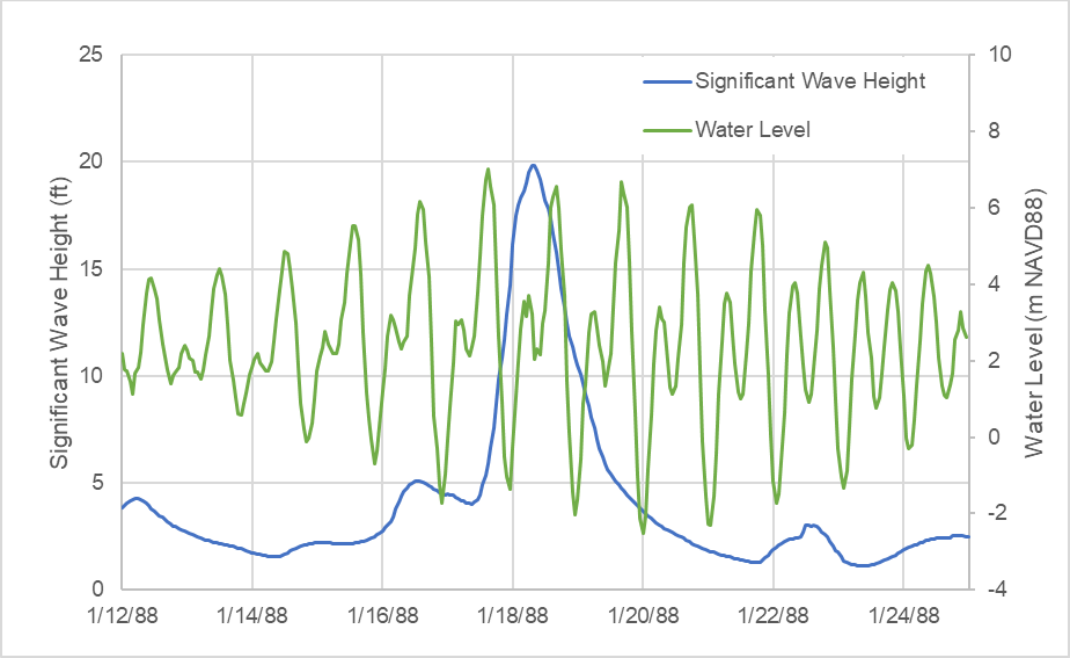


FIGURE 4.34: SEDIMENT DEPOSITION POST-1988 STORM – INITIAL PROPOSED SITE

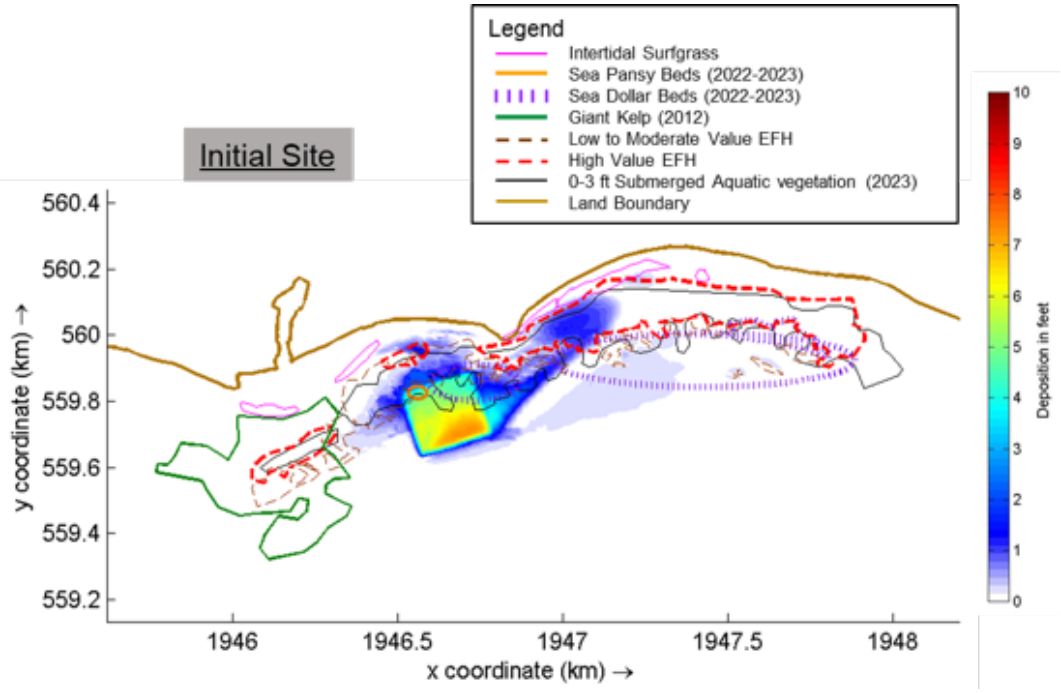


FIGURE 4.35: SEDIMENT DEPOSITION POST-1988 STORM –WEST SITES

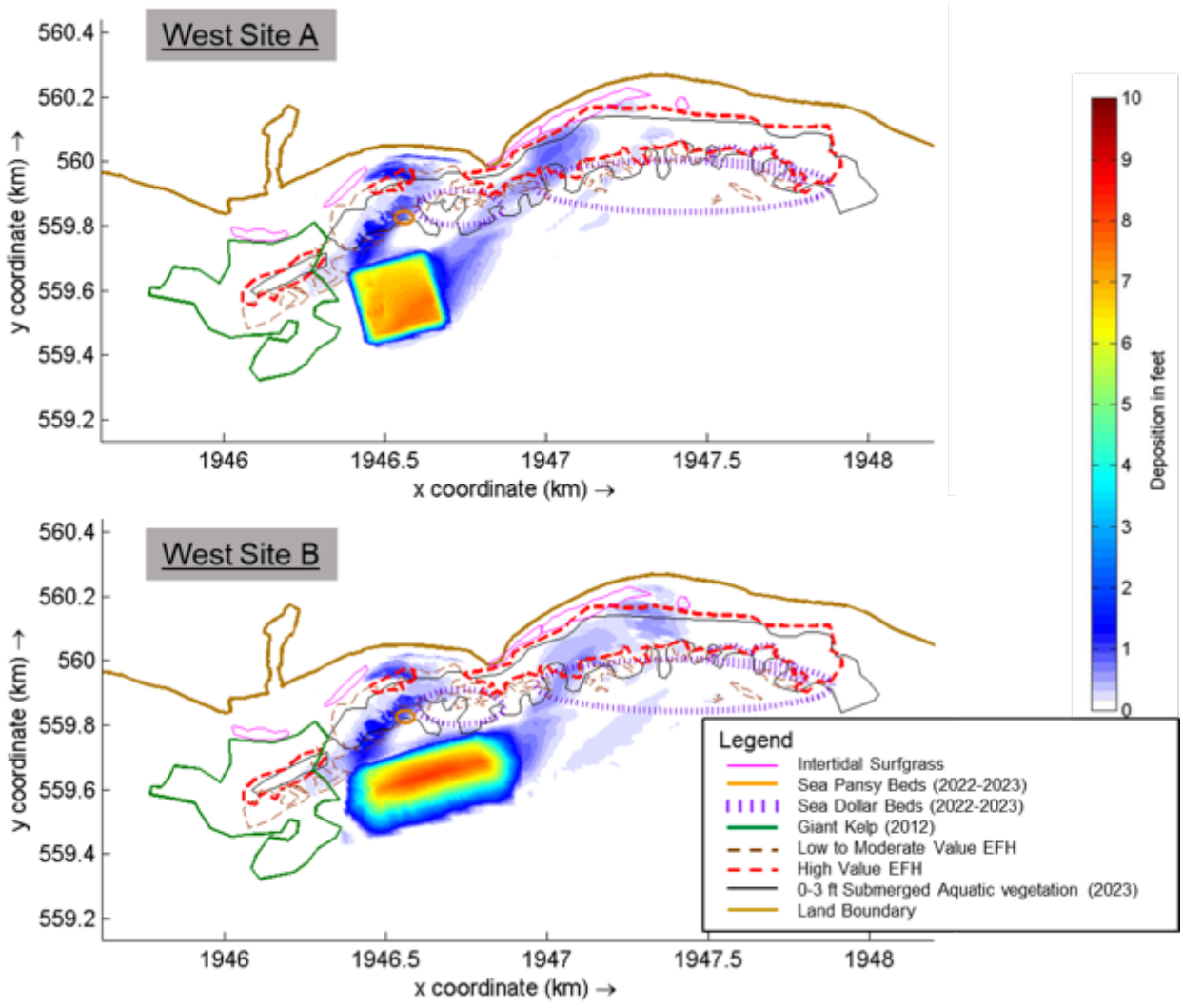
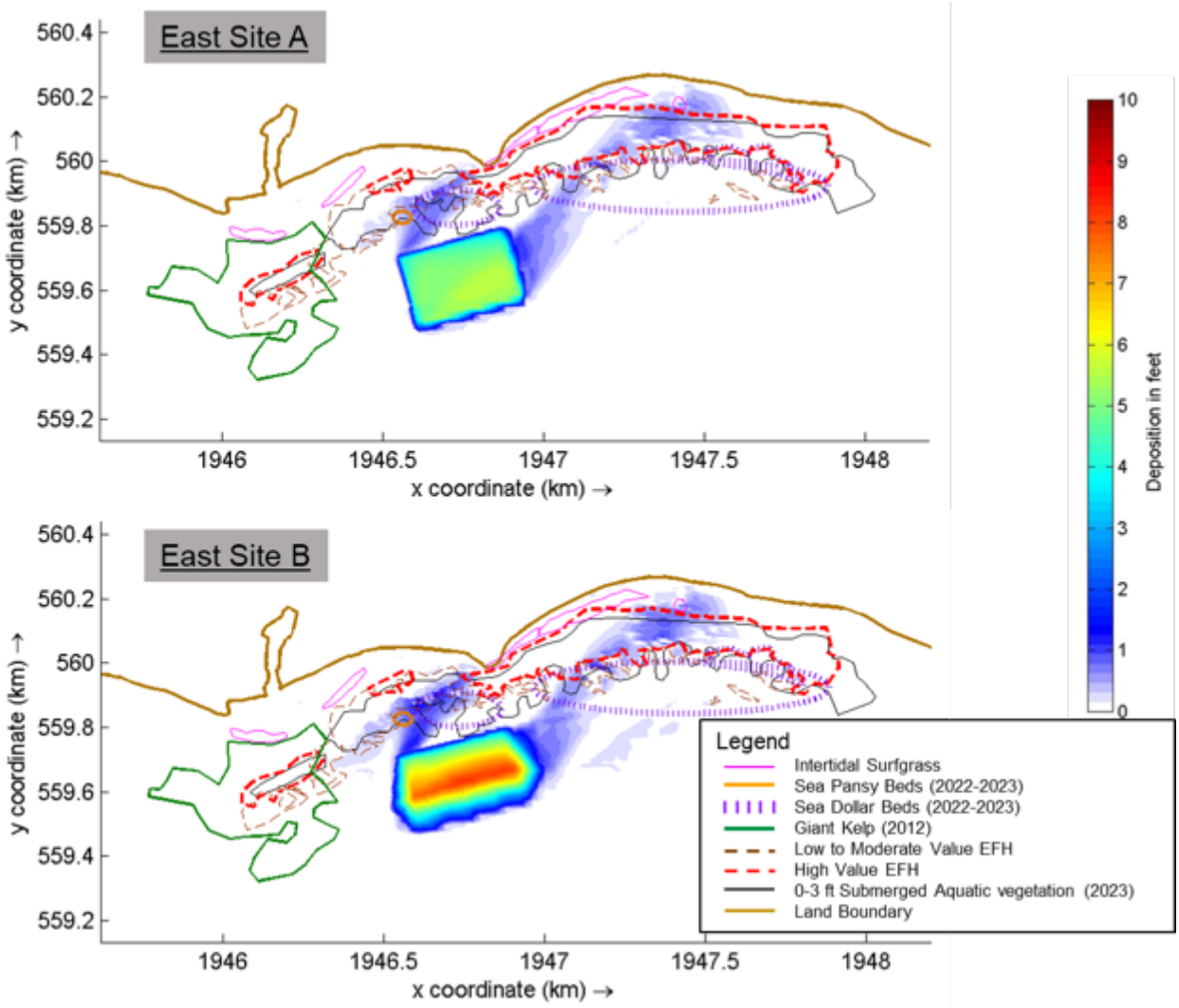


FIGURE 4.36: SEDIMENT DEPOSITION POST-1988 STORM – EAST SITES

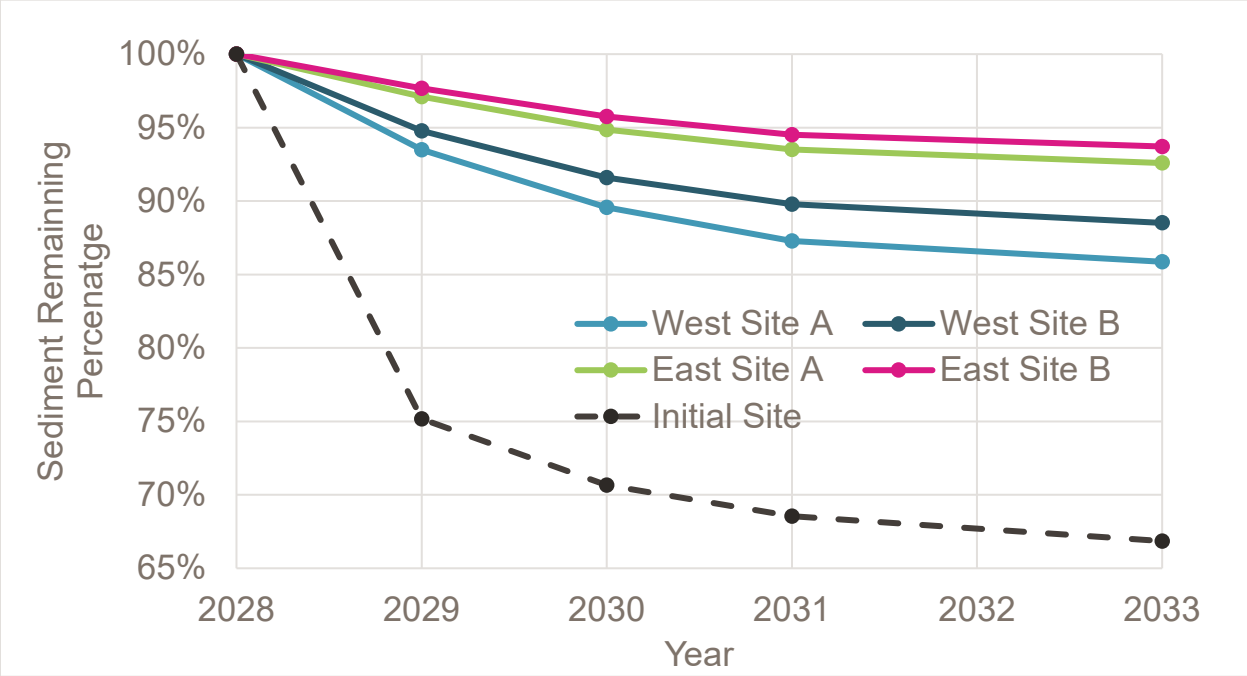


The amount of the sediment remaining at the placement sites was plotted in percentages relative to its initial amount right after the placement. Figure 4.37 shows the percentages of the remaining sediment within the placement site immediately after, one year after, two years after and 5 years after the construction.

- The initial proposed site has the highest sediment dispersion or transport under the modeled wave conditions. About 1/3 of the placed materials will be mobilized and transported; hence, it is the best site in terms of beach nourishment benefit.
- More sediments (more than 85%) will stay on site after 5 years for the new sites proposed by agencies.
- East Site B has the least sediment dispersion (or sediment loss) of 6%. It will have the least benefit in terms of beach nourishment although it will have least impact on the habitats.
- West Site A has the most sediment loss of 14% by year 5 among 4 new proposed sites since West Site A has the highest mound top elevation around -13.5ft NAVD88 (on its northern side) among the four alternatives. Sediment at a shallower depth will be exposed to more wave energy during breaking and shoaling, leading to more sediment dispersion.

When looking at the trend over time, there is more sediment loss in the first year and it gradually slows down over time. There are minor changes between year 4 and year 5 for all the alternative sites.

FIGURE 4.37: PERCENTAGES OF REMAINING SEDIMENT WITHIN THE SITES BY YEARS POST-CONSTRUCTION



Note: 1. The Topanga Lagoon Restoration project is assumed to be completed in 2028.
2. The volume calculation does not include the mound slope.

4.8.3 Armoring at Site

One of the questions for the study to answer is “How much coarse material is expected to remain at the placement location (area, thickness, volume)?”

The Delft3D FM model modeled sediments in multiple grain sizes. Hence, the sorting and armoring process at the mound can be investigated so that the potential for the development of an “armor layer” as vertical sorting occurs on the placed materials can be understood. The grain sizes modeled for the mound materials are 0.15mm (fine sand), 0.4mm (medium sand), 3mm (coarse sand) and 12.5mm (pebble). The fine and coarse sand was only assigned to the material, but the medium sand and pebble were included in both existing sediments on the seabed and the disposed materials. Per CRM’s 2023 survey, the sea floor at a depth of 20ft to 30ft is sandy with scattered rocks.

As presented in Figure 4.37, West Site A has the most sediment dispersion among the four new sites and East Site B has the least. This section discusses the sediment movement of individually modeled sediment classes and uses the two sites to illustrate the results. Figure 4.38 depicts the sediment thickness changes of individual grain size five years after the construction of the revised East Site B. The sediment thickness change is an indication of sediment loss or gain. The plots show that fine and medium sand will leave the site and nourish the downcoast beach in the long term with added sand, while coarse pebbles will remain. For grain size equal or larger than 3mm, there is no sediment thickness change at the mound site. The plots of medium sand (0.4mm) and pebble (12.5mm) show both existing and placed sediments. It appears that there are more thickness changes/sediment movements alongshore in the existing surf zone with shallower depth than that at the placement site since the currents (both wave-induced and tidal-driven currents) are higher at shallower depths.

The sediment quantities within the placement site were calculated for the four grain sizes modeled for West Site A and East Site B placement scenarios. The west sites have more percentages of the total sediment

dispersed than the east sites. Thus, the possibility of developing an armoring layer after the sediment dispersion is higher under the west sites than east sites. Figure 4.39 plots the percentages of materials remaining at the site by sediment classes fpr West Site A and East Site B. At the beginning of the simulation, all materials (100%) stay in the site boundary, representing the condition immediately after the construction. After one year, 68.6% of fine sand (0.15mm) and 96.8% of medium sand (0.4mm) at West Site A remain at the site, and 77.0% and 99.2% remaining for East Site B. No dispersal occurred for the coarse sand (3mm) and pebble (12.5mm) at both sites. After the fifth year, the fine sand and medium sand are down to 34.0% and 91.7% at West Site A and 44.4% and 99.1% at East Site B, respectively. There was no change to the coarse sand and medium sand. The material losses at the mound over a 3-year period between the second and fifth year are much slower than the first year—approximately equivalent to the first year's loss. This could be due to two reasons: (1) The mound top is lowered after erosion. The sediment dispersion is less at a deeper depth due to smaller wave-induced currents. (2) The remaining coarser sediments form a layer of "armored" surface, protecting the finer sediment underneath from erosion. The "multiple bed layers" bed composition model in Delft 3D mimics this process: when sediment is deposited, it will be mixed with only the top layer of the sediments. When the sediment is eroded, the recently deposited sediment will erode first. This is different from the "well-mixed bed" model, which has the deposited sediment mixed instantaneously with all the sediment already present in the bed.

FIGURE 4.38: SEDIMENT THICKNESS CHANGES BY SEDIMENT CLASSES – EAST SITE B 5-YEAR POST -CONSTRUCTION

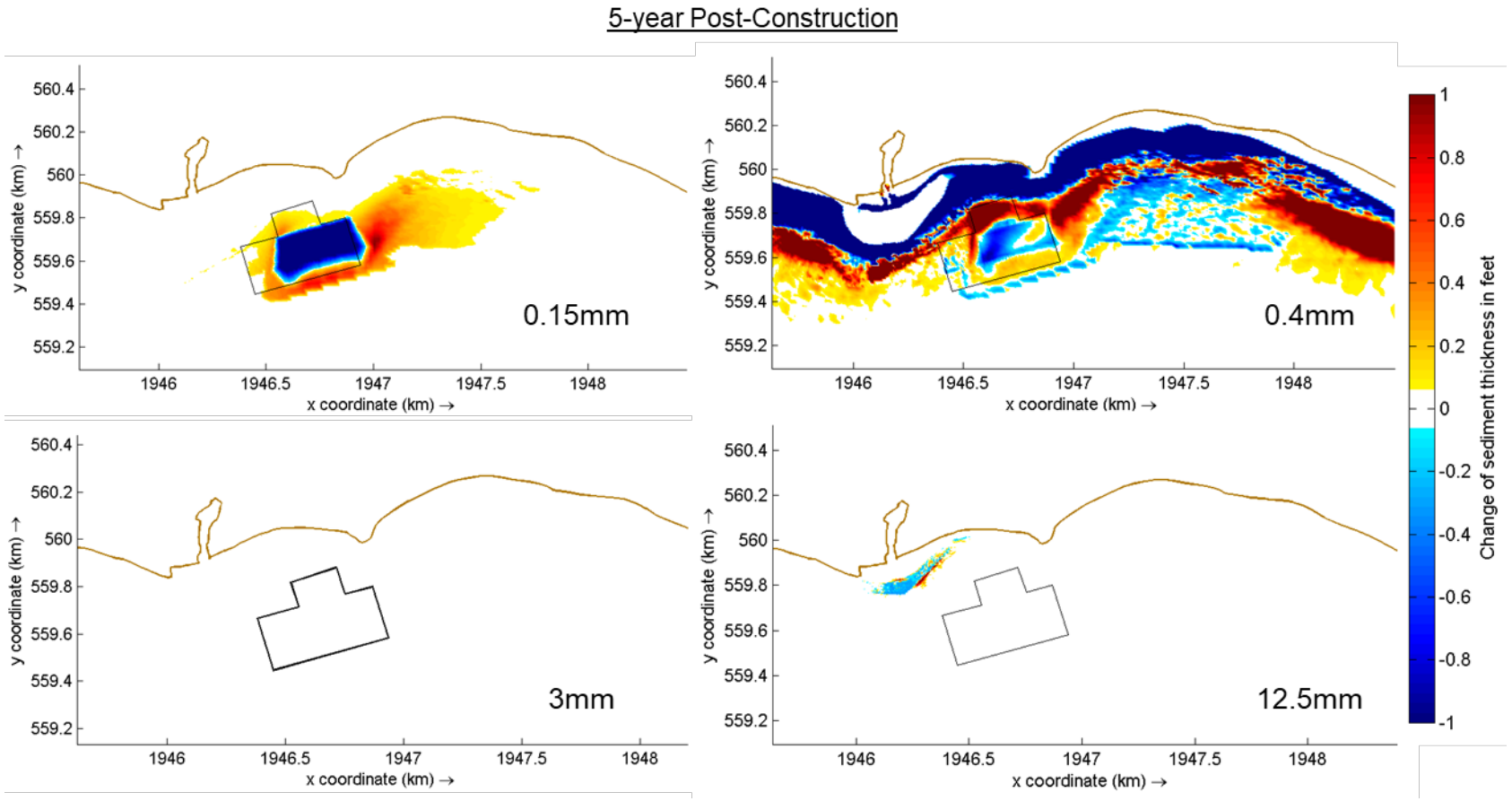
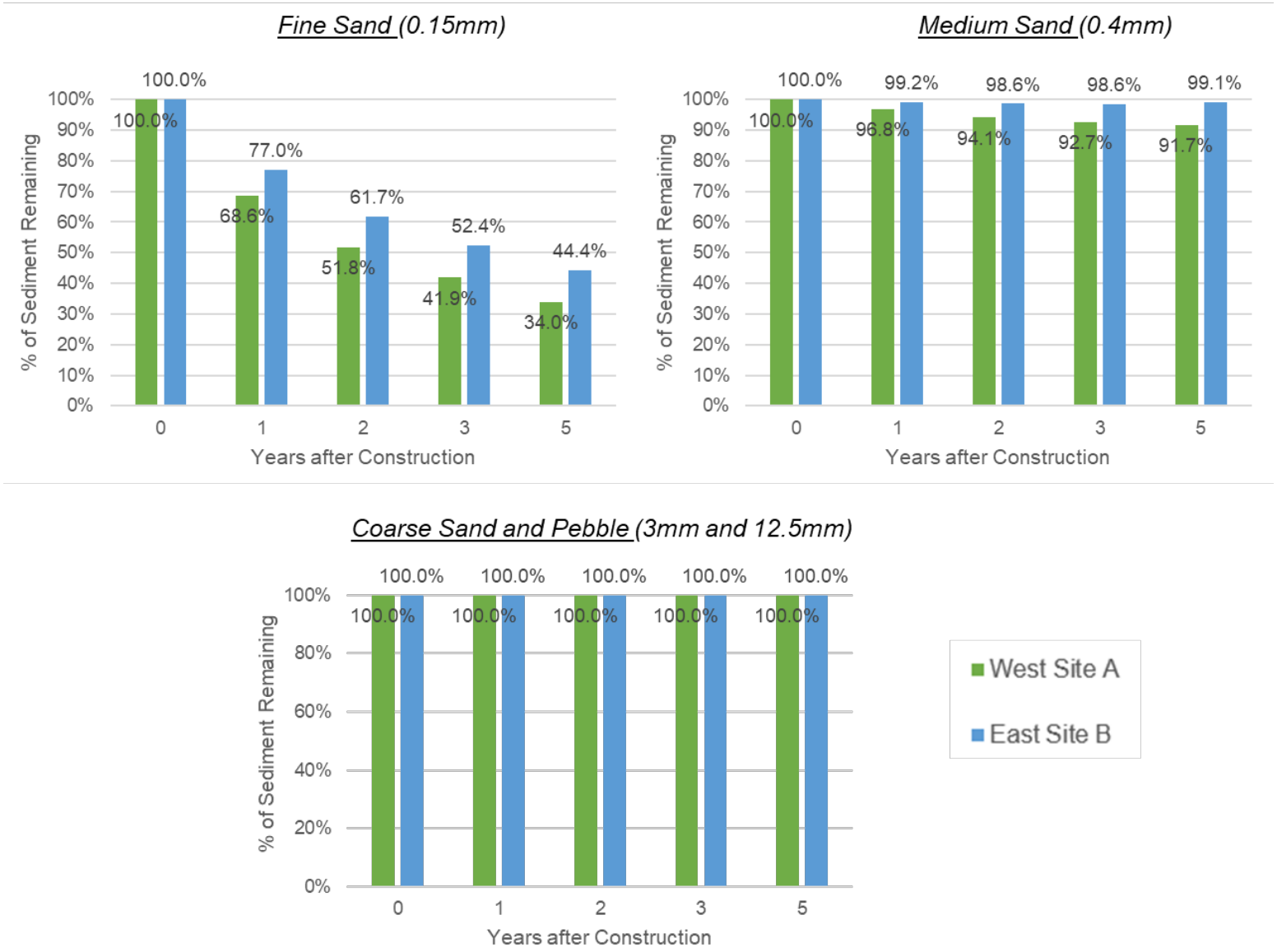


FIGURE 4.39: SEDIMENT REMAINING PERCENTAGES BY SIZE CLASSES AT THE BEGINNING, 1-YEAR, 2-YEAR, 3-YEAR, AND 5-YEAR AFTER CONSTRUCTION



5 Conclusions and Recommendations

A total of five nearshore sediment placement sites were modeled in this study. The initial site was abandoned because of its footprint covering the existing marine habitats, such as EFH and HPAC. The four revised site alternatives were then studied for their long-term morphology changes as well as impacts due to short-term storm events.

The deposition from the revised sites is generally less than 2 ft of sediment 5 years after construction under tides and typical annual wave conditions. Such a depth change is within the seasonal bathymetry changes observed in the area. There is no significant deposition within the sensitive marine habitats surveyed in 2023. The sediment transport modeling of the revised mound sites after the 100-year storm event (January 1988 event) presents a similar 2-ft deposition depth over the marine habitats. However, such sediment deposition is considered a short-term impact occurring within a few days of an infrequent disastrous 100-year storm event. These sediments are expected to migrate over time, unburying the habitat and allowing for recovery to pre-placement conditions.

The quantities of the sediments remaining on-site over time were presented for West Site B. The results demonstrate that fine sediments will move out of the mound while coarse sediments will stay. Under the typical modeled conditions, there is no sediment loss or gain at the site when the grain size is equal to or larger than 3mm. For the movable sediment (fine and medium sand), the lost sediment in the first year is almost double that of the second year. As time passes, the sediment loss is expected to be even smaller.

5.1 Recommended sediment placement site

The pros and cons of the initially proposed site and the four revised placement alternative sites are discussed from four aspects: constructability, surf impacts, marine habitat impacts, and beach nourishment benefit.

- Constructability:
  - The sites with fixed mound top elevation (West Site B and East Site B) are relatively easy to manage quantities during construction.
  - The mound placement height is less for East Site A than West Site A (5.8ft vs. 8.1ft). West Site A would require two lifts for placement versus one for East Site A; hence, slightly less construction effort is required with a smaller mound height. The initially proposed site will have a uniform 9.2 ft placement, and it will also require two lifts.
  - Placement at Mastro's Point is not recommended because of its high wave energy, which will damage construction equipment.
- Surf impacts:
  - The east sites (initially proposed site, East Site A and East Site B) avoid the potential impacts to the surf break, compared to the two west sites as it is away from the popular surfing spot.
  - West Site B has a shallower top elevation than East Site B (13.5ft NAVD88 vs 15ft NAVD88), which could have more impact to surfing.
- Impacts to marine habitats:
  - The initially proposed site will have initial placement impacts to the habitats on the northeast corner. The accumulative sand deposition is also deeper compared to the four new sites. However, the deposition occurs gradually, so habitats will have time to adapt.
  - Sediment deposition depth outside of the placement area is similar among all four new sites.
  - The east sites (East Site A and East Site B) have "buffer areas" on both sides, hence lower risks than the west sites.
- Beach nourishment benefit:
  - The modeling results indicate that the benefit of beach nourishment in terms of sand volume dispersed ranges from 15,400 cy to 85,200 cy 5-year post-construction under the average wave conditions. The initially proposed site will provide the best benefits compared to the four new

sites. The model predicted that 85,000 cy of sediment will be mobilized and transported to the downcoast beaches. The rank for the 4 new sites is West Site A, West Site B, East Site A and East Site B, and their corresponding sediment transport volumes are 35,800, 28,200, 17,900, and 15,400 cy, respectively.

- The benefit (sediment dispersal) will be more under higher wave conditions compared to the average conditions since more sediment can be mobilized and transported under the higher wave conditions.
- The materials not dispersed over the 5-year modeling period are not lost and still within the littoral zone and will be mobilized under larger wave storms and lower tidal conditions. Hence, the down coast beaches will still benefit from it.
- Another benefit of material remaining at the placement site is causing larger waves (with wave height above 17ft) breaking further away from the shore and reducing wave impacts to the beaches. These large swells are higher than the surfable swell size ranging from 1-15ft (or ankle-shin height to triple overhead) in Topanga Point based on the recent survey results, so it should not impact the surfing, especially for the initially proposed placement site and new East placement sites since they are far away from the surf area.

TABLE 5.1: PROS AND CONS OF THE FOUR REVISED PLACEMENT SITES

Site Option	Pros	Cons
Initially proposed site	• Best beach nourishment benefit • Away from surf break	• Temporary Habitat impacts
West Site A	•	• Closer to the Point, controversy with surfing impacts • Deeper initial placement depth (8.2') • Low benefit to beach nourishment
West Site B	• Easy for construction with fixed mound top, milder slope than site A	• Closer to the surf break, controversy with surfing impacts • Low benefit to beach nourishment
East Site A	• Away from surf break • Shallower placement depth (6')	• Low benefit to beach nourishment
East Site B	• Easy for construction measurement with fixed mound top, milder slope than site A • Away from surf break	• Low benefit to beach nourishment

In summary, materials placed in a shallower water depth will be dispersed faster such that the down coast beaches will benefit from it more and earlier. The initially proposed site provides the best benefit in terms of beach nourishment, although it will have some initial impacts to the sand dollar and sand pansy beds. Those habitats are colonized recently after October 2022 survey. Hence, the impact is likely temporary, and the habitat will recover after the placement. The East Site placement alternatives have the least impact on habitats and surfing, but with less immediate benefit in terms of beach nourishment.

5.2 Q&A

The study is performed to address questions from the public. Below are answers to these questions:

- **Where will the material go once placed?**

Once the material is placed, coarse materials will remain at the site, and part of the fine material will be transported onshore and alongshore towards east. The material will show up on both sides of Mastro's Point and will move further east (downcoast direction) and disperse over time in the long term. Some of the coarser materials are expected to stay at the placement site longer.

- **How much time will it take for the mound to disperse/reach equilibrium?**

Overall, the dispersion of the sediment placed on the revised sites will not exceed 15% of the original amount (excluding silt and clay) after 1 year. The dispersion is about 25% for the initially proposed site. The

amount of sediment dispersed reduces year by year and will reach equilibrium or close to it after five years under the average wave conditions. The sediment loss between Year 4 and Year 5 is only 1% compared to the amount of original placed sediments. However, a large wave event can suspend coarser surface armor materials and reveal finer underlayers that will then be suspended and transported by waves. The placed materials will be within the littoral cell and benefit the sand starving coast no matter how long it will take for these materials to disperse.

- **How much coarse material is expected to remain at the placement location (area, thickness, volume)?**

The model predicts that coarse materials with grain size >=3mm will remain on the placement site under modeled wave conditions for more than 5 years.

- **Which areas would be expected to change substrate (e.g., sandy bottom to gravely bottom)?**

The substrate at the placement site will be a mixture of sand and small gravels and is not expected to be different than seabed materials in the current conditions. Majority of placed materials will remain on site, including part of the fine sand materials, after 5-years under the average wave conditions. Taking West Site B as an example, about 60% of the fine sand and 90% of the medium sand still remain in place two years after construction. The excavated material from Topanga Lagoon has only 17% gravel (grain size between 9.5mm and 37.5mm), and these gravel/cobbles are much smaller than those currently present at Topanga Point. The size of cobbles/boulder at Topanga Point ranges from a few inches to a foot or larger. Therefore, the grain sizes of placed material are well within the grain size range of materials currently present in the sea bed. Hence, it is not expected that the placed material would change the substrate.

- **Is direct placement on Cove beach or within the swash zone along the Cove beach feasible?**

It is not feasible to place excavated material on Topanga Beach (Cove) or within the swash zone along Topanga Beach. The excavated material is dark brown in color and rigid in shape. It has as high as 30% silt and clay based on the sediment sampling data. If placed in the swash zone along Topanga Beach, potential turbidity during placement can significantly impact recreational activities. There is no feasible solution to separate the fine from the material. Also, it is not feasible to place the material in the swash zone due to potential to harm sensitive marine habitats present, including EFHs and HAPCs. Placing materials west of Topanga Point is also not a good option, as materials drifting down coast could lead to turbidity in the popular surf break.

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Appendix D

Geotechnical Investigation Report Visitor Services at the Topanga Ranch Motel Site, Topanga Lagoon Restoration Project, Malibu, CA (GeoPentech 2022)

The Appendices herein contain supporting information. These Appendices contain highly detailed figures and other graphic information, which are difficult to translate for screen reading software; therefore, the Appendices have not been translated into an auditory format. If you have a disability and/or have difficulty accessing any material in this document, please contact us by mail, email, or telephone, and we will work with you to make all reasonable accommodations. Please indicate 1) the nature of the accessibility need; 2) your preferred format; 3) the material you are trying to access and its location within this document; and 4) how to reach you if questions arise while fulfilling your request. You can direct your requests to:

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Geotechnical Investigation Report
Visitor Services at the Topanga Ranch Motel Site
Topanga Lagoon Restoration Project
Malibu, California

October 19, 2022

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TABLE OF CONTENTS

1 INTRODUCTION 3
1.1 General 3
1.2 Project Description 3
1.3 Purpose 4
2 SCOPE OF WORK 4
3 FIELD INVESTIGATION AND LABORATORY TESTING 4
3.1 Previous Field Investigation and Laboratory Testing 4
3.2 Current Field Investigation and Laboratory Testing 5
4 GEOLOGIC AND SUBSURFACE CONDITIONS 7
4.1 Regional Geology and Seismicity 7
4.2 Surface Conditions 7
4.3 Local Geologic Conditions 8
4.4 Groundwater 8
5 POTENTIAL GEOLOGIC AND SEISMIC HAZARDS 9
5.1 Surface Fault Rupture 9
5.2 Seismic Shaking 9
5.3 Liquefaction Potential 9
5.4 Slope Instability and Lateral Spreading Potential 10
5.5 Seismically-Induced Settlement 10
5.6 Flooding 10
5.7 Erosion 10
5.8 Subsidence 11
5.9 Seiches and Inundation (Water Storage Facilities) 11
5.10 Tsunami 11
5.11 Corrosion Potential 11
5.12 Other Geologic Hazards 11
6 PRELIMINARY GEOTECHNICAL RECOMMENDATIONS 11
6.1 Key Geotechnical Considerations 11
6.2 Geotechnical Mitigation Options 12
6.3 Future Work 14
7 LIMITATIONS 14
8 REFERENCES 15

TABLES

1 Summary of Boring Geologic Data
2 Summary of Boring Groundwater Data

FIGURES

1 Project Location Map
2 Alternative 2 – Topanga Lagoon Configuration
3 Alternative 3 – Topanga Lagoon Configuration
4 Alternative 4 – Topanga Lagoon Configuration
5 Project Site Plan
6 Motel Site Plan
7 Project Geologic Map (Dibblee, 1992)
8 Site Fault Map (CGS, 2020)
9 Site Cross Sections A
10 Site Cross Sections B
11 Site Cross Sections C
12 Site Cross Sections D
13 Earthquake Zones of Required Investigation (CGS, 1997 and 2018)
14 FEMA Flood Insurance Rate Map

APPENDICES

A 2002 Field Investigation and Laboratory Tests (GeoPentech, 2003)
B 2021 Field Investigation and Laboratory Tests
C Slope Stability Analyses

1 INTRODUCTION

1.1 General

This geotechnical investigation report was prepared by GeoPentech to support the planned California Department of Parks and Recreation (CDPR) Visitor Services planned at the Topanga Ranch Motel site for the Topanga Lagoon Restoration Project (Project) in Malibu, California. The Project location is shown on the map on Figure 1. This work was completed in accordance with the Agreement for Professional Services between the Resource Conservation District of the Santa Monica Mountains (RCDSMM) and GeoPentech dated October 7, 2021 and GeoPentech's proposal dated October 6, 2021.

1.2 Project Description

The Pacific Coast Highway Bridge (PCH Bridge) spans across Topanga Lagoon and was built in 1933 by partially filling in the lagoon at the time. The Topanga Lagoon Restoration Project is a coordinated multiagency plan that seeks to expand the existing lagoon footprint by removing the historically placed fill. Project alternatives include a component for Visitor Services with potential overnight accommodations. The Visitor Services would be located in the area of the existing Topanga Ranch Motel (Motel) and would make use of the historic Motel structures.

Four Project alternatives are currently being considered of which only Alternatives 3 and 4 include a Visitor Services component at the Motel site. Alternative 1 is the "No Project/ Managed Decline" alternative. Alternative 2 removes the Motel to provide the maximum restoration habitat. Alternatives 3 and 4 include a Visitor Services component at the Motel site. Alternative 2 through 4 are described below.

- Alternative 2: All Motel structures would be removed. The existing fill pad would be reshaped and completed with a parking lot. The proposed grading would produce a 2:1 slope wrapping around the north and west sides of the parking lot. One existing concession (restaurant lessee) would be remodeled and continue operation in place. The proposed Alternative 2 configuration and grading plan are presented on Figure 2.
- Alternative 3: Portions of the Motel structures would be restored in their historic configurations, including relocation of some of the structures from the west slope, which is currently experiencing flood and bank erosion. One existing concession (restaurant lessee) would be remodeled and continue operation in place. The proposed grading would produce a 2:1 slope on the west side of the pad. The proposed Alternative 3 Visitor Services configuration and grading plan are presented in Figure 3.
- Alternative 4: The portion of the historic Motel east of the current motor court access lane would be retained. Adjacent parking would be adjusted, and a remodeled restaurant lessee would continue to operate. The proposed grading would produce a 2½:1 slope on the west side of the pad. The proposed Alternative 4 Visitor Services configuration and grading plan are presented in Figure 4.

1.3 Purpose

The purpose of this investigation was to collect geotechnical and geologic data to evaluate the subsurface conditions underlying the proposed Visitor Services area at the Motel site. The results of this study were used to evaluate slope stability and subsurface variability for developing preliminary foundation and soil stabilization recommendations. These recommendations should be further developed and finalized at later stages of the project once an alternative is selected.

2 SCOPE OF WORK

GeoPentech's scope of work included the following:

- Reviewed relevant previous reports, including boring logs and laboratory test data.
- Performed a field investigation that included advancing hollow stem auger borings and cone penetration tests (CPTs),
- Performed laboratory tests on soil samples collected during the field investigation,
- Evaluated site subsurface conditions, geologic setting, and geologic-seismic hazards and their potential impact on the subject project,
- Performed engineering evaluations of the geotechnical data to develop preliminary recommendations for slope stability and foundation design,
- Prepared this report to present the results of the geotechnical investigation.

3 FIELD INVESTIGATION AND LABORATORY TESTING

3.1 Previous Field Investigation and Laboratory Testing

A previous field investigation and associated physical laboratory test program was completed at the site by GeoPentech in 2002 (GeoPentech, 2003). The 2002 field investigation included a total of seven hollow stem auger borings (B-1 through B-7, B-7A, and B-8 through B-10) and four CPTs (CPT-2, CPT-3, CPT-7, and CPT-7A). The extents of the Motel site and the locations of the 2002 borings and CPTs are shown on Figures 5 and 6. Elevations referenced in previous investigations by GeoPentech (2003) are based on NGVD 29. Within this report, GeoPentech (2003) elevations were converted to North American Vertical Datum of 1988 (NAVD 88) using the topography shown on Figure 5. Additional details of the 2002 field investigation and laboratory testing are summarized below.

2002 Hollow Stem Auger Borings: The 2002 borings were drilled to total depths ranging between about 19½ and 35½ feet below ground surface (bgs) (about Elevation +18½ feet above mean sea level (MSL) to about -1½ feet below MSL). The borings were advanced using a truck-mounted CME 85 drill rig using an 8-inch outside diameter hollow-stem auger. During drilling, drive-samples were collected at 2-foot intervals using an 18-inch-long modified California sampler. The modified California sampler cutting shoe and barrel had nominal inside diameters of 2.38 and 2.50 inches, respectively, and a nominal outside diameter of 3 inches. The modified California sampler was driven 18 inches or to refusal into the bottom

of the borehole by repeatedly dropping a 140-pound hammer 30 inches. The 2002 boring logs are presented in Appendix A.

2002 CPTs: The CPT investigation consisted of pushing an instrumented cone-tipped probe into the ground while simultaneously recording the resistance to penetration at the cone tip and along the friction sleeve. The CPTs were advanced to total depths between about 34 feet and 58 feet bgs (about Elevation 0 to -22 feet MSL). Appendix A presents the 2002 CPT sounding data. The CPT plots in Appendix A show the measured tip resistance, local friction, and friction ratio, as well as the estimated soil behavior type and interpreted SPT blow counts (N values).

2002 Laboratory Testing: Selected soil samples collected during the 2002 field investigation were tested to evaluate their physical properties. Physical tests performed included 41 grain-size distribution (ASTM D422) and 12 specific gravity (ASTM D854) tests. The laboratory test results are included on the boring logs in Appendix A.

3.2 Current Field Investigation and Laboratory Testing

Eleven additional hollow stem auger boreholes (HSA-M1, HSA-M2, HSA-1 through HSA-8, and HSA-S1) and five additional CPTs (CPT-M1 through CPT-M5) were completed by GeoPentech between December 20 and 22, 2021 to supplement the data collected from the previous 2002 field investigation. The approximate locations of the 2021 borings are shown on Figures 5 and 6. Additional details of the current field investigation are summarized below.

2021 Hollow Stem Auger Borings

The 2021 borings were spatially located to fill in gaps of the 2002 borings, collect samples for geotechnical testing, and collect subsurface data to evaluate potential wastewater system options adjacent to Topanga Canyon Boulevard (Boring HSA-S1). The total depths of the 2021 borings ranged between about 14 and 51 feet bgs (about Elevation +7½ feet above MSL to about -13 feet below MSL). The 2021 borings were performed under the supervision of a geologist who monitored the drilling operations and prepared a field record of soils observed and drilling conditions. Prior to drilling, the boring sites were cleared of utilities by searches performed by Underground Services Alert (USA) member agencies. The borings were advanced using 8-inch outside diameter hollow-stem auger drilling equipment. The drilling was subcontracted to Martini Drilling, who provided a truck mounted CME-75 Diesel HT rig, crew, and supplies.

During drilling of HSA-M1 and HSA-M2, drive samples were collected at 5-foot intervals using either an SPT sampler or a Modified California (ModCal) sampler. During drilling of HSA-1 through HSA-8 and HSA-S1, drive-samples were collected at 2½-foot intervals using an 18-inch-long Standard Penetration Test (SPT) sampler. SPT and ModCal samples were taken by driving a sampler approximately 18 inches into the soil at the bottom of the boring using a 140-pound automatic-trip hammer falling approximately 30 inches.

The modified California sampler cutting shoe and barrel have nominal inside diameters of 2.38 and 2.50 inches, respectively, and a nominal outside diameter of 3 inches. The modified California sampler was driven 18 inches or to refusal into the bottom of the borehole by repeatedly dropping a 140-pound hammer 30 inches. The SPT sampler cutting shoe and barrel

have nominal inside diameters of 1.375 and 1.50 inches, respectively, and a nominal outside diameter of 2.00 inches. Liners were not used. The SPT samples were placed in plastic bags, labeled, and sealed. The ModCal sampler cutting shoe and barrel have nominal inside diameters of 2.38 and 2.50 inches, respectively, and a nominal outside diameter of 3 inches. Nominal 1-inch long, 2.4-inch diameter steel rings were used to line the barrel. The ModCal rings were slid into storage tubes and sealed with tape to help preserve the moisture content of the samples.

After recovering the sample, the geologist recorded sample characteristics (depth interval, sample type, and description of the recovered material) on a field log and sealed and labeled the sample for transport to NMG or AP Engineering and Testing for laboratory testing. The soil descriptions noted on the field logs were visually classified in accordance with the Unified Soil Classification System. Field observations were later updated with laboratory test results as appropriate. A key to the log of boring and the boring logs are included in Appendix B.

Upon completion of drilling, logging, and sampling, all borings were immediately backfilled with cement-bentonite grout. After the borings were backfilled, the ground surface at each location was restored to its original condition.

2021 CPTs

The CPTs were performed to supplement information collected in the borings and to further evaluate subsurface conditions at the site. All work was performed under the supervision of an engineer who monitored the CPT operations. All five CPTs were advanced to refusal. The final depths of all CPTs ranged from about 17 to 39 feet bgs (about Elevation +18 feet above MSL to about Elevation 0 feet MSL). Pore pressure dissipation tests were performed at the base of CPT-M3 (about 39 feet bgs) and CPT-M5 (about 25 feet bgs), and the groundwater level was measured at about 31½ and 21½ ft bgs, respectively. The CPTs were subcontracted to Gregg Drilling, who provided all equipment, crew, and supplies. Details of the CPT methods and results are reported in Appendix B.

2021 Laboratory Testing

Laboratory tests were performed on selected samples obtained from the 2021 borings to evaluate pertinent geotechnical properties of the soils. The laboratory testing program included moisture content (6 total), dry density (6 total), Atterberg limits (5 total), No. 200 sieve wash (5 total), grain size distribution (37 total), direct shear (5 total), and corrosion (1 total). The geotechnical testing was conducted at the laboratory facilities of NMG and AP Engineering and Testing, Inc. in Irvine and Pomona, California, respectively. The tests were performed in general accordance with applicable procedures of ASTM International (ASTM). The results of laboratory tests are summarized on the laboratory data sheets in Appendix B. The tests and a portion of the results are also noted on the boring logs for convenience.

4 GEOLOGIC AND SUBSURFACE CONDITIONS

4.1 Regional Geology and Seismicity

The Topanga Lagoon Restoration Project is in California's Transverse Ranges geomorphic province, which is characterized by east-west trending mountains, oblique to the northwesterly-trending coastline and mountains of the adjacent Coast Ranges and Peninsular Ranges geomorphic provinces. The Project is located at the southern base of the Santa Monica Mountains along the shoreline adjacent to the Pacific Ocean. The Motel is located at the mouth of Topanga Creek. The Motel site is underlain by up to about 30 vertical feet of fill material that was placed across the historic 30-acre Topanga Lagoon in the 1930s to construct PCH.

Figure 7 shows the Project on a geologic map of the area by Dibblee (1992). As indicated on Figure 7, the site area is underlain by Holocene-age surficial sediments, including active stream channel deposits (Qg), beach sand (Qs), and alluvium (Qa). As described by Dibblee (1992), the surficial sediments generally consist of sand, gravel, silt, and clay. As noted above, fill is also currently present at the site; however, this fill was not mapped separately on Figure 7. The surficial sediments at the site are underlain by upper Cretaceous-age sedimentary rocks of the Tuna Canyon formation (Kss, Ksh, and Kcg). The Tuna Canyon Formation consists of marine and nonmarine sandstone with shale and conglomerate beds. Miocene-age intrusive rocks (db) generally consisting of diabase and basalt have also been mapped in the site area.

The Project site is in a seismically active region of southern California, as evidenced by the 1987 M6 Whittier earthquake and the 1994 M6.7 Northridge earthquake. Figure 8 shows the site relative to mapped active faults in the region identified by the California Geological Survey (CGS, 2020). As shown on Figure 8, significant faults near the site include the Holocene active Santa Monica fault (located about ¾ km to the south), the late Quaternary active Anacapa-Dune fault (located about 3 km to the south), the late Quaternary active Malibu Coast fault (located about 6½ km to the east), the Holocene active Newport Inglewood fault (located about 15 km to the east), and the Holocene active Hollywood fault (located about 16 km to the east). Based on the seismic setting, the site is susceptible to strong seismic shaking during the design life of the Project.

4.2 Surface Conditions

The northern and southern extents of the Project slope up into the Santa Monica Mountains and down into the Pacific Ocean, respectively. Figures 9 through 12 presents Cross Sections A through D which include the existing ground surface (Alternative 1) and the proposed Alternatives 3 and 4 ground surfaces through the north and west slopes of the Motel site. The locations of the cross sections are shown on Figures 5 and 6. As shown on Figures 9 through 12, the existing ground surface at the Motel site generally slopes south from about Elevation 38 to 32 feet MSL. The existing ground surface along the north side of the site slopes down to the historic Topanga Lagoon at an angle of about 1½:1 (Horizontal to Vertical), and the existing ground surface along the west side of the site slopes down to Topanga Creek at angles between about 1:1 and 1½:1.

As indicated on Figures 9 through 12 and discussed in Section 1.2, Alternatives 3 and 4 contain vertical retaining walls that wrap around the site to support the PCH Bridge and the historic

Motel structures on the north and west sides (see Figures 3 and 4, respectively). It is noted that the proposed Alternative 3 and 4 slopes are shallower than the current ground surface (Alternative 1).

4.3 Local Geologic Conditions

Current and previous investigations completed for the Project encountered artificial fill, Beach Deposits, alluvium, and bedrock (see Figures 5 and 6 for boring locations). Descriptions of the geologic units are summarized in Table 1 and discussed below.

Artificial Fill: Man-placed artificial fill was encountered within Motel vicinity from the ground surface to depths between about 8 and 30 feet bgs (about Elevation +12 to +3½ feet MSL). Fill was encountered in HSA-S1 adjacent to Topanga Canyon Boulevard to a depth of about 40 feet (about Elevation +24 feet MSL). A portion of this fill is planned to be removed in the Project area as part of the Topanga Lagoon restoration. The fill is undocumented, and we are unaware of any construction records indicating how the fill was placed. The fill generally consisted of medium dense to very dense, moist, silty sand with gravel (SM) to silty/clayey sand with gravel (SM/SC). The observed gravel predominantly consisted of fine to coarse fragments of sandstone and shale. Occasional sandy gravel (GM) and stiff to hard, silt (ML) and clay (CL, CH) zones generally a few feet thick were observed.

Beach Deposits: Beach Deposits were encountered below the fill to a maximum depth of about 51 feet bgs or Elevation -13 feet MSL. The Beach Deposits predominantly consisted of medium dense to dense, sand (SM, SC, SP-SC, SP) with occasional silt (ML) and gravel layers (GM, GC). An approximately 2-foot-thick layer of loose, silty sand (SM) was encountered at the top of the Beach Deposits within B-5.

Alluvium: Within HSA-S1, alluvium was encountered below the fill at a depth of about 40 feet bgs or Elevation +24 feet MSL. The observed alluvium consisted of dense, silty sand (SM) with fine gravel.

Bedrock: Bedrock was encountered below the fill within HSA-1 at a depth of approximately 30 feet bgs or Elevation +8 feet MSL. The bedrock consisted of hard shale.

4.4 Groundwater

During the current and previous field investigations, the groundwater surface was observed at the time of drilling within all boreholes except HSA-1, HSA-3a, HSA-4, HSA-7, HSA-8, HSA-S1, B-4, B-6, and B-9. Generally, the groundwater surface was encountered in the Beach Deposits between about Elevation +10 to +3½ feet MSL. Groundwater observations within borings completed at the site are summarized in Table 2.

5 POTENTIAL GEOLOGIC AND SEISMIC HAZARDS

An evaluation of the potential geologic hazards is presented in the following sections.

5.1 Surface Fault Rupture

The Project site is not located within a currently established Alquist-Priolo Earthquake Fault Zone based on a review of the Earthquake Zones of Required Investigation for the Topanga Quadrangle (CGS, 1997 and 2018). Additionally, the site is not located within 1,000 feet of a mapped Holocene-active fault based on a review of mapping by CGS (2020). Therefore, the site is not considered susceptible to surface fault rupture hazards.

5.2 Seismic Shaking

The Project is within a seismically active region and the site could be subjected to strong ground shaking in the event of future earthquakes generated by the various active or potentially active faults mapped in the region, or on 'blind' faults or faults with little or no surface expression. This investigation did not include a site-specific evaluation of ground motions. Seismic design parameters as per the provisions in the 2019 California Building Code (CBC, 2019) and the ASCE 7-16 Standard are provided in Section 6.1.

5.3 Liquefaction Potential

Liquefaction occurs when relatively loose, saturated, non-cohesive soils undergo a temporary loss of stiffness and strength in response to strong ground shaking. Liquefaction potential is greatest where the groundwater level is shallow, and submerged, loose, fine sands occur within a depth of about 50 feet bgs or less. Liquefaction potential decreases as clay and gravel content increase. Also, higher ground accelerations and shaking durations during earthquakes increase the liquefaction potential.

According to the Earthquake Zones of Required Investigation for the Topanga Quadrangle (CGS, 1997), the PCH Bridge site is located within an area identified as having a potential for liquefaction (see Figure 13). As noted previously, portions of the artificial fill currently present at the site will be removed down to the underlying Beach Deposits as part of the proposed Topanga Lagoon restoration. Based on subsurface data collected, the groundwater surface was encountered within the Beach Deposits and will be shallower than 50 feet bgs (i.e., between about Elevation +7½ to 2 feet MSL). Additionally, the Beach Deposits are Holocene-age and were found to be predominately composed of sands and silty sands with local layers of finer grained silts and clays. The sandy soils below the groundwater surface appear to be predominantly medium dense to dense based on equivalent SPT-N estimates calculated from modified California sample blow counts. Relatively low blow count loose to medium dense sands were encountered at the top of the Beach Deposits within B-5, B-7, HSA-M1, HSA-M2, HSA-2, HSA-3b, and HSA-5, which indicate potential susceptibility of the top of beach deposits to liquefaction. The CPT results was also in general agreement with the range of equivalent SPT-N in saturated sandy Beach Deposits. Based on the available information discussed above and the geologic setting, the upper about 2 to 3 feet of beach deposits currently underlying the site is susceptible to liquefaction.

5.4 Slope Instability and Lateral Spreading Potential

Slope instability hazards are generally highest in areas of moderate to steep terrain that are underlain by unfavorably oriented geologic discontinuities. Lateral spreading occurs when soils liquefy and slide or flow downhill, or breach an open slope face, resulting in permanent ground deformation. Thus, open slope faces bearing on or composed of materials susceptible to liquefaction are also potentially susceptible to slope instability and lateral spreading.

Landslides are mapped on the bedrock slopes outside the project area; however, no landslides are mapped at the Project site by Dibblee (1992) (see Figure 7). The site is also not located in a designated Earthquake-Induced Landslide Zone (CGS, 1997).

The slopes around Topanga Lagoon and Creek adjacent to the site are composed of artificial fill and alluvial sediments that may have the potential to slump or ravel over time. As discussed above, the site is susceptible to liquefaction hazards and contains open slope faces. Therefore, the potential for lateral spreading and slope instability exists at the site. Slope stability analyses were performed for existing conditions (Alternative 1) at the site. This evaluation included global stability analyses for the existing site configurations. The results of the analyses are presented in Appendix C and indicate that while the existing slopes have a static factor of safety greater than 1.5; there is a potential for slope instability and lateral spreading during a major seismic event.

5.5 Seismically-Induced Settlement

Seismically induced ground settlement is often caused when unsaturated loose to medium-dense granular soils are densified during ground shaking. While not prevalent, there are localized zones of loose to medium dense sandy soils encountered in the previous and current borings above the water table which could be considered susceptible to seismically-induced settlements.

5.6 Flooding

Topanga Lagoon is filled with water year-round. A natural sand berm is present most of the year across the downstream portion of Topanga Lagoon which creates a generally stagnant pool of water in the lagoon. The sand berm generally breaches during storm events establishing a surface connection between the lagoon and the ocean until the breach is closed again. According to Federal Emergency Management Agency (FEMA, 2021), the lagoon is located within a “Special Flood Hazard Area – Zone AE” with a base flood elevation of about +20 feet MSL (see Figure 14).

5.7 Erosion

Erosion is a concern within the Project area and the potential for erosion is highest in areas located close to Topanga Creek and adjacent to slopes. The potential for erosion can be reduced by controlling/diverting surface runoff (e.g., with a drainage channel) to carry water away from areas of concern. The potential for erosion can also be mitigated by maintaining existing vegetation and planting additional native vegetation, if possible.

5.8 Subsidence

Ground surface subsidence generally results from the extraction of fluids or gas from the subsurface that can result in the gradual lowering of the overlying ground surface. Subsidence can also occur when subsurface peat deposits oxidize and undergo volume loss. As there are no known ongoing extractions of oil or water that would lead to subsidence at the site, and the subsurface soils are not known to contain significant quantities of peat, the potential for subsidence at the site is considered low.

5.9 Seiches and Inundation (Water Storage Facilities)

This potential hazard is associated with seiches (water waves created when a body of water is shaken that have the potential to overtop a water storage facility) and inundation due to water storage facility failure. The site is not located within a mapped dam inundation zone; therefore, inundation is not considered a hazard.

5.10 Tsunami

A tsunami is a sea wave generated by a large submarine landslide or an earthquake-related ground deformation beneath the ocean. The site will be below an elevation of +40 feet MSL, and the site is located within ½ mile of the Pacific Ocean coastline. Therefore, the risk for tsunami inundation does exist at the site.

5.11 Corrosion Potential

A sample from the field investigation (HSA-M1) was tested for minimum resistivity, sulfates, chlorides, and pH during the current investigation (laboratory results are presented in Appendix D). Based on the results of these tests, the tested soil is not considered corrosive for structures based on guidelines from the California Department of Transportation (2021). Irrespective of the corrosion test results, the site is near the beach and associated salty water, and therefore, the site soils may be susceptible to corrosion. We recommend that a corrosion consultant or project civil engineer review the results of corrosion tests and provide detailed recommendations for underground metallic pipes and below-grade structures if needed.

5.12 Other Geologic Hazards

Other geologic conditions including oil wells, potential hazardous oil and gas, volcanic eruption, expansive soils, and collapsible soils are not considered to be hazards at the site.

6 PRELIMINARY GEOTECHNICAL RECOMMENDATIONS

6.1 Key Geotechnical Considerations

Based on our understanding of the project and the results of our investigation, the proposed development is feasible from a geotechnical point of view. Key geotechnical considerations are discussed below:

Liquefaction, and slope instability: Liquefaction potential of the upper about 2 to 3 feet of beach deposits exists at the site. Liquefaction of this material could lead to lateral spreading and slope instability at the site during a major seismic event.

Undocumented Fill Soils: The site is underlain by up to about 30 feet of fill soils. The fill is undocumented, and we are unaware of any construction records indicating how the fill was placed. As such, its performance under the proposed development is uncertain.

Development alternatives should include provisions to address both these considerations. The following presents an overview of the mitigation options.

6.2 Geotechnical Mitigation Options

Mitigation Measures for Liquefaction, and slope instability

There are several options in mitigating liquefaction and slope instability that can be applied to some or all of the alternatives as described below. Project constraints and opportunities should be considered to select the most appropriate option for the selected alternative. The options include:

- **No mitigation:** With this option, no mitigation measures will be adopted to address liquefaction and slope instability, and therefore, the risk of instability in a major seismic event is accepted by the project team. This option could be viable for Alternative 2, where only parking lots are planned at the site, with no structures planned at the site. This option is currently not considered feasible for Alternatives 3 and 4, unless additional investigation, evaluation, and analysis is undertaken to quantify the impacts on the project in terms of estimated displacements, those impacts are reviewed by the project team and considered acceptable for the project objectives.

- **Remove and Replace:** With this option, all undocumented material and liquefiable soils will be removed and replaced with engineered soils. This involves the removal of about 30 ft of the material at the site and replacement as engineered fill soils. From a geotechnical point of view, this option is feasible for all the alternatives, but may not be feasible due to other project constraints.

- **Ground Improvement:** Ground improvement methods such as deep soil mixing or deep dynamic compaction can be used to improve the liquefiable soils and address the instability concerns without excavating the soils. The ground improvement methods seek to improve the engineering properties of the soils in-situ by densification, mixing with cementitious material, or other means. Depending on the specifics of the method, some portion of the soils will only need to improve to meet the objectives, and full improvement of all the soils may not be needed. The improvement, however, should extend to liquefiable soils below the existing fill soil. From a geotechnical point of view, this option is feasible for all the alternatives, but may not be feasible due to other project constraints.

- **Perimeter Retaining Structure:** With this option, a retaining structure will need to be designed and constructed to address potential impacts of the liquefaction within the project site. With this option, the risk of instability outside of the wall in a major seismic event is accepted by the project team. Various retaining systems could be viable for this alternative based on the specific configuration of the wall, demands, project

constraints, and other factors. These systems could include a secant pile system with or without bracing, a sheet pile system with or without bracing, or a cast-in-place wall founded on piles. The walls can be exposed or buried below the soil slopes to meet project needs. From a geotechnical point of view, this option is feasible for all the alternatives, but may not be feasible due to other project constraints.

We understand that the project constraints may limit the implementation of one or some of these options for some project areas, and a combination of options may be adopted.

Foundation Options:

After mitigating the liquefaction and slope stability concerns, there are a few options for supporting the Visitor Center Buildings. Note that we understand mitigation of potential liquefaction and slope stability to eliminate residual hazards may not be possible within the project constraints. However, it is highlighted that we do not recommend the development of any habitable structures (Alternatives 3 and 4) for the project if slope instability concerns are not mitigated. With this context, the foundation options below address uncertainty associated with the performance of the undocumented fill and underlying beach soils at the site to various levels.

- **Remove and Replace:** With this option, all undocumented material and liquefiable soils will be removed and replaced with engineered soils. Visitor Center buildings can then be supported on shallow foundations such as spread or continuous footings. Using this approach, the residual risk of significant differential settlement under a design-level seismic event is considered to be negligible.

- **Deep Foundations:** Alternatively, the Visitor Center buildings can be supported on deep foundations, without removal and replacement of the undocumented material and liquefiable soils. The deep foundations (piles) should extend below the liquefiable layer(s) and derive resistance from the dense native deposits. With this option, the residual risk of differential settlement under a design-level seismic event is considered to be negligible.

- **Mat Foundations on Undocumented Fill:** Given the type and anticipated uses of the buildings at the Visitor Center and our understanding of potential project constraints, supporting the buildings on mat foundations on undocumented fill soils could be feasible depending on the expected level of performance. However, if this approach is selected, the subsurface conditions under individual buildings should be further investigated to develop an estimate of the differential settlement under static and seismic conditions so that the feasibility of this option can be quantitatively assessed. Using this approach, the risk of differential settlement under both gravity loads and during a seismic event exists, and some level of movement would have to be accepted by the project team after assessment to address life safety concerns. The performance criteria for this approach would need to be developed considering the project goals and public safety requirements.

It is noted that as discussed in Section 5, the potential risk of inundation exists at the site during a tsunami and possibly floods (depending on site elevation), and these hazards are not mitigated with the options outlined in this section.

6.3 Future Work

Detailed design recommendations should be developed for the selected project alternative and preferred mitigation options. GeoPentech will be available to develop such recommendations once the project team has considered and selected a project alternative and associated mitigation option(s). We consider this phase of the project a collaborative effort and will be happy to provide our opinion regarding initial design inputs on an as-needed basis to assist in developing the feasibility evaluations of different options. Such inputs would be anticipated to include:

- Seismic parameters,
- Foundation recommendations such as bearing capacity, mat foundation subgrade modulus, or pile support parameters,
- Earthwork recommendations,
- Shoring recommendations,
- Earth pressures for retaining structures,
- Paving recommendations
- Other aspects of the potential work as-needed.

Specific details of these inputs depend on the concept and configuration of the project alternative and site mitigation options selected. Once the concepts are available, we can evaluate the potential performance of the required elements and provide detailed design recommendations.

7 LIMITATIONS

The characterization of materials presented in this report are based upon our understanding of the project and the assumptions that the subsurface conditions do not deviate appreciably from what was observed in the field investigations. However, the possibility of different subsurface conditions cannot be discounted. If the locations, configurations, layout, or features of the proposed Topanga Lagoon Restoration Project are changed, or more site-specific geologic data is retrieved, then the characterization of materials presented in this report may not be applicable. It is the responsibility of the Owner to bring any such changes of the proposed project and any deviations of the known subsurface conditions to the attention of GeoPentech. In this way, a supplemental characterization of materials, if required, can be made without delay to the project.

Professional judgments presented in this report are based on an evaluation of the technical information gathered and GeoPentech's general experience in the fields of geology and geotechnical engineering. GeoPentech does not guarantee the performance of the project in

any respect, only that the engineering work and judgment rendered meet the standard of care of the geotechnical profession at this time.

8 REFERENCES

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GeoPentech, 2003a, "Technical Memorandum: Topanga Lagoon Restoration Project, Preliminary Soil Investigation, Los Angeles County, California", dated January 29.

GeoPentech, 2003b, "Technical Memorandum: Topanga Lagoon Restoration Project, Preliminary Geotechnical Evaluation, Pacific Coast Highway Bridge Span over Topanga Lagoon, Los Angeles County, California", dated December 1.

Table 1: Summary of Boring Geologic Data

Boring ID	Ground Surface Elevation (feet) NAVD88	Geologic Unit	Depth Range (feet)	Elevation Range (feet) NAVD88	Predominant Lithology
HSA-M1	38	Fill	0 to 30	+38 to +8	SC, CL, SM w/ gravel
		Beach Dep.	30 to 51	+8 to -13	SP, SP-SM
HSA-M2	38	Fill	0 to 26	+38 to +12	SC, CL w/ gravel
		Beach Dep.	26 to 51	+12 to -13	ML, SP-SM, SP
HSA-1	38	Fill	0 to 30	+38 to +8	SM, SC, ML w/ gravel
		Bedrock	30 to 33	+8 to +5	Shale
HSA-2	36	Fill	0 to 30	+36 to +6	SM, SC w/ gravel
		Beach Dep.	30 to 31½	+6 to +4½	SM
HSA-3a/ HSA-3b	32	Fill	0 to 27½	+32 to +4½	SM, SC, ML w/ gravel
		Beach Dep.	27½ to 31½	+4½ to +½	SP-SC, SP
HSA-4	35	Fill	0 to 29	+35 to +6	SM, SC, ML, CL, CH w/ grav.
HSA-5	17	Fill	0 to 8	+17 to +9	CL
		Beach Dep.	8 to 14	+9 to +3	SP
HSA-6	37	Fill	0 to 30	+37 to +7	SM, SC w/ gravel
		Beach Dep.	30 to 31½	+7 to +5½	SP-SM
HSA-7	34	Fill	0 to 26½	+34 to +7½	SM, SC w/ gravel
HSA-8	33	Fill	0 to 26½	+33 to +6½	SC, SM
HSA-S1	64	Fill	0 to 40	+64 to +24	SC w/ gravel
		Alluvium	40 to 43	+24 to +21	SM w/ gravel
B-1	25	Fill	0 to 19	+25 to +6	GM, SC, SM w/ gravel
		Beach Dep.	19 to 25½	+6 to -½	GM, GC, SM
B-2	36	Fill	0 to 30	+36 to +6	SM, SC w/ gravel
		Beach Dep.	30 to 31½	+6 to +4½	SM
B-3	34	Fill	0 to 30	+34 to +4	SM w/ gravel
		Beach Dep.	30 to 31½	+4 to +2½	SC
B-4	33	Fill	0 to 29½	+33 to +3½	GM, SC, SM, CH w/gravel
B-5	35	Fill	0 to 28½	+35 to +6½	SM w/ gravel
		Beach Dep.	28½ to 33½	+6½ to +1½	SM
B-6	38	Fill	0 to 19½	+38 to +18½	SM, SC w/ gravel
B-7	32	Fill	0 to 24½	+32 to +7½	SM, SC, CL w/ gravel
		Beach Dep.	24½ to 31	+7½ to +1	SC, SM
B-7A	33	Fill	0 to 24½	+33 to +8½	SM, SC, CL w/ gravel
		Beach Dep.	24½ to 27½	+8½ to +5½	SP-SM, SC
B-8	34	Fill	0 to 26	+34 to +8	SM, SC w/ gravel
		Beach Dep.	26 to 35½	+8 to -1½	SM, SC
B-9	33	Fill	0 to 21½	+33 to +11½	SM, SC w/ gravel
B-10	38	Fill	0 to 30	+38 to +8	SM, SC w/ gravel
		Beach Dep.	30 to 33½	+8 to +4½	SM

Table 2: Summary of Boring Groundwater Data

Boring ID	Ground Surface Elevation (feet) NAVD88	Depth to Groundwater Observed During Drilling (feet)	Groundwater Elevation Observed During Drilling (feet MSL) NAVD88	Date Measured
HSA-M1	38	30	+8	12/21/2021
HSA-M2	38	30	+8	12/21/2021
HSA-1	38	Dry (>33)	Dry (< +5)	12/20/2021
HSA-2	36	30	+6	12/20/2021
HSA-3a	32	Dry (>16½)	Dry (< +15½)	12/20/2021
HSA-3b	32	27	+5	12/20/2021
HSA-4	35	Dry (>29)	Dry (< +6)	12/20/2021
HSA-5	17	7	+10	12/22/2021
HSA-6	37	30	+7	12/21/2021
HSA-7	34	Dry (>26½)	Dry (< +7½)	12/21/2021
HSA-8	33	Dry (>26½)	Dry (< +6½)	12/22/2021
HSA-S1	64	Dry (>43)	Dry (<21)	12/22/2021
B-1	25	19	+6	11/12/2002
B-2	36	30	+6	11/11/2002
B-3	34	30½	+3½	11/11/2002
B-4	33	Dry (>29½)	Dry (< +3½)	11/13/2002
B-5	35	27	+8	11/13/2002
B-6	38	Dry (>19½)	Dry (< +18½)	11/13/2002
B-7	32	25	+7	11/11/2002
B-7A	33	26	+7	11/11/2002
B-8	34	26	+7	11/12/2002
B-9	33	Dry (>21½)	Dry (< +11½)	11/12/2002
B-10	38	31½	+6½	11/12/2002

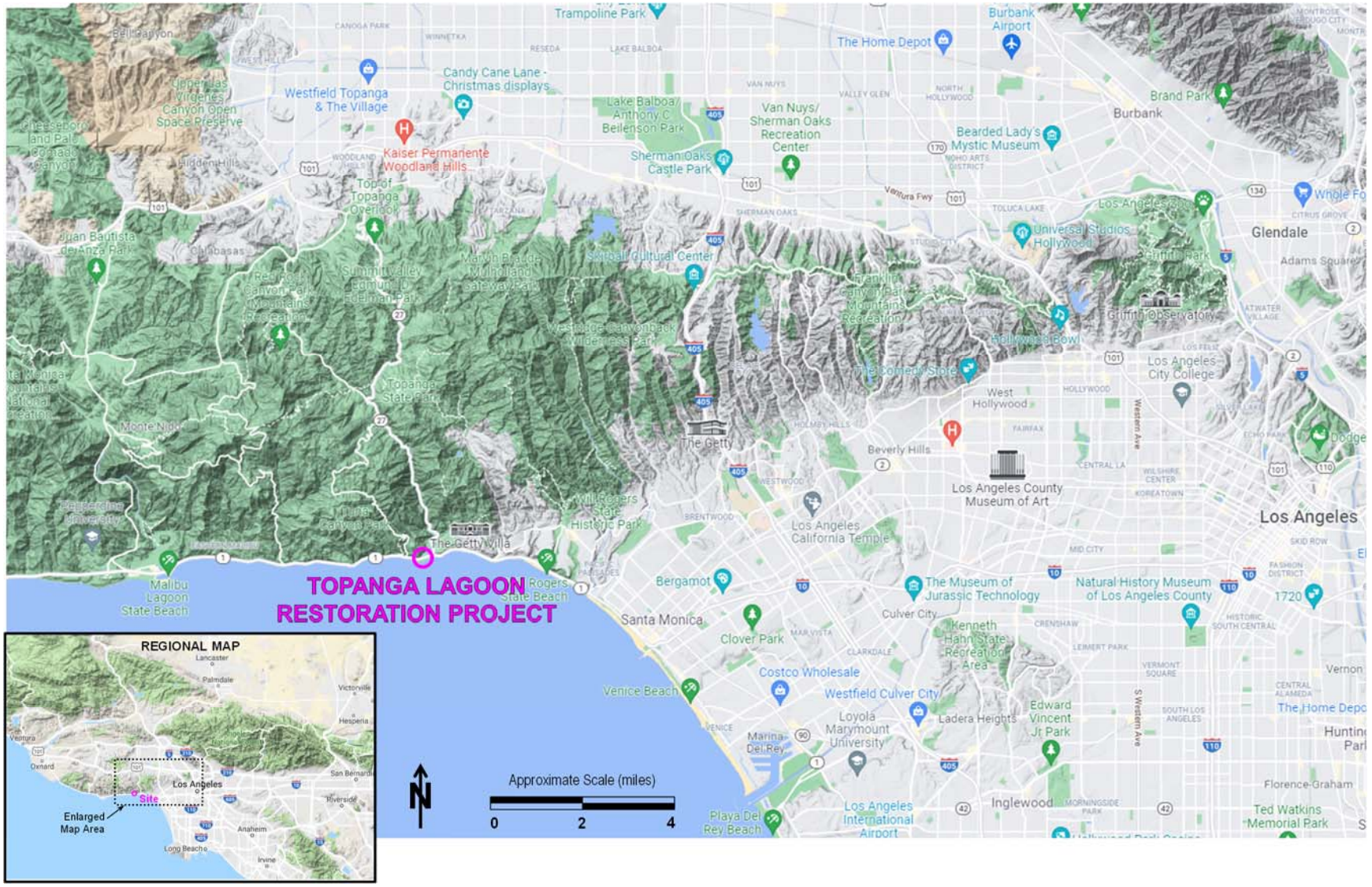

Figure 1: Project Location Map

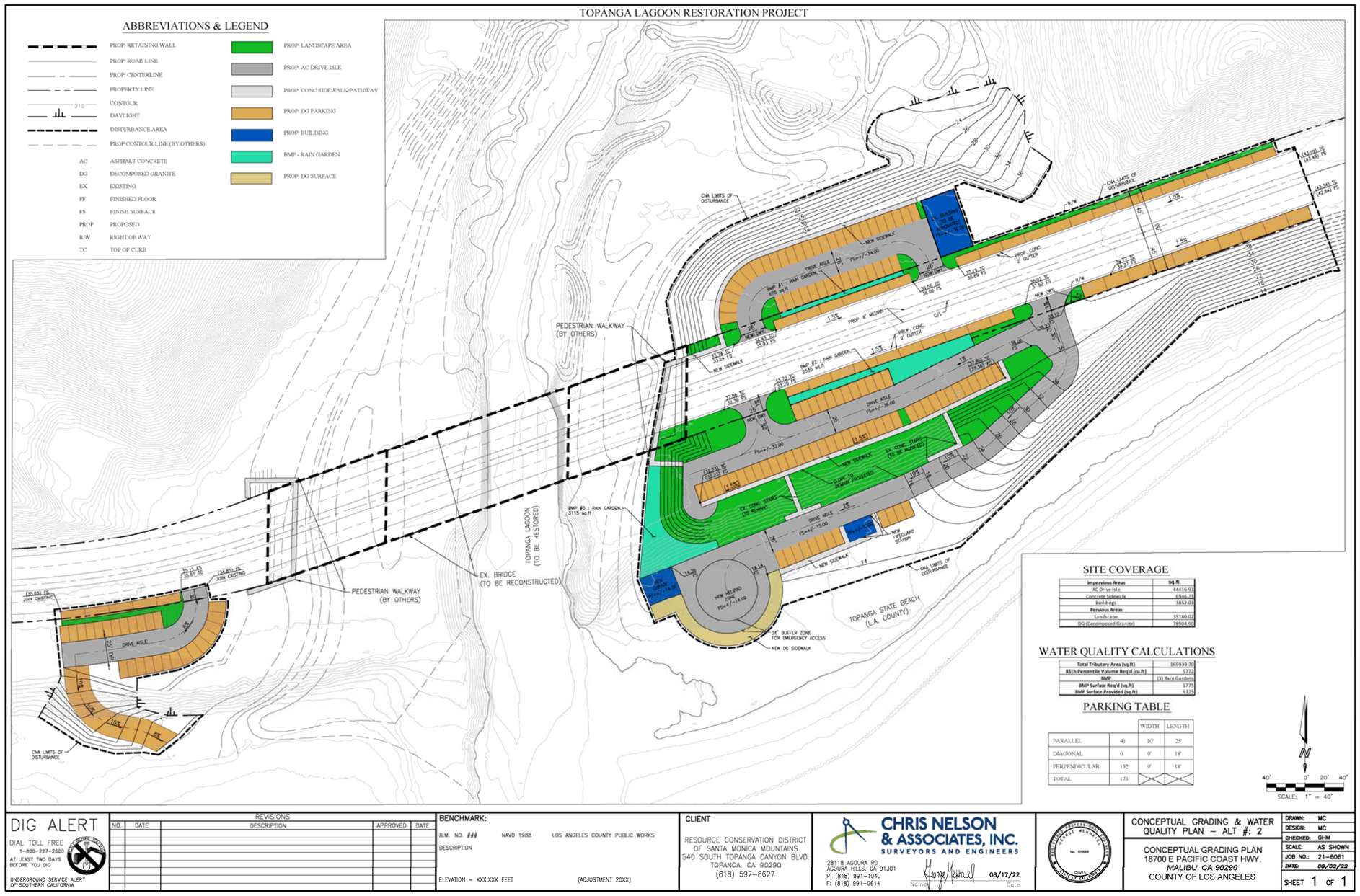

Figure 2: Alternative 2 – Topanga Lagoon Configuration

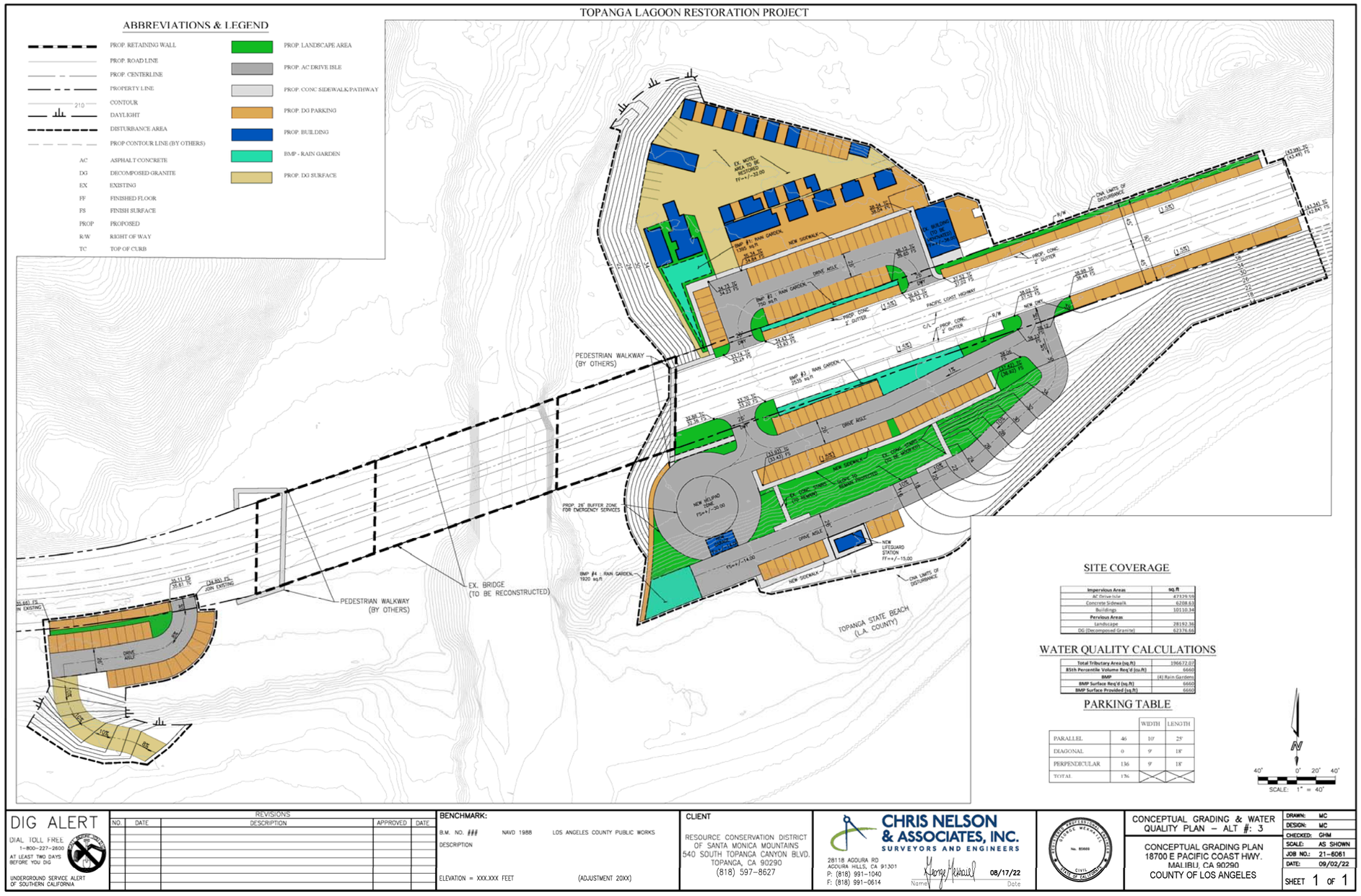

Figure 3: Alternative 3 – Topanga Lagoon Configuration

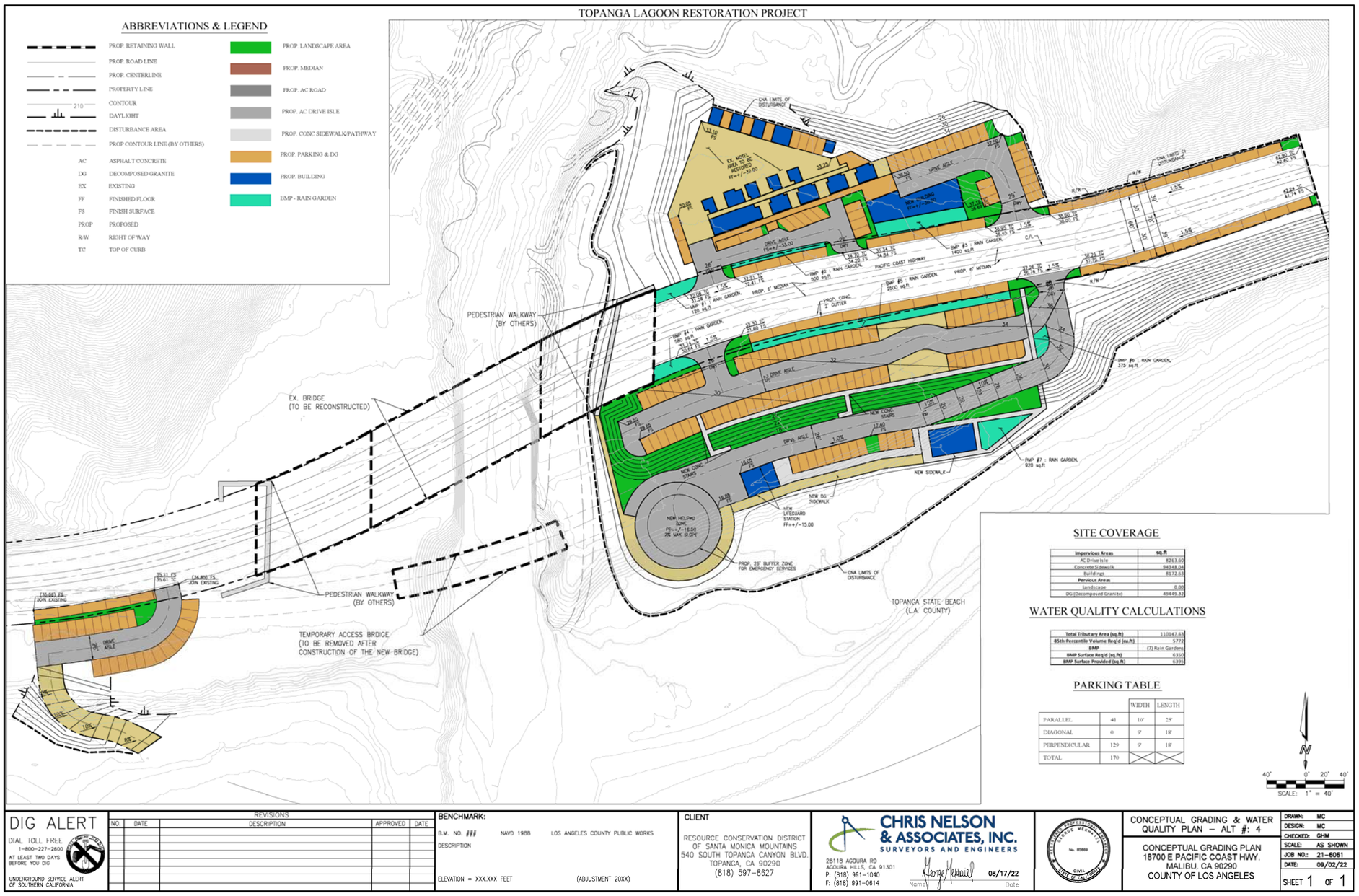

Figure 4: Alternative 4 – Topanga Lagoon Configuration

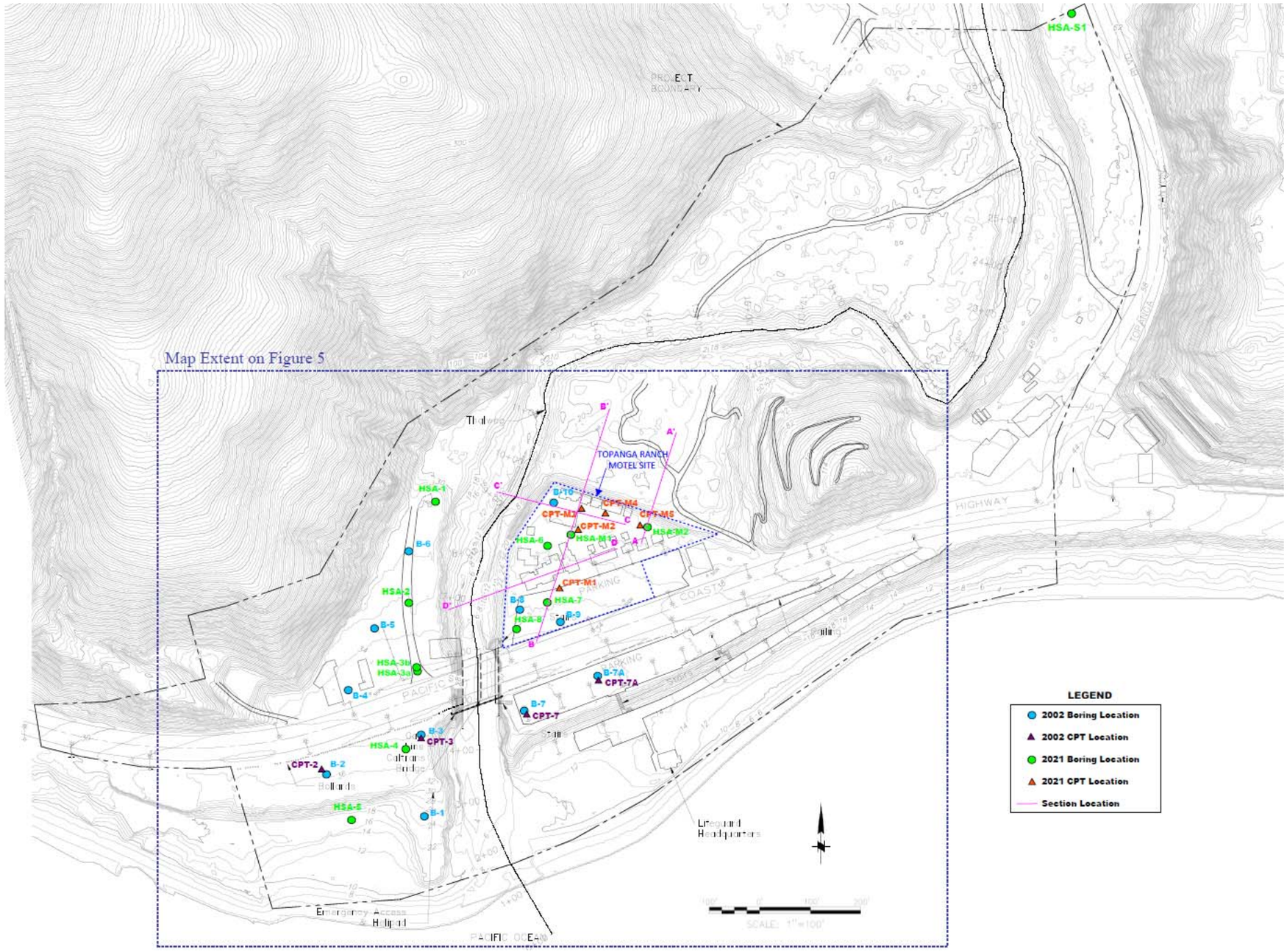

Figure 5: Project Site Plan

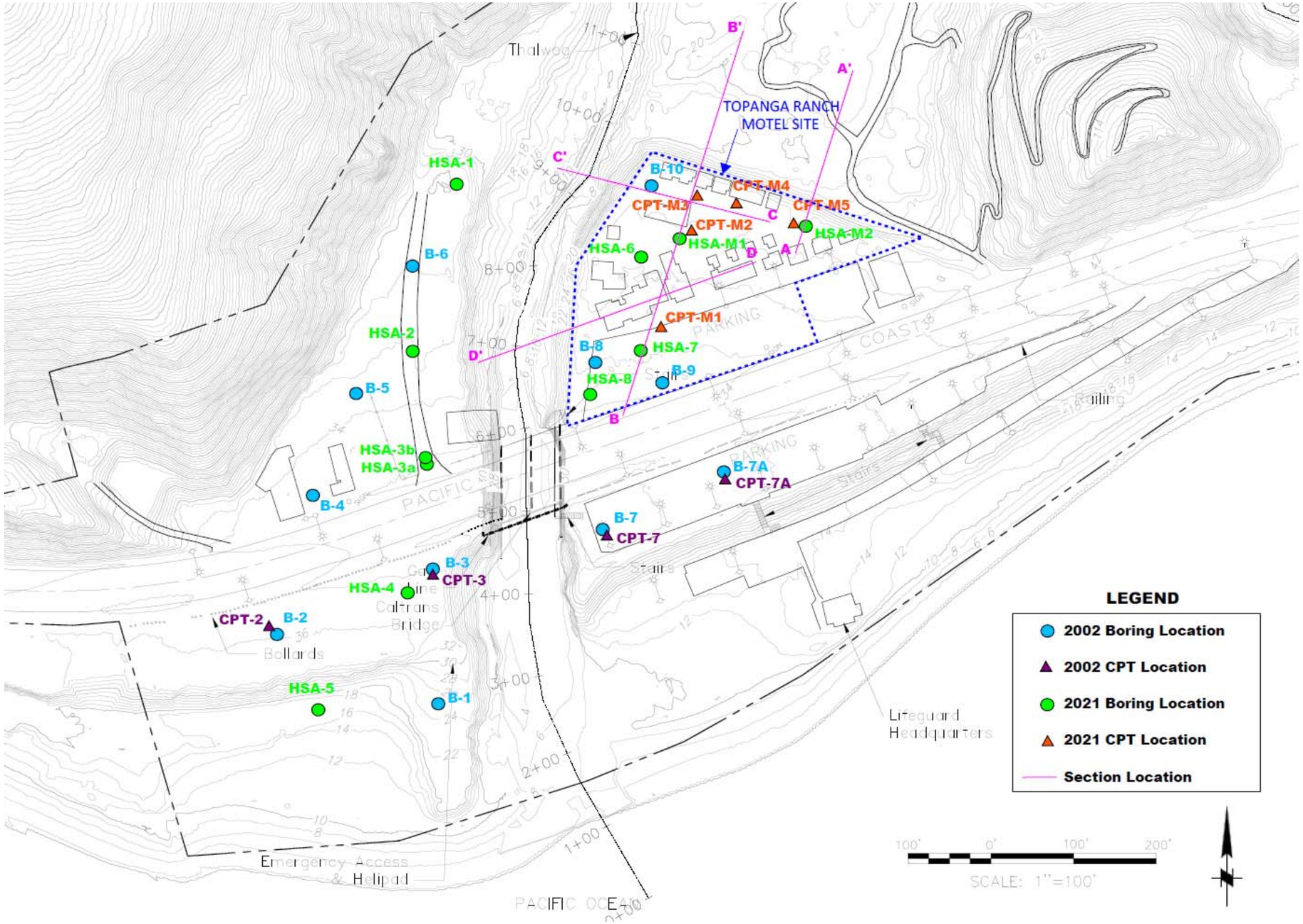

Figure 6: Motel Site Plan

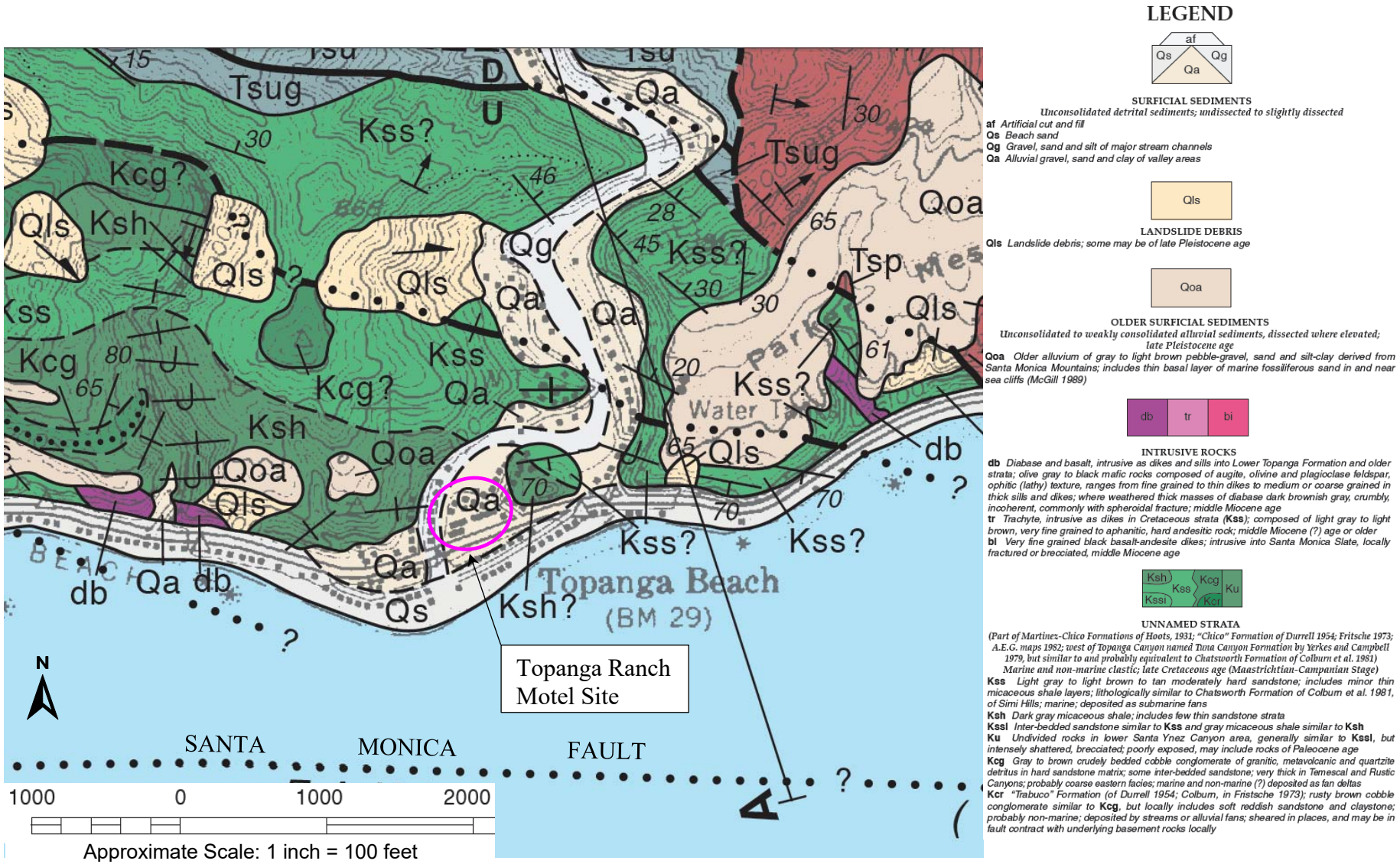

Figure 7: Project Geologic Map (Dibblee, 1992)

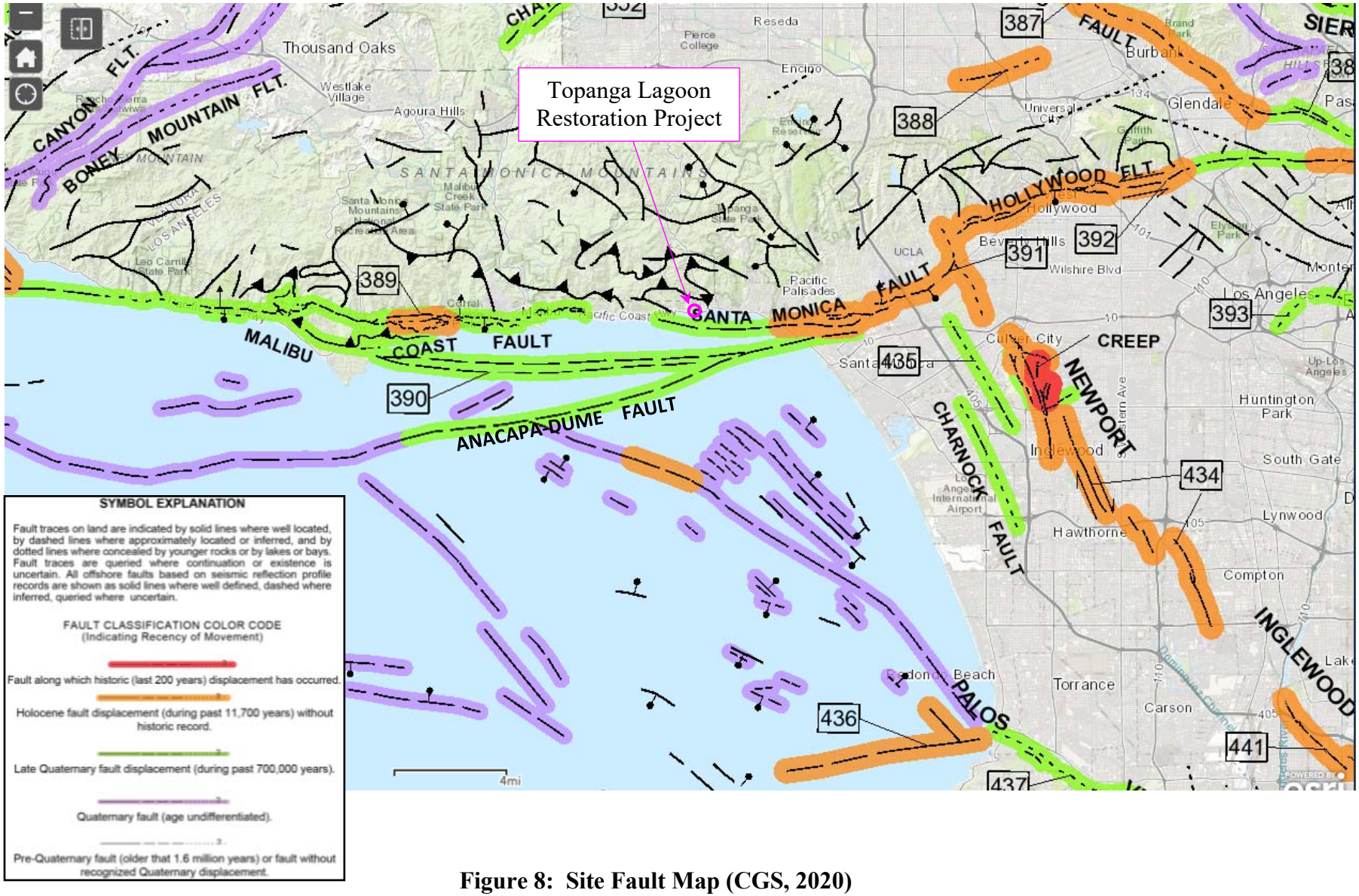

Figure 8: Site Fault Map (CGS, 2020)

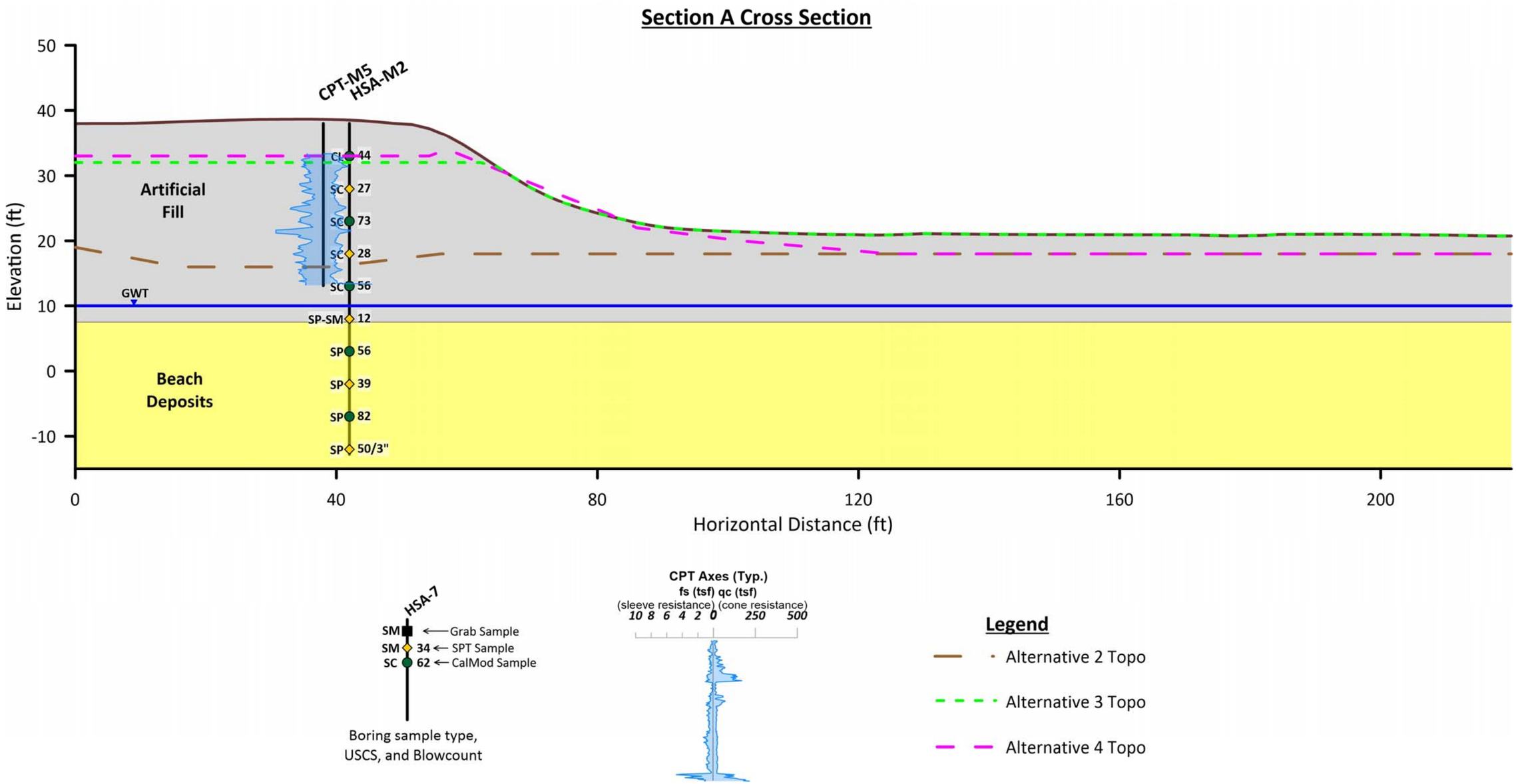

Figure 9: Site Cross Sections A

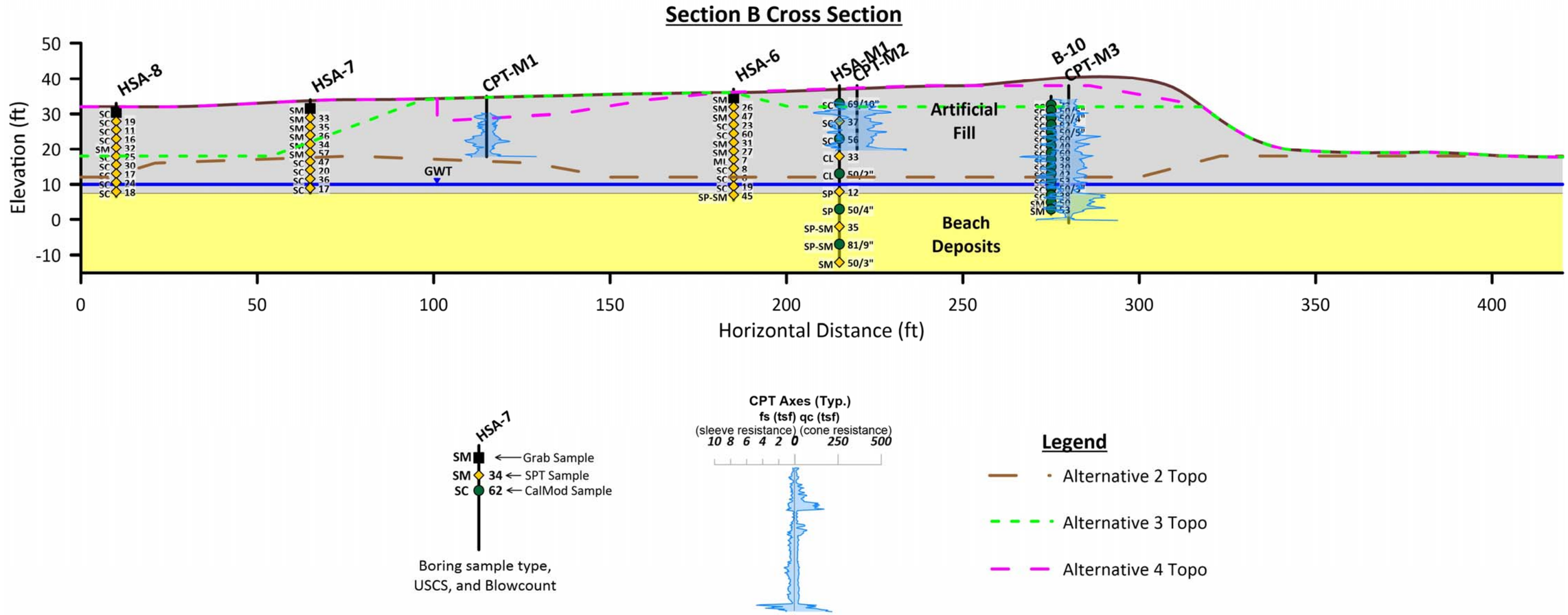

Figure 10: Site Cross Sections B

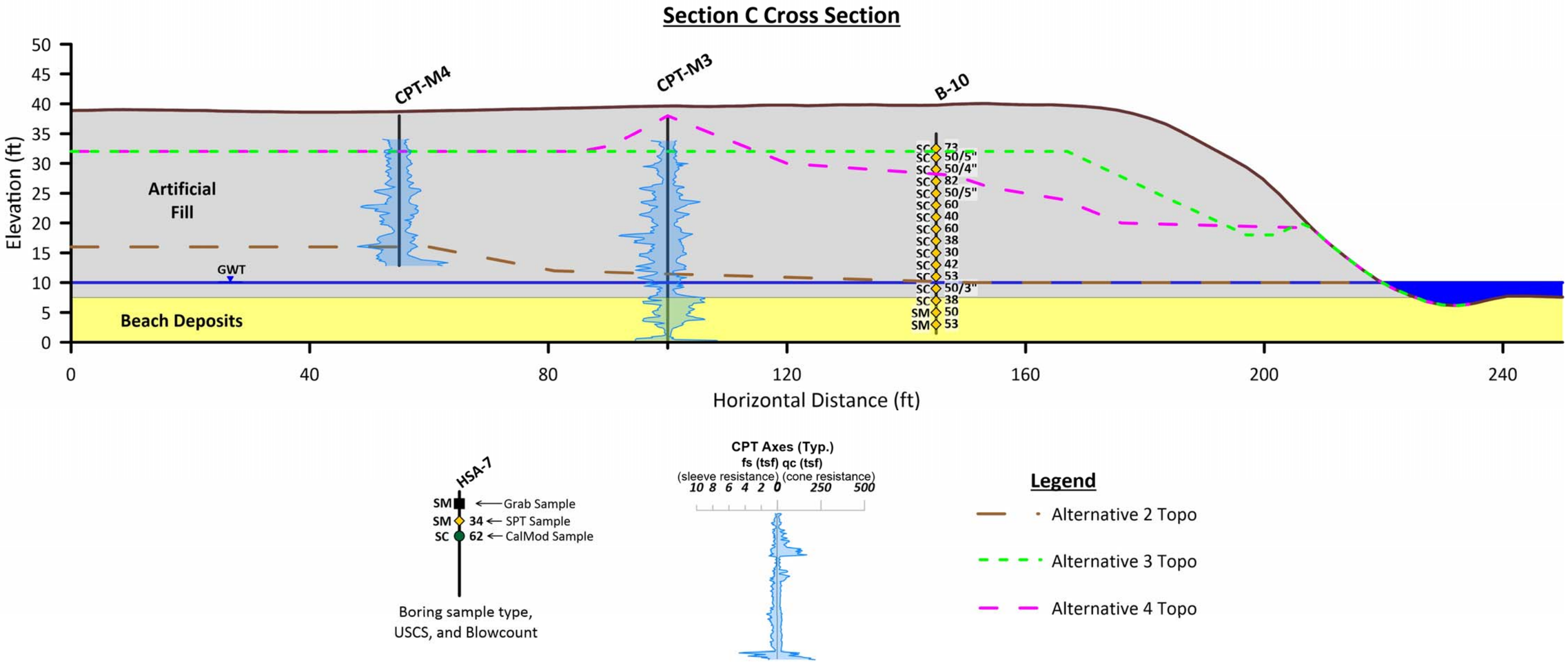

Figure 11: Site Cross Sections C

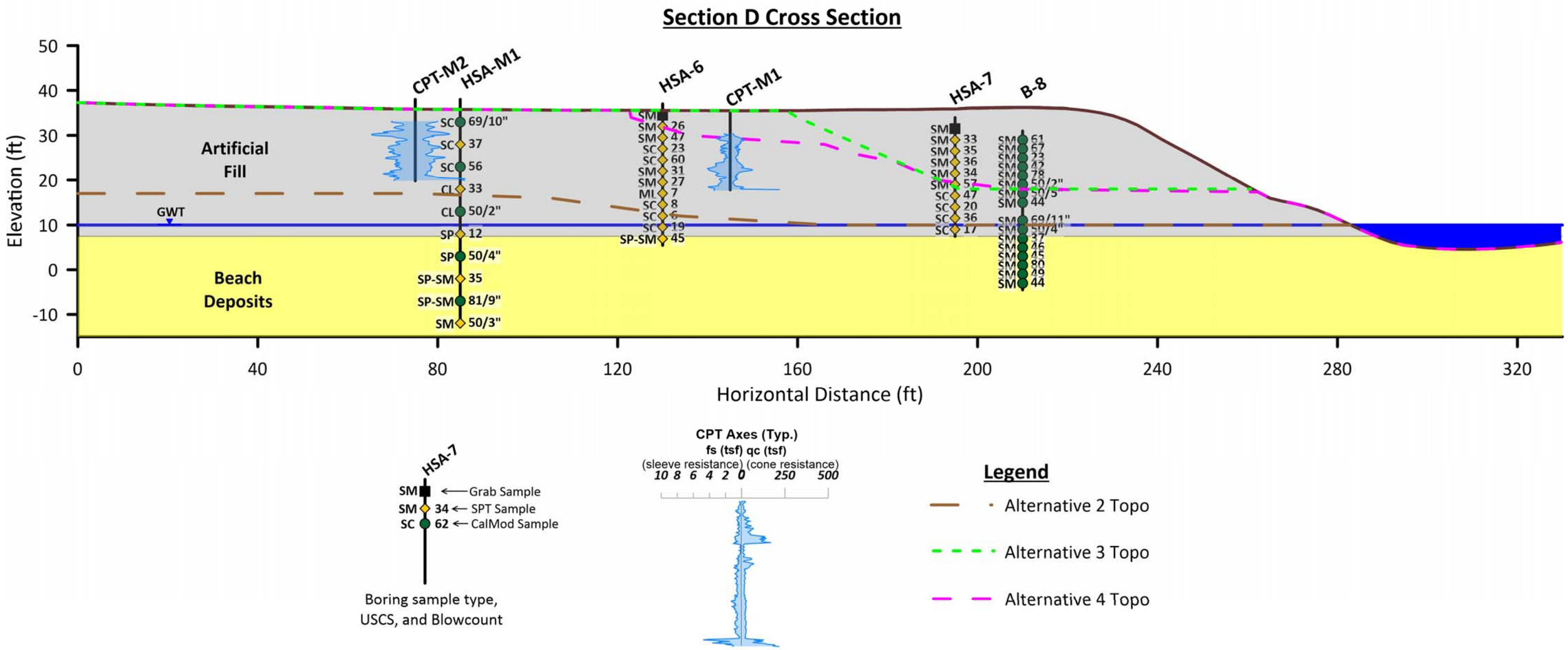

Figure 12: Site Cross Sections D

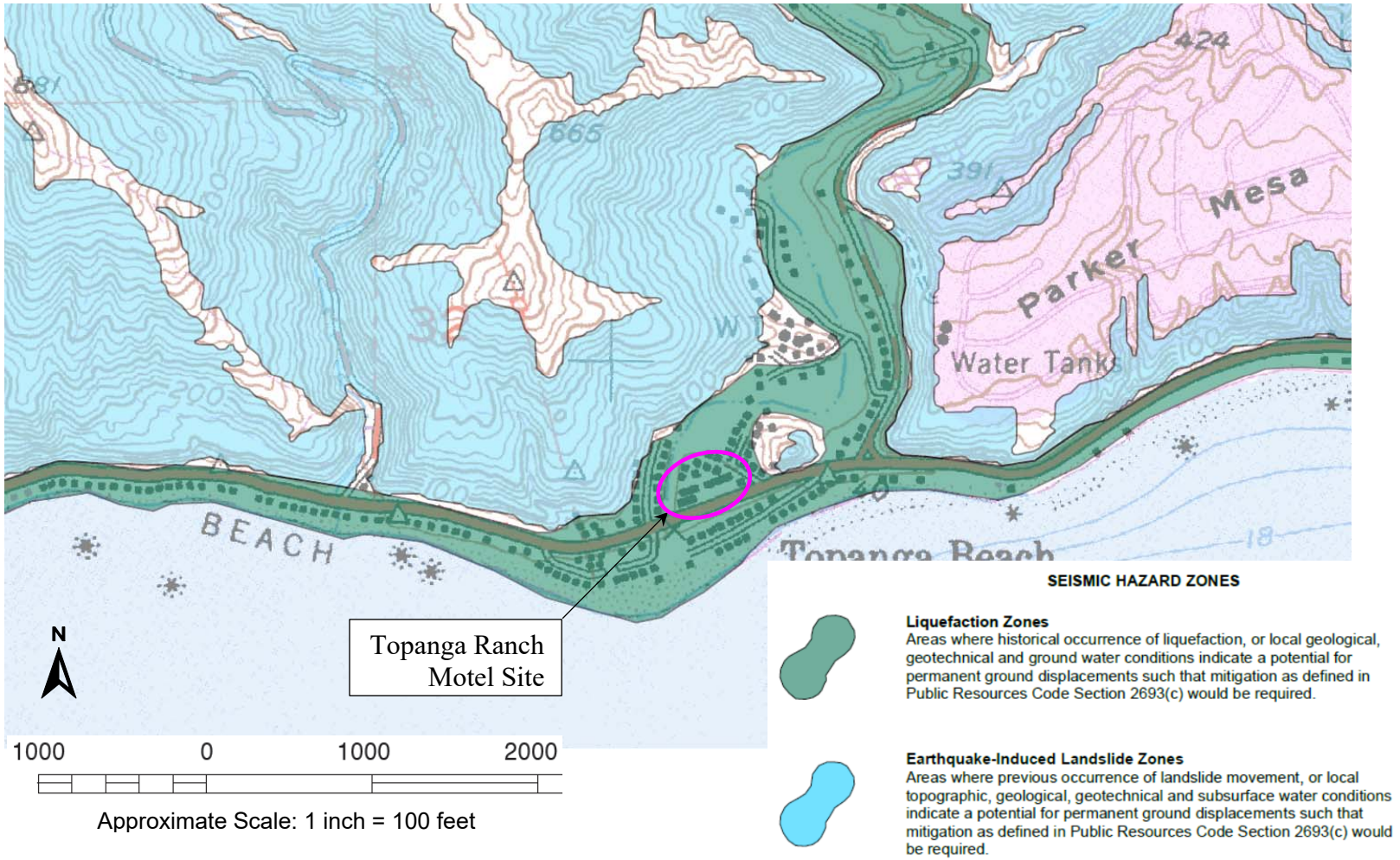

Figure 13: Earthquake Zones of Required Investigation (CGS, 1997 and 2018)

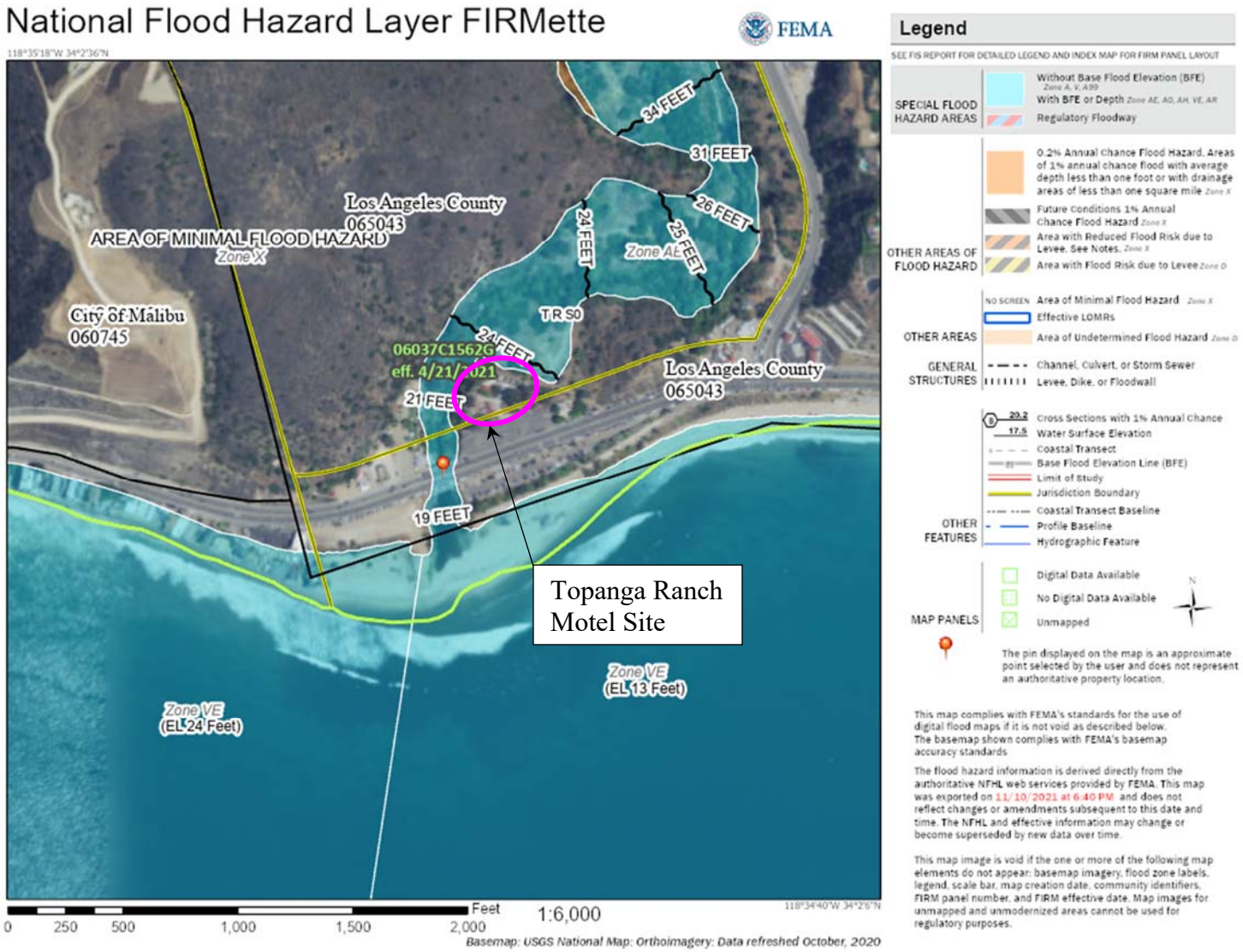

Figure 14: FEMA Flood Insurance Rate Map

APPENDIX A

2002 Field Investigation and Laboratory Tests

(GeoPentech, 2003)

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Key to Log of Boring

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Number	SAMPLES: Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
1	2	3	4	5	6	7	8	9	10

COLUMN DESCRIPTIONS

1 **Elevation:** Elevation in feet referenced to mean sea level (MSL) or site datum.

2 **Depth:** Depth in feet below the ground surface.

3 **Sample Type:** Type of soil sample collected at depth interval shown; sampler symbols are explained below.

4 **Sample Number:** Sample identification number.

5 **Sampling Resistance:** Number of blows required to advance driven sampler 12 inches beyond first 6-inch interval, or distance noted, using a 140-lb hammer with a 30-inch drop. Hydraulic down-pressure may be recorded for pushed samplers.

6 **Graphic Log:** Graphic depiction of subsurface material encountered; typical symbols are explained below.

7 **Material Description:** Description of material encountered; may include density/consistency, moisture, color, and grain size.

8 **Water Content:** Water content of sample, as percentage of dry weight of soil, measured in lab according to ASTM D2216.

9 **Dry Unit Weight:** Dry weight per unit volume of soil sample, in pounds per cubic foot, measured in lab according to ASTM D2937.

10 **Remarks and Other Tests:** Comments and observations regarding drilling or sampling made by driller or field personnel. Other lab tests are indicated using abbreviations explained below.

TYPICAL MATERIAL GRAPHIC SYMBOLS

- POORLY GRADED SAND (SP)
- POORLY GRADED SAND with SILT (SP-SM)
- SILTY SAND (SM)
- SILT (ML)
- ELASTIC SILT (MH)
- SILTY to CLAYEY SAND (SM/SC)
- LEAN CLAY (CL)
- FAT CLAY (CH)
- CLAYEY SAND (SC)
- SILTY CLAY (CL or CL-ML)
- CLAYEY SILT (ML)
- GRAVEL (GP/GW)

TYPICAL SAMPLER GRAPHIC SYMBOLS

- Modified California tube-lined split barrel (2.5-inch-OD)
- Standard Penetration Test (SPT) split spoon
- Shelby tube (thin-wall, fixed-head undisturbed)
- California ring-lined split barrel (3-inch-OD)
- Bulk sample
- Grab sample

OTHER LABORATORY TEST ABBREVIATIONS

AL	Atterberg Limits test (ASTM D4318)
LL	Liquid Limit from Atterberg Limits test
PI	Plasticity Index from Atterberg Limits test
Gs	Specific Gravity (ASTM D854)
GR	Gravel content from sieve analysis (ASTM D422), %>4 sieve
SA	Sand content from sieve analysis, %<#4 and >#200 sieve
FI	Fines content from sieve analysis, %<#200 sieve
UC	Unconfined compressive strength test (ASTM D2166), q_u in ksf

OTHER GRAPHIC SYMBOLS

- First water encountered at time of drilling and sampling
- Static water level measured at specified time after drilling
- Change in material properties within a lithologic stratum
- Inferred contact between soil strata or gradational lithologic change

Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive; field descriptions may have been modified to reflect lab test results. Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced; they are not warranted to be representative of subsurface conditions at other locations or times.

Figure A-1

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 1

Sheet 1 of 1

Date(s) Drilled	**11/12/02**	Logged By	**S. Duke**	Checked By	**S.T. Freeman**
Drilling Method	**Hollow-Stem Auger**	Drill Bit Size/Type	**4-1/4-inch-ID, 8-inch-OD auger**	Total Depth of Borehole	**25.5 feet**
Drill Rig Type	**CME 85**	Drilling Contractor	**A & R Drilling**	Approximate Surface Elevation	**17 feet MSL**
Groundwater Level(s)	**19 feet bgs ATD**	Sampling Method	**Modified California lined with 2-inch-dia. brass tubes**	Hammer Data	**Downhole hammer; 140 lbs / 30-inch drop**
Borehole Backfill	**Drill cuttings (tamped)**	Location	**Refer to site plan**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
	0					**FILL** Medium dense, moist, brown, SILTY GRAVEL with SAND (GM), gravel consists mostly of yellowish brown sandstone fragments, fine- to medium-grained sand, trace clay			
15			1	28					Composite of 1 and 2: GR = 35% SA = 34% FI = 31%
						Increasing shale fragments			
	5		2	22					
						Medium dense, moist, brown, SILTY to CLAYEY SAND with GRAVEL (SM/SC), fine- to medium-grained sand, fine gravel consists mostly of sandstone and shale fragments			
10			3	22					
						Becomes reddish brown			
			4	35					
	10					Increasing shale and sandstone fragments			
			5	28					Composite of 5 and 6: GR = 20% SA = 46% FI = 34% Gs = 2.80
5						Becomes medium dense to dense, dark gray with dark gray shale fragments			
			6	39					
	15		7	32					
						Dense, moist, dark brown, CLAYEY SAND with GRAVEL (SC), gravel consists of sandstone and shale fragments			
0			8	39					Composite of 8 and 9: GR = 29% SA = 43% FI = 28%
			9	25		▽			
	20					**BEACH DEPOSITS** Medium dense to dense, wet, brown, SILTY to CLAYEY GRAVEL with SAND (GM/GC), fine to coarse gravel			
			10	40					Composite of 10 and 11: GR = 57% SA = 29% FI = 14% Gs = 2.73
-5			11	41					
						Dense, wet, bluish gray, SILTY SAND (SM)			
	25		12	45					
-10						**Bottom of boring at 25.5 feet**			
	30								
-15									
	35								

Report: GP SOIL LOG; File: TLAGOON.GPJ; 12/20/2002

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Figure A-2

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 2

Sheet 1 of 1

Date(s) Drilled	**11/11/02**	Logged By	**S. Duke**	Checked By	**S.T. Freeman**
Drilling Method	**Hollow-Stem Auger**	Drill Bit Size/Type	**4-1/4-inch-ID, 8-inch-OD auger**	Total Depth of Borehole	**31.5 feet**
Drill Rig Type	**CME 85**	Drilling Contractor	**A & R Drilling**	Approximate Surface Elevation	**28 feet MSL**
Groundwater Level(s)	**30 feet bgs ATD**	Sampling Method	**Modified California lined with 2-inch-dia. brass tubes**	Hammer Data	**Downhole hammer; 140 lbs / 30-inch drop**
Borehole Backfill	**Drill cuttings (tamped)**	Location	**Refer to site plan**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
	0					Asphalt			
						FILL			
			1	58		Dense, moist, brown, SILTY to CLAYEY SAND with GRAVEL (SM/SC), fine- to medium-grained sand, fine to coarse gravel consists of sandstone and shale fragments			Composite of 1 and 2: GR = 21% SA = 49% FI = 30% Gs = 2.72
25			2	52					
	5		3	53		Becomes reddish brown			
20			4	59					
						Becomes light brown (in sampler tip)			
	10		5	58		Becomes dark reddish brown			Composite of 5 and 6: GR = 23% SA = 49% FI = 28%
			6	50/2"		Concreted sandstone cobble in sampler shoe			
15									
			7	50/3"		Becomes very dense, dark gray			
	15								
			8	65		Becomes dark reddish brown; increase in clay content			Composite of 8 and 9: GR = 33% SA = 39% FI = 28%
10			9	68					
	20		10	47		Medium dense to dense, moist, dark brown, SILTY SAND (SM), fine-grained sand, few fine to coarse gravel-size fragments of sandstone and shale			
5			11	34					Composite of 11 and 12: GR = 11% SA = 53% FI = 36% Gs = 2.72
	25		12	33					
			13	40					
0			14	28		Medium dense, moist, gray, CLAYEY SAND (SC), fine- to medium-grained sand			
	30					▽			
			15	48		**BEACH DEPOSITS** Dense, wet, brown, SILTY SAND (SM), fine- to medium-grained sand			
						Bottom of boring at 31.5 feet			
-5									
	35								

Report: GP SOIL LOG; File: TLAGOON.GPJ; 12/20/2002

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Figure A-3

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 3

Sheet 1 of 1

Date(s) Drilled	**11/11/02**	Logged By	**S. Duke**	Checked By	**S.T. Freeman**
Drilling Method	**Hollow-Stem Auger**	Drill Bit Size/Type	**4-1/4-inch-ID, 8-inch-OD auger**	Total Depth of Borehole	**31.5 feet**
Drill Rig Type	**CME 85**	Drilling Contractor	**A & R Drilling**	Approximate Surface Elevation	**26 feet MSL**
Groundwater Level(s)	**30.5 feet bgs ATD**	Sampling Method	**Modified California lined with 2-inch-dia. brass tubes**	Hammer Data	**Downhole hammer; 140 lbs / 30-inch drop**
Borehole Backfill	**Drill cuttings (tamped)**	Location	**Refer to site plan**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
	0					**FILL** Dense, moist, brown, SILTY SAND (SM), fine- to medium-grained sand, some clay			
25			1	50					Composite of 1 and 2: GR = 14% SA = 59% FI = 27%
	5		2	39		Becomes dark reddish brown, with fine to coarse gravel-size fragments of sandstone and shale			
20			3	34		Coarse gravel-size sandstone fragment in sampler shoe Becomes medium dense			
			4	64		Becomes very dense			Composite of 4 and 5: GR = 12% SA = 62% FI = 26%
	10		5	44		Becomes dense			
15			6	37		Concreted sandstone cobble in sampler shoe			
	15		7	30		Medium dense to dense, moist, yellowish brown, SILTY SAND with GRAVEL (SM), fine gravel consists of sandstone and shale fragments			
10			8	40		Becomes brown, with some clay			Composite of 8 and 9: GR = 22% SA = 60% FI = 18% Gs = 2.73
			9	33		Cobble in sampler shoe			
	20		10	60		Becomes dense, dark brown; increase in clay content			
5			11	48					
	25		12	43		Becomes light brown (in sampler tip)			
0			13	33		Becomes medium dense, dark brown			Composite of 13 and 14: GR = 18% SA = 44% FI = 38%
			14	35					
	30		15	36		▽			
-5						**BEACH DEPOSITS** Medium dense, wet, dark gray, CLAYEY SAND (SC), fine-grained sand			
						Bottom of boring at 31.5 feet			
	35								

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Figure A-4

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 4

Sheet 1 of 1

Date(s) Drilled	**11/13/02**	Logged By	**S. Duke**	Checked By	**S.T. Freeman**
Drilling Method	**Hollow-Stem Auger**	Drill Bit Size/Type	**4-1/4-inch-ID, 8-inch-OD auger**	Total Depth of Borehole	**29.5 feet**
Drill Rig Type	**CME 85**	Drilling Contractor	**A & R Drilling**	Approximate Surface Elevation	**30 feet MSL**
Groundwater Level(s)	**Not encountered**	Sampling Method	**Modified California lined with 2-inch-dia. brass tubes**	Hammer Data	**Downhole hammer; 140 lbs / 30-inch drop**
Borehole Backfill	**Drill cuttings (tamped)**	Location	**Refer to site plan**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
30	0					Asphalt over gravel base course			
			1	50/5"		**FILL** Very dense, wet, dark bluish gray, SILTY GRAVEL with SAND (GM), fine to coarse gravel consists of sandstone fragments, fine- to medium-grained sand, sewage odor [Leach Field?]			Rig grinding.
25	5		2	67					Discrete Sample 2: GR = 42% SA = 40% FI = 18%
			3	50/4"		Very dense, wet, dark bluish gray, CLAYEY SAND with GRAVEL (SC), fine- to medium-grained sand, fine to coarse gravel consists of sandstone fragments; sewage odor [Leach Field?]			
			4	83		Increase in moisture content, decrease in fines content; becomes brownish red			
20	10		5	36		Becomes medium dense, dark bluish gray; increase in moisture content			
			6	50/1"		Bluish gray sandstone cobble in sampler shoe			
			7	36		Decrease in moisture content; decrease in sewage odor (possibly bottom edge of leach field)			Drill rig kicked to the side; may have encountered a boulder.
15	15		8	69		Becomes very dense, moist, dark yellowish brown; gravel consists of shale and sandstone fragments			
			9	28		Medium dense, moist, dark yellowish brown, SILTY SAND with GRAVEL (SM), fine to coarse gravel consists of sandstone and shale fragments			Discrete Sample 9: GR = 29% SA = 39% FI = 32% Gs = 2.68
10	20		10	50		Becomes dense; increase in gravel content			
			11	43		Becomes dark reddish brown to dark brown; decrease in fines and gravel content			Discrete Sample 11: GR = 28% SA = 45% FI = 27%
5	25		12	27		Medium dense, moist, dark yellowish brown, SILTY SAND (SM), fine-grained sand, few gravel-size sandstone fragments			
			13	32		Very stiff, moist, dark gray, FAT CLAY (CH)			
			14	30					
0	30					**Bottom of boring at 29.5 feet**			
-5	35								

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Figure A-5

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 5

Sheet 1 of 1

Date(s) Drilled	**11/13/02**	Logged By	**S. Duke**	Checked By	**S.T. Freeman**
Drilling Method	**Hollow-Stem Auger**	Drill Bit Size/Type	**4-1/4-inch-ID, 8-inch-OD auger**	Total Depth of Borehole	**33.5 feet**
Drill Rig Type	**CME 85**	Drilling Contractor	**A & R Drilling**	Approximate Surface Elevation	**30 feet MSL**
Groundwater Level(s)	**27 feet bgs ATD**	Sampling Method	**Modified California lined with 2-inch-dia. brass tubes**	Hammer Data	**Downhole hammer; 140 lbs / 30-inch drop**
Borehole Backfill	**Drill cuttings (tamped)**	Location	**Refer to site plan**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
30	0					Asphalt over gravel base course			
						FILL Dense, moist, dark brown, SILTY SAND with GRAVEL (SM), fine- to medium-grained sand, fine to coarse gravel consists of sandstone and shale fragments			
			1	53					Discrete Sample 1: GR = 26% SA = 48% FI = 26%
						Becomes dense to very dense			
25	5		2	90					
			3	60					Composite of 3 and 4: GR = 18% SA = 51% FI = 31%
			4	80					
20	10					Increase in gravel content			
			5	50					
			6	69					Composite of 6 and 7: GR = 31% SA = 42% FI = 27% Gs = 2.73
15	15		7	42					
			8	50/3"		Strong, yellowish brown sandstone cobble in sampler shoe			
			9	51					
10	20					Becomes medium dense to dense; increase in gravel content			
			10	30					
			11	59					Composite of 11 and 12: GR = 34% SA = 42% FI = 24%
5	25		12	29					
			13	15		Becomes wet ▽			
			14	10		**BEACH DEPOSITS** Loose, wet, dark bluish gray, SILTY SAND (SM), fine- to medium-grained sand			
0	30					Becomes medium dense			
			15	22					
						Becomes dense, with some gravel			
			16	41					
						Bottom of boring at 33.5 feet			
-5	35								

Report: GP SOIL LOG; File: TLAGOON.GPJ; 12/20/2002

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Figure A-6

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 6

Sheet 1 of 1

Date(s) Drilled	**11/13/02**	Logged By	**S. Duke**	Checked By	**S.T. Freeman**
Drilling Method	**Hollow-Stem Auger**	Drill Bit Size/Type	**4-1/4-inch-ID, 8-inch-OD auger**	Total Depth of Borehole	**19.5 feet**
Drill Rig Type	**CME 85**	Drilling Contractor	**A & R Drilling**	Approximate Surface Elevation	**34 feet MSL**
Groundwater Level(s)	**Not encountered**	Sampling Method	**Modified California lined with 2-inch-dia. brass tubes**	Hammer Data	**Downhole hammer; 140 lbs / 30-inch drop**
Borehole Backfill	**Drill cuttings (tamped)**	Location	**Refer to site plan**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
30	0					Asphalt over gravel base course			
						FILL Dense to very dense, moist, dark brown, SILTY SAND with GRAVEL (SM), fine- to medium-grained sand, fine to coarse gravel consists of shale and sandstone fragments			Composite of 1 and 2: GR = 17% SA = 50% FI = 33% Gs = 2.74
			1	60					
	5		2	50/4"					
			3	50/3"		←Strong, yellowish brown sandstone cobble in sampler shoe			
25			4	90					
	10		5	50/5"					
			6	74					
20			7	41		Dense, moist, reddish brown, SILTY SAND (SM), fine- to medium-grained sand, some clay, few gravel			Discrete Sample 7: GR = 8% SA = 65% FI = 27%
	15		8	40		Dense, moist, brown, CLAYEY SAND with GRAVEL (SC), fine- to medium-grained sand, fine to coarse gravel consists of shale and sandstone fragments			
15			9	36					
	20					**Bottom of boring at 19.5 feet**			
10	25								
5	30								
0	35								

Report: GP SOIL LOG; File: TLAGOON.GPJ; 12/20/2002

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Figure A-7

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 7

Sheet 1 of 1

Date(s) Drilled	**11/11/02**	Logged By	**S. Duke**	Checked By	**S.T. Freeman**
Drilling Method	**Hollow-Stem Auger**	Drill Bit Size/Type	**4-1/4-inch-ID, 8-inch-OD auger**	Total Depth of Borehole	**30.9 feet**
Drill Rig Type	**CME 85**	Drilling Contractor	**A & R Drilling**	Approximate Surface Elevation	**30 feet MSL**
Groundwater Level(s)	**25 feet bgs ATD**	Sampling Method	**Modified California lined with 2-inch-dia. brass tubes**	Hammer Data	**Downhole hammer; 140 lbs / 30-inch drop**
Borehole Backfill	**Drill cuttings (tamped)**	Location	**Refer to site plan**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
30	0					Asphalt over gravel base course			
						FILL Medium dense, moist, brown, SILTY to CLAYEY SAND (SM/SC), fine- to medium-grained sand			
			1	38					
						Becomes dark brown; increase in fines content, with few fine gravel-size fragments of shale/claystone and sandstone			
25	5		2	37					
						Becomes dense to very dense			
			3	66					No recovery at 6 ft. Start using catcher on samplers.
			4	50					Composite of 4 and 5: GR = 14% SA = 49% FI = 37%
20	10					Becomes very dense; decrease in fines content			
			5	76					
			6	83/10"		Hard, moist, dark reddish brown, SILTY CLAY (CL), trace fine-grained sand			
			7	50/4"		Dense to very dense, moist, yellowish brown, SILTY to CLAYEY SAND with GRAVEL (SM/SC), fine- to medium-grained sand, fine to coarse gravel consists of hard sandstone			Composite of 7 and 8: GR = 19% SA = 47% FI = 34%
15	15					With fine to coarse gravel-size fragments of shale and sandstone			
			8	65					
						Becomes dark brown; increase in clay content			
			9	57					Composite of 9 and 10: GR = 23% SA = 42% FI = 35% Gs = 2.73
10	20					Becomes brown; decrease in fines content			
			10	69					
						Becomes dense			
			11	42		Sandstone cobble in sampler shoe			
			12	54		**BEACH DEPOSITS** ▽ Dense, wet, dark gray, CLAYEY SAND (SC), fine-grained sand			
5	25					Dense, wet, gray, SILTY SAND (SM), fine- to medium-grained sand, few gravel			Composite of 13 and 14: GR = 14% SA = 73% FI = 13%
			13	50					
						Becomes medium dense			
			14	25					
0	30					Increase in gravel content			
			15	50/4"					
						Bottom of boring at 30.9 feet			
-5	35								

Report: GP SOIL LOG; File: TLAGOON.GPJ; 12/20/2002

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Figure A-8

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 7A

Sheet 1 of 1

Date(s) Drilled	**11/11/02**	Logged By	**S. Duke**	Checked By	**S.T. Freeman**
Drilling Method	**Hollow-Stem Auger**	Drill Bit Size/Type	**4-1/4-inch-ID, 8-inch-OD auger**	Total Depth of Borehole	**27.5 feet**
Drill Rig Type	**CME 85**	Drilling Contractor	**A & R Drilling**	Approximate Surface Elevation	**30 feet MSL**
Groundwater Level(s)	**26 feet bgs ATD**	Sampling Method	**Modified California lined with 2-inch-dia. brass tubes**	Hammer Data	**Downhole hammer; 140 lbs / 30-inch drop**
Borehole Backfill	**Drill cuttings (tamped)**	Location	**Refer to site plan**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
30	0					Asphalt over gravel base course			
						FILL Dense to very dense, moist, dark brown, SILTY to CLAYEY SAND (SM/SC), fine- to medium-grained sand, few fine to coarse gravel-size fragments of shale/claystone and sandstone			
			1	72					Composite of 1 and 2: GR = 12% SA = 54% FI = 34%
25	5		2	60					
						Increase in gravel content			
			3	73					Composite of 3 and 4: GR = 16% SA = 50% FI = 34%
			4	57					
20	10					Hard, moist, dark reddish brown, SILTY CLAY (CL), some fine gravel-size fragments of shale and sandstone			
			5	46					
						Very dense, moist, yellowish brown, SILTY to CLAYEY SAND with GRAVEL (SM/SC), fine- to medium-grained sand, fine to coarse sandstone gravel			
			6	79					Composite of 6 and 7: GR = 20% SA = 49% FI = 31% Gs = 2.72
						Very strong sandstone cobble in sampler shoe			
15	15		7	91					
						Becomes dense, dark brown; increase in clay content			
			8	47					Drilling becomes more difficult; possibly binding on siltstone/claystone.
			9	38					
10	20		10	48					Composite of 10 and 11: GR = 31% SA = 45% FI = 24%
			11	42					
5	25		12	38		**BEACH DEPOSITS** Medium dense, moist, gray, POORLY GRADED SAND with SILT (SP-SM), fine- to medium-grained sand ▽			
			13	29		Medium dense, wet, dark gray, CLAYEY SAND (SC), fine-grained sand			
0	30					**Bottom of boring at 27.5 feet**			
-5	35								

Report: GP SOIL LOG; File: TLAGOON.GPJ; 12/20/2002

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Figure A-9

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 8

Sheet 1 of 2

Date(s) Drilled	**11/12/02**	Logged By	**S. Duke**	Checked By	**S.T. Freeman**
Drilling Method	**Hollow-Stem Auger**	Drill Bit Size/Type	**4-1/4-inch-ID, 8-inch-OD auger**	Total Depth of Borehole	**35.5 feet**
Drill Rig Type	**CME 85**	Drilling Contractor	**A & R Drilling**	Approximate Surface Elevation	**31 feet MSL**
Groundwater Level(s)	**26 feet bgs ATD**	Sampling Method	**Modified California lined with 2-inch-dia. brass tubes**	Hammer Data	**Downhole hammer; 140 lbs / 30-inch drop**
Borehole Backfill	**Drill cuttings (tamped)**	Location	**Refer to site plan**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
	0					Asphalt over gravel base course			
30						**FILL** Dense to very dense, moist, dark brown, SILTY to CLAYEY SAND with GRAVEL (SM/SC), fine- to medium-grained sand, fine gravel consists of sandstone and shale fragments			Composite of 1 and 2: GR = 24% SA = 45% FI = 31%
			1	61					
	5		2	67					
25			3	23		Medium dense, moist, yellowish brown, SILTY SAND with GRAVEL (SM), fine to coarse gravel consists of sandstone fragments			
			4	42		Dense, moist, dark reddish brown, SILTY to CLAYEY SAND (SM/SC), fine-grained sand, few fine gravel-size shale fragments			Composite of 4 and 5: GR = 12% SA = 50% FI = 38%
	10					Becomes very dense			
20			5	78					
			6	50/2"		Very dense, moist, yellowish brown, SILTY SAND with GRAVEL (SM), fine-grained sand, fine to coarse gravel consists of sandstone fragments			
			7	50/5"		Dense to very dense, moist, brown, SILTY to CLAYEY SAND with GRAVEL (SM/SC), fine-grained sand, fine to coarse gravel consists of shale and sandstone fragments			
	15					Decrease in gravel size and content			
15			8	44					Discrete Sample 8: GR = 27% SA = 42% FI = 31% Driller skipped sample at 18 ft.
	20					Increase in gravel size and content			
10			9	69/11"					
			10	50/4"					
						Becomes medium dense, dark brown; decrease in gravel content			
	25		11	37					
5						▽			
			12	46		**BEACH DEPOSITS** Dense, wet, bluish gray, SILTY to CLAYEY SAND (SM/SC), fine- to medium-grained sand, few fine gravel			Discrete Sample 12: GR = 12% SA = 71% FI = 17% Gs = 2.71
			13	45		Increase in gravel content			
	30					Becomes dense to very dense			
0			14	80					
			15	49		Coarse gravel in sampler shoe			
	35		16	44					

Report: GP SOIL LOG; File: TLAGOON.GPJ; 12/20/2002

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Figure A-10

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 8

Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
	35		16	44		**BEACH DEPOSITS** (continued) Dense, wet, bluish gray, SILTY to CLAYEY SAND with GRAVEL (SM/SC) **Bottom of boring at 35.5 feet**			
-5									
	40								
-10									
	45								
-15									
	50								
-20									
	55								
-25									
	60								
-30									
	65								
-35									
	70								
-40									
	75								

Report: GP SOIL LOG; File: TLAGOON.GPJ; 12/20/2002

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Figure A-10

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 9

Sheet 1 of 1

Date(s) Drilled	**11/12/02**	Logged By	**S. Duke**	Checked By	**S.T. Freeman**
Drilling Method	**Hollow-Stem Auger**	Drill Bit Size/Type	**4-1/4-inch-ID, 8-inch-OD auger**	Total Depth of Borehole	**21.5 feet**
Drill Rig Type	**CME 85**	Drilling Contractor	**A & R Drilling**	Approximate Surface Elevation	**31 feet MSL**
Groundwater Level(s)	**Not encountered**	Sampling Method	**Modified California lined with 2-inch-dia. brass tubes**	Hammer Data	**Downhole hammer; 140 lbs / 30-inch drop**
Borehole Backfill	**Drill cuttings (tamped)**	Location	**Refer to site plan**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
	0					Asphalt over gravel base course			
30						**FILL** Dense, moist, dark brown, SILTY to CLAYEY SAND with GRAVEL (SM/SC), fine- to medium-grained sand, fine to coarse gravel consists of shale and sandstone fragments			
			1	46					Composite of 1 and 2: GR = 20% SA = 46% FI = 34% Gs = 2.73
	5		2	48					
25			3	63		Becomes dark yellowish brown; decrease in clay content			
			4	28		Becomes medium dense, dark brown; increase in clay content			Discrete Sample 4: GR = 15% SA = 55% FI = 30%
	10					Becomes dense, light brown; decrease in clay content			
20			5	62					Composite of 5 and 6: GR = 31% SA = 35% FI = 34%
			6	55					
			7	50/3"		Becomes very dense; increase in gravel content			Drilling becomes more difficult.
	15								
15			8	50/5"		Very strong, bluish gray sandstone cobble in sampler shoe			
			9	50/3"		Becomes dark brown			Composite of 9 and 10: GR = 35% SA = 40% FI = 25%
	20								
10			10	76					
						Bottom of boring at 21.5 feet			
	25								
5									
	30								
0									
	35								

Report: GP SOIL LOG; File: TLAGOON.GPJ; 12/20/2002

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 10

Sheet 1 of 1

Date(s) Drilled	**11/12/02**	Logged By	**S. Duke**	Checked By	**S.T. Freeman**
Drilling Method	**Hollow-Stem Auger**	Drill Bit Size/Type	**4-1/4-inch-ID, 8-inch-OD auger**	Total Depth of Borehole	**33.5 feet**
Drill Rig Type	**CME 85**	Drilling Contractor	**A & R Drilling**	Approximate Surface Elevation	**35 feet MSL**
Groundwater Level(s)	**31.5 feet bgs ATD**	Sampling Method	**Modified California lined with 2-inch-dia. brass tubes**	Hammer Data	**Downhole hammer; 140 lbs / 30-inch drop**
Borehole Backfill	**Drill cuttings (tamped)**	Location	**Refer to site plan**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
35	0					Coarse gravel road fill			
						FILL Very dense, moist, dark brown, SILTY to CLAYEY SAND with GRAVEL (SM/SC), fine- to medium-grained sand, fine to coarse gravel consists of sandstone and shale fragments			
			1	73					Composite of 1 and 2: GR = 20% SA = 45% FI = 35%
30	5		2	50/5"		← Very strong, bluish gray cobble in sampler shoe			
			3	50/4"					No recovery at 6 ft.
			4	82					
25	10		5	50/5"					
						Dense, moist, yellowish brown, SILTY to CLAYEY SAND (SM/SC), fine- to medium-grained sand, few fine to coarse gravel-size fragments of sandstone and shale			
			6	60					Composite of 6 and 7: GR = 10% SA = 50% FI = 40%
						← Shell fragments (in sampler tip) Becomes mostly reddish brown			
20	15		7	40					
						Becomes dark brown; increase in fines content			
			8	60					
						Becomes medium dense			
			9	38					
15	20					Medium dense to dense, moist, dark brown, SILTY to CLAYEY SAND with GRAVEL (SM/SC), fine- to medium-grained sand, fine to coarse gravel consists of shale and sandstone fragments			Composite of 10 and 11: GR = 39% SA = 39% FI = 22%
			10	30					
			11	42					
						Becomes dense to very dense, dark gray, with dark gray shale fragments			
10	25		12	53					
						Becomes dark brown			
			13	50/3"					Composite of 13 and 14: GR = 35% SA = 41% FI = 24%
						Becomes medium dense, yellowish brown, with yellowish brown sandstone fragments			
			14	38					
5	30					**BEACH DEPOSITS** Dense, moist, brown, SILTY SAND (SM), fine- to medium-grained sand, few fine gravel-size shale fragments; wet below 31.5 feet ▽			
			15	50					
			16	53					
						Bottom of boring at 33.5 feet			
0	35								

Report: GP SOIL LOG; File: TLAGOON.GPJ; 12/20/2002

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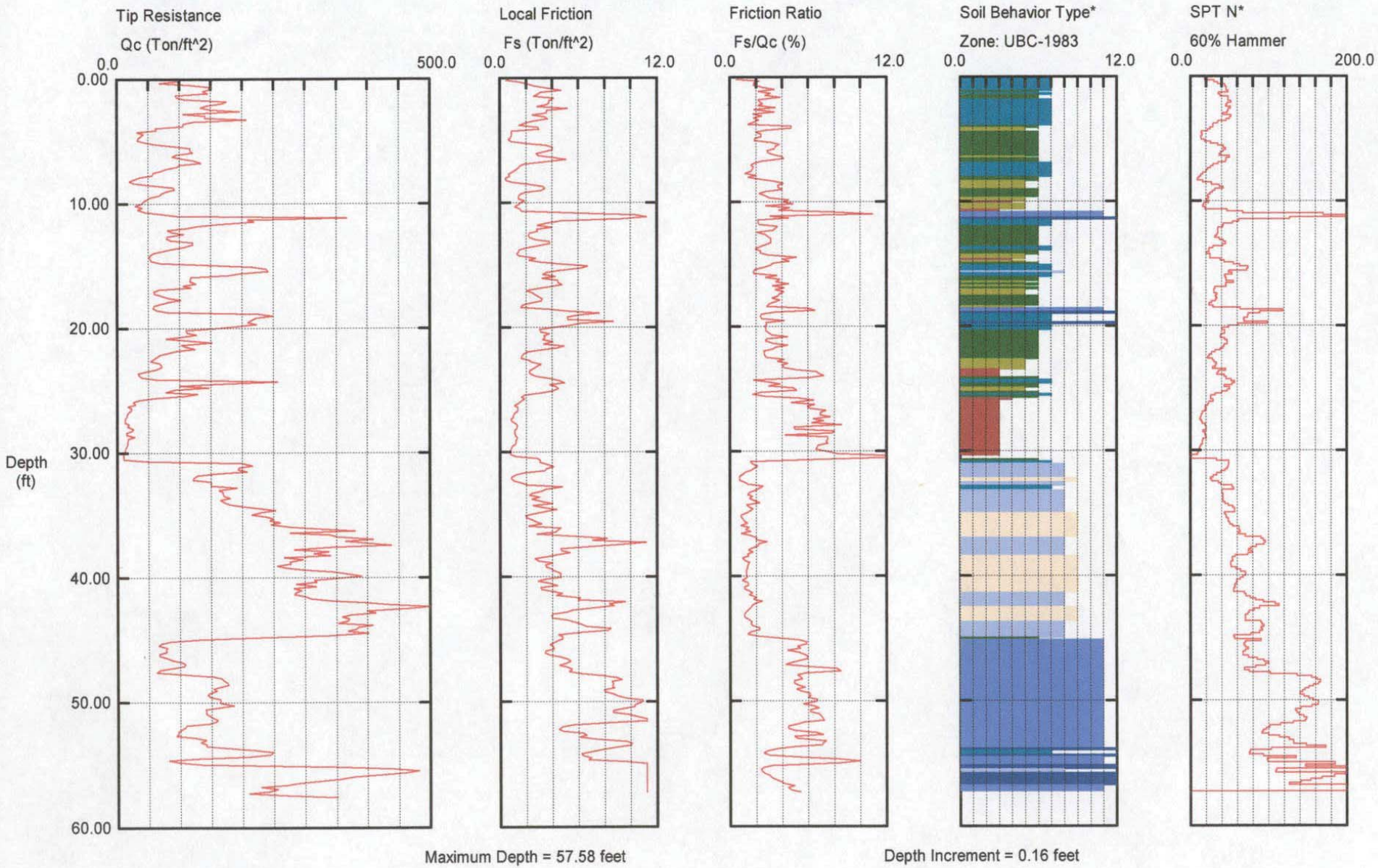
Figure A-12

*Soil behavior type and SPT based on data from UBC-1983

GeoPentech

Operator: John-Andy
Sounding: CPT-2
Cone Used: 409/JH-AP/R#3

CPT Date/Time: 11-12-02 10:20
Location: Topanga Bridge
Job Number:



Maximum Depth = 57.58 feet

Depth Increment = 0.16 feet

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

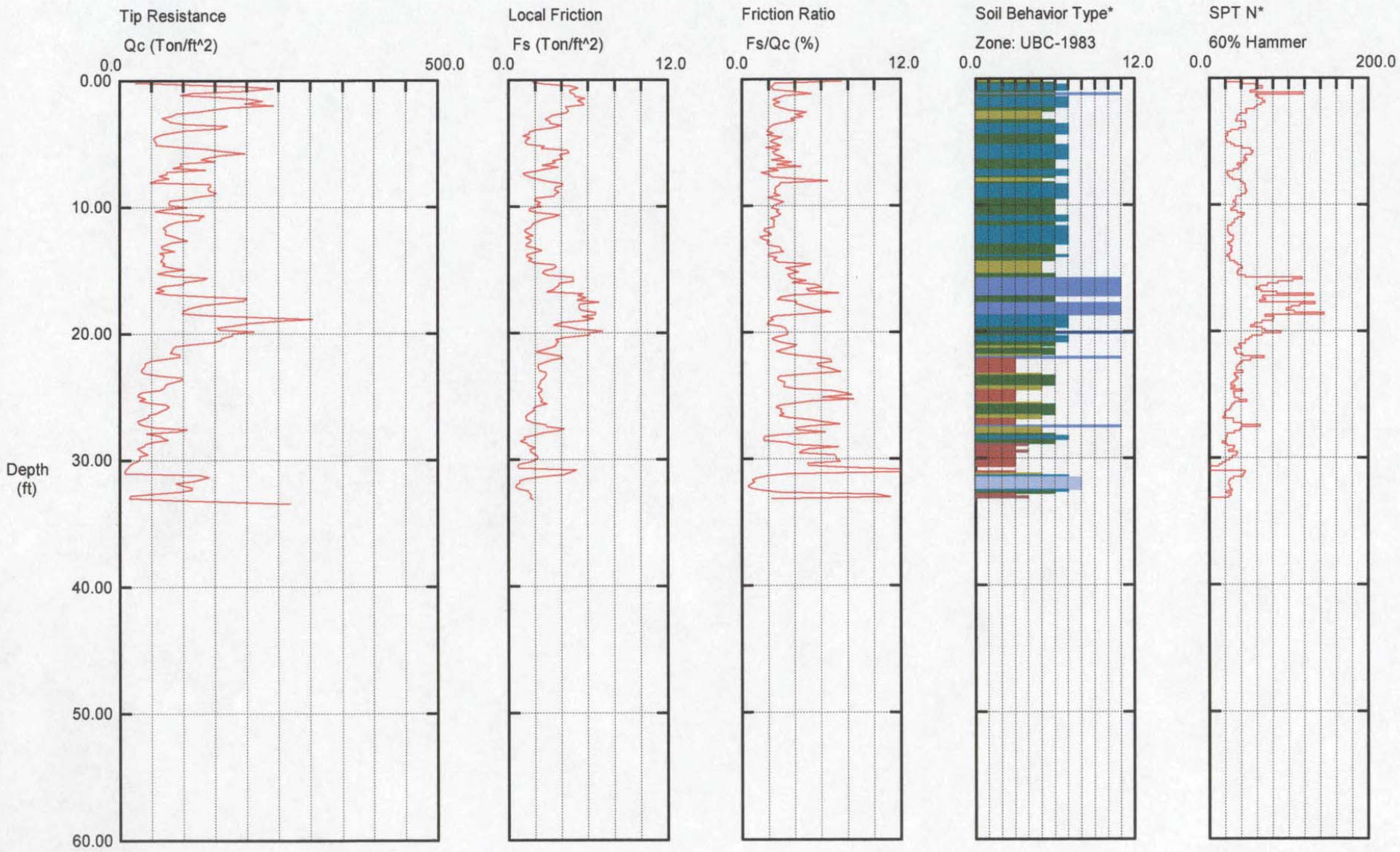
sdf-42

*Soil behavior type and SPT based on data from UBC-1983

GeoPentech

Operator: John-Andy
Sounding: CPT-3
Cone Used: 409/JH-AP/R#3

CPT Date/Time: 11-12-02 11:41
Location: Topanga Bridge
Job Number:



Maximum Depth = 33.46 feet

Depth Increment = 0.16 feet

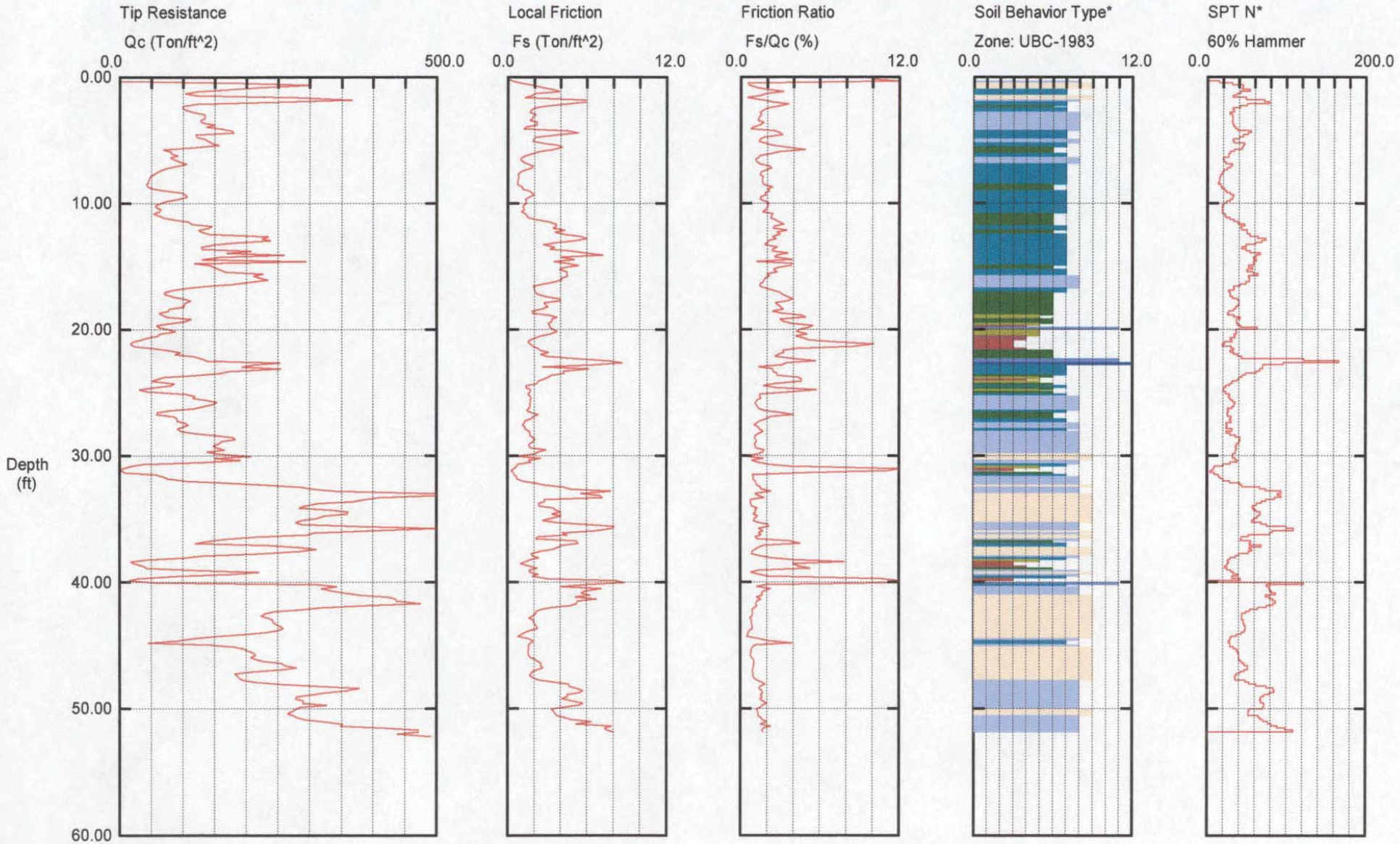
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

GeoPentech

Operator: John-Andy
Sounding: CPT-7
Cone Used: 409/JH-AP/R#3

CPT Date/Time: 11-12-02 09:06
Location: Topanga Bridge
Job Number:



Maximum Depth = 52.17 feet

Depth Increment = 0.16 feet

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

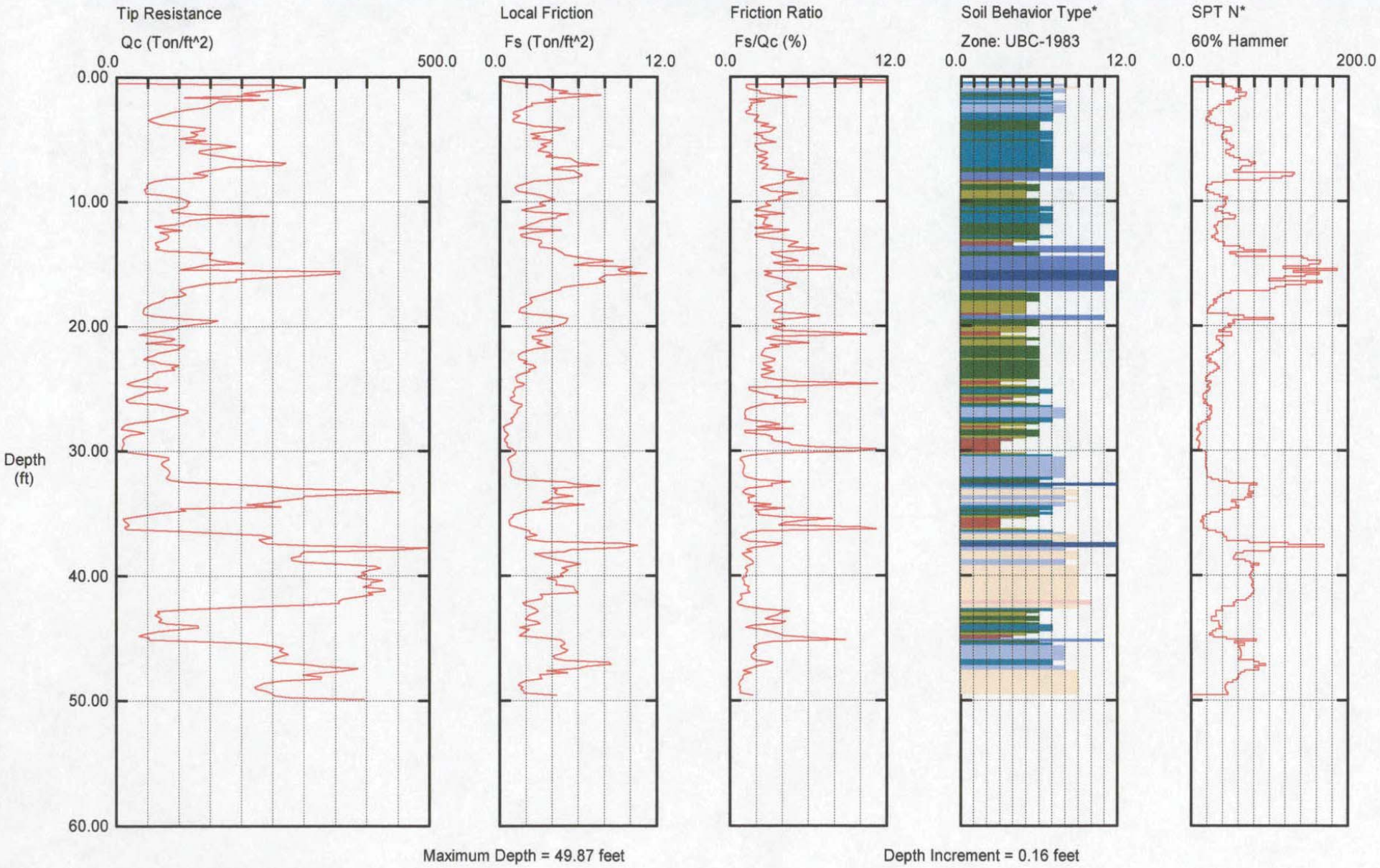
sdf-40

*Soil behavior type and SPT based on data from UBC-1983

GeoPentech

Operator: John-Andy
Sounding: CPT-7A
Cone Used: 409/JH-AP/R#3

CPT Date/Time: 11-12-02 07:49
Location: Topanga Bridge
Job Number:



Maximum Depth = 49.87 feet

Depth Increment = 0.16 feet

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

sdf-39

17781 Cowan , Suite 150, Irvine, CA 92614 Tel.No. (949) 253-5922 Fax. No. (949) 724-1557

Project Name: Topanga Lagoon **Teratest No.:** 015297

Project No.: 02006A **Tabulated By:** LF

Client: GeoPentech **Date:** 12/06/02

TABLE 1

SUMMARY of LABORATORY TEST RESULTS

Boring No.	Sample No.	Depth (ft)	Particle-Size Distribution ASTM D 422 GR:SA:FI[2] (%)	Specific Gravity[3] ASTM D 854	Soil Classification ASTM D 2487 (group symbol)
1	1 & 2	2 - 5.5	35:34:31		(GM)s
1	5 & 6	10 - 13.5	20:46:34	2.80	(SM/SC)g
1	8 & 9	16 - 19	29:43:28		(SC)g
1	10 & 11	20 - 23.5	57:29:14	2.73	(GM/GC)s
2	1 & 2	2 - 5.5	21:49:30	2.72	(SM/SC)g
2	5 & 6	10 - 13.5	23:49:28		(SM/SC)g
2	8 & 9	16 - 19.5	33:39:28		(SM/SC)g
2	11 & 12	22 - 25.5	11:53:36	2.72	SM
3	1 & 2	2 - 5.5	14:59:27		SM
3	4 & 5	8 - 11.5	12:62:26		SM
3	8 & 9	16 - 19.5	22:60:18	2.73	(SM)g
3	13 & 14	26 - 29.5	18:44:38		(SM)g
4	2	4 - 5.5	42:40:18		(GM)s
4	9	18 - 19.5	29:39:32	2.68	(SM)g
4	11	22 - 23.5	28:45:27		(SM)g
5	1	2 - 3.5	26:48:26		(SM)g
5	3 & 4	6 - 9.5	18:51:31		(SM)g
5	6 & 7	12 - 15.5	31:42:27	2.73	(SM)g
5	11 & 12	22 - 25.5	34:42:24		(SM)g
6	1 & 2	2 - 5	17:50:33	2.74	(SM)g
6	7	14 - 15.5	8:65:27		SM

[2] GR:SA:FI = Gravel: Sand: Fines (Percent Passing #200 Sieve)

[3] Material Passing the #4 Sieve

17781 Cowan , Suite 150, Irvine, CA 92614 Tel.No. (949) 253-5922 Fax. No. (949) 724-1557

Project Name: Topanga Lagoon **Teratest No.:** 015297

Project No.: 02006A **Tabulated By:** LF

Client: GeoPentech **Date:** 12/06/02

TABLE 1 cont'd

SUMMARY of LABORATORY TEST RESULTS

Boring No.	Sample No.	Depth (ft)	Particle-Size Distribution ASTM D 422 GR:SA:FI[2] (%)	Specific Gravity[3] ASTM D 854	Soil Classification ASTM D 2487 (group symbol)
7	4 & 5	8 - 11.5	14:49:37		SM/SC
7	7 & 8	14 - 17.5	19:47:34		(SM/SC)g
7	9 & 10	18 - 21.5	23:42:35	2.73	(SM/SC)g
7	13 & 14	26 - 29.5	14:73:13		SM
7a	1 & 2	2 - 5.5	12:54:34		SM/SC
7a	3 & 4	6 - 9.5	16:50:34		(SM/SC)g
7a	6 & 7	12 - 15.5	20:49:31	2.72	(SM/SC)g
7a	10 & 11	20 - 23.5	31:45:24		(SM/SC)g
8	1 & 2	2 - 5.5	24:45:31		(SM/SC)g
8	4 & 5	8 - 11.5	12:50:38		SM/SC
8	8	16 - 17.5	27:42:31		(SM/SC)g
8	12	26 - 27.5	12:71:17	2.71	SM/SC
9	1 & 2	2 - 5.5	20:46:34	2.73	(SM/SC)g
9	4	8 - 9.5	15:55:30		(SM/SC)g
9	5 & 6	10 - 13.5	31:35:34		(SM/SC)g
9	9 & 10	18 - 21.5	35:40:25		(SM/SC)g
10	1 & 2	2 - 5	20:45:35		(SM/SC)g
10	6 & 7	12 - 15.5	10:50:40		SM/SC
10	10 & 11	20 - 23.5	39:39:22		(SM/SC)g
10	13 & 14	26 - 29.5	35:41:24		(SM/SC)g

[2] GR:SA:FI = Gravel: Sand: Fines (Percent Passing #200 Sieve)

[3] Material Passing the #4 Sieve

Teratest Labs, Inc.

APPENDIX B

2021 Field Investigation and Laboratory Tests

Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Key to Log of Boring

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Number	SAMPLES: Blows per 6"	SAMPLES: Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
1	2	3	4	5	6	7	8	9	10	11

COLUMN DESCRIPTIONS

1 **Elevation:** Elevation in feet referenced to mean sea level (MSL).

2 **Depth:** Depth in feet below the ground surface.

3 **Sample Type:** Type of soil sample collected at depth interval shown; sampler symbols are explained below.

4 **Sample Number:** Sample identification number.

5 **Sampling Resistance:** Number of blows required to advance driven sampler 6 inches, or distance noted, using the drive weight listed in hammer data. Hydraulic down-pressure may be recorded for pushed samplers.

6 **Sample Recovery:** Amount of sample recovered from sampling interval; given as inches of sample recovered or ratio of sample length to drive length (expressed as a percentage, %)

7 **Graphic Log:** Graphic depiction of subsurface material encountered; typical symbols are explained below.

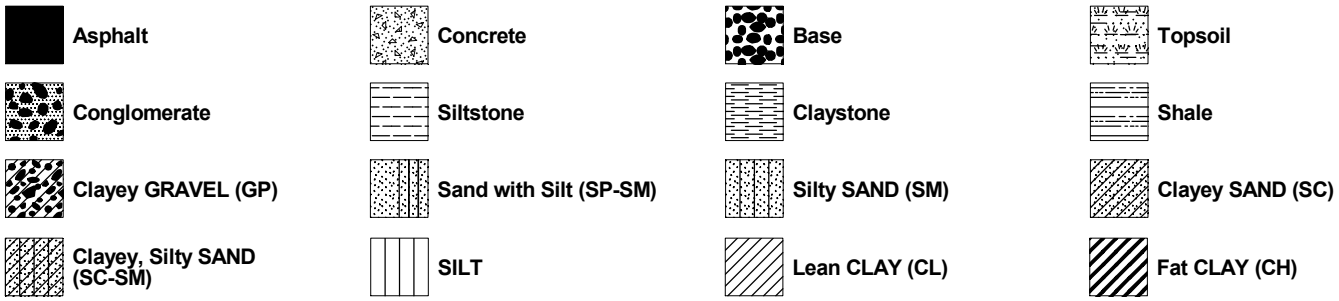
8 **Material Description:** Description of material encountered; may include density/consistency (from field assessments), moisture, color (Munsell code), and grain size.

9 **Water Content:** Water content of sample, as percentage of dry weight of soil, measured in lab according to ASTM D2216.

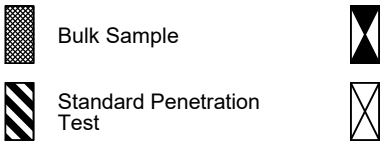
10 **Dry Unit Weight:** The weight of soil solids per cubic foot of total volume of soil mass, measured according to ASTM D2937.

11 **Remarks and Other Tests:** Comments and observations regarding drilling or sampling made by driller or field personnel. Other lab tests are indicated using abbreviations explained below.

TYPICAL MATERIAL GRAPHIC SYMBOLS



TYPICAL SAMPLER GRAPHIC SYMBOLS



OTHER LABORATORY TEST ABBREVIATIONS

COMP	Compaction by modified effort (ASTM D1557)
OMC	Optimum moisture content from compaction test, %
MDD	Maximum dry density from compaction test, pcf
CONS	One-dimensional consolidation test (ASTM D2435)
CORR	Chemical tests to determine soil corrosivity
DS	Consolidated drained direct shear test (ASTM D3080)
EI	Expansion Index (ASTM D4829), EI at 50% saturation
SA	Sieve Analysis (ASTM D4222), % <#200 sieve
FC	Fines Content wash on #200 sieve (ASTM D1140)
HYD	Hydrometer Analysis on fine-grained soils
ER	Minimum soil electrical resistivity (DOT CA 532/643)
LL	Liquid Limit from Atterberg Limits test (ASTM D4318)
PI	Plasticity Index; NP indicates non-plastic determination

OTHER GRAPHIC SYMBOLS

____ Contact between strata

_ _ _ Inferred contact between strata or gradational change

Change within material properties within a stratum

Water level measured after time of drilling

Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive; field descriptions have been modified to reflect lab test results. Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced; they are not warranted to be representative of subsurface conditions at other locations or times. Datum used is WGS84.

SOIL PLASTICITY DESCRIPTIONS

Plasticity Index Range	Plasticity Adjective	Adjective for Soil Type, Texture, and Plasticity Chart Location		
		ML & MH (SILT)	CL & CH (CLAY)	OL & OH (ORGANIC SILT or CLAY)
0	nonplastic	-	-	ORGANIC SILT
1 – 10	low plasticity	-	Silty	ORGANIC SILT
>10-20	medium plasticity	clayey	Silty to no adj.	ORGANIC clayey SILT
>20 – 40	high plasticity	clayey	-	ORGANIC silty CLAY
>40	very plastic	clayey	-	ORGANIC CLAY

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D-2487)					
MATERIAL TYPES	CRITERIA FOR ASSIGNING SOIL GROUP NAMES			GROUP SYMBOL	SOIL GROUP NAMES & LEGENDS
COARSE-GRAINED SOILS >50% RETAINED ON NO. 200 SIEVE	GRAVELS >50% OF COARSE FRACTION RETAINED ON NO. 4. SIEVE	CLEAN GRAVELS <5% FINES	$C_u \geq 4$ AND $1 \leq C_c \leq 3$	GW	WELL-GRADED GRAVEL
			$C_u < 4$ AND/OR $1 > C_c > 3$	GP	POORLY-GRADED GRAVEL
		GRAVELS WITH FINES >12% FINES	FINES CLASSIFY AS ML OR MH	GM	SILTY GRAVEL
			FINES CLASSIFY AS CL OR CH	GC	CLAYEY GRAVEL
	SANDS >50% OF COARSE FRACTION PASSES NO 4. SIEVE	CLEAN SANDS <5%	$C_u \geq 6$ AND $1 \leq C_c \leq 3$	SW	WELL-GRADED SAND
			$C_u < 6$ AND/OR $1 > C_c > 3$	SP	POORLY-GRADED SAND
		SANDS AND FINES >12% FINES	FINES CLASSIFY AS ML OR MH	SM	SILTY SAND
			FINES CLASSIFY AS CL OR CH	SC	CLAYEY SAND
FINE-GRAINED SOILS >50% PASSES NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT <50	INORGANIC	PI >7 AND PLOTS > "A" LINE	CL	LEAN CLAY
			PI <4 OR PLOTS < "A" LINE	ML	SILT
		ORGANIC	LL (oven dried)/LL (not dried) <0.75	OL	ORGANIC CLAY OR SILT
	SILTS AND CLAYS LIQUID LIMIT >50	INORGANIC	PI PLOTS > "A" LINE	CH	FAT CLAY
			PI PLOTS < "A" LINE	MH	ELASTIC SILT
		ORGANIC	LL (oven dried)/LL (not dried) <0.75	OH	ORGANIC CLAY OR SILT
HIGHLY ORGANIC SOILS		PRIMARILY ORGANIC MATTER, DARK IN COLOR, AND ORGANIC ODOR		PT	PEAT

PENETRATION RESISTANCE						
SAND & GRAVEL			SILT & CLAY			
RELATIVE DENSITY	SPT BLOWS/FOOT[1]	MOD CAL BLOWS/FOOT[2]	CONSISTENCY	SPT BLOWS/FOOT[1]	MOD CAL BLOWS/FOOT[2]	UNC. COMP. STRENGTH (KSF)
VERY LOOSE	0 - 4	0 - 6	VERY SOFT	0 - 1	0 - 3	0 – ½
LOOSE	5 - 10	7 - 16	SOFT	2 - 4	4 - 7	½ - 1
MEDIUM DENSE	11 - 30	17 - 47	MEDIUM STIFF	5 - 8	8 - 13	1 - 2
DENSE	31 - 50	48 - 76	STIFF	9 - 15	14 - 24	2 - 4
VERY DENSE	>50	>77	VERY STIFF	16 - 30	25 - 46	4 - 8
			HARD	>30	>46	>8

1. Number of blows of 140 lb hammer falling 30 inches to drive a 2 inch O.D. (1 3/8 inch I.D.) split-barrel sampler the last 12 inches of an 18 inch drive (ASTM-1586 Standard Penetration Tests)
2. Number of blows of 140 lb hammer falling 30 inches to drive a 2.5 inch O.D. (2 inch I.D.) split-barrel sampler the last 12 inches of an 18 inch drive (ASTM-3550 Standard Penetration Tests) Standard Practice for Thick Wall, Ring-Lined, Split Barrel, Drive Sampling of Soils (a multiplier of 0.65 was used to adjust densities for the larger surface area of the modified California sampler.

Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-M1

Sheet 1 of 2

Date(s) Drilled	**12/21/2021**	Logged By	**R. Wakefield**	Checked By	**S. Duke**
Drilling Method	**Hollow Stem Auger**	Drill Bit Size/Type	**8" bullet bit**	Total Depth of Borehole	**50.8 feet**
Drill Rig Type	**CME-75**	Drilling Contractor	**Martini Drilling**	Approximate Surface Elevation	**38 ft msl**
Groundwater Level(s)	**~30 ft bgs**	Sampling Method	**Bulk, Grab, Mod Cal, SPT**	Hammer Data	**Automatic hammer 140 lbs/30" drop**
Borehole Location	**Lat: 34.039925° Long: -118.582523°**	Borehole Completion	**Backfilled with cement-grout via tremie, cuttings spread on site**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Blows per 6"	Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
35	0		Bulk-1				**[Undocumented Fill (Afu)]** **Silty SAND (SM)**, dry, reddish brown, fine SAND; slight HCl reaction, occasional silt clumps			Bulk-1: CORR
30	5		1	14 19 50/4"			**Clayey SAND (SC)**, very dense, moist, olive, fine SAND; slight HCl reaction, common gravel and variable	7	113.0	<#200=26%
25	10		2	11 19 18			becomes dense, yellowish brown; abundant sandstone and shale clasts, abundant gravel and rocks			SA:G=36% S=43% F=21%
20	15		3	19 25 31			becomes moderate HCl reaction, strong localized HCl reaction from calcium carbonate stringers, abundant fine gravel			<#200=20.7% DS
15	20		4	8 9 24			**Lean CLAY (CL)** with silt and sand layers, hard, moist, greenish gray, medium plasticity, strong localized HCl reaction from calcium carbonate stringers, mottled materials and colors			LL=28 PI=15
10	25		5	15 50/2"			becomes dark olive, less sand and silt layers, moderate HCl reaction, large rock in sampler shoe	11	99.0	
	30									

Report: GP SOIL BA LOG; File: 21013A TOPANGA LAGOON BRIDGE .GPJ; 3/21/2022

Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-M1

Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES Type	Number	Blows per 6"	Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
	30		6	3 4 8			**[Beach Deposits]** **Poorly-graded SAND (SP)**, medium dense, saturated, fine to medium SAND, no HCl reaction			
5										
	35		7	32 50/4"			becomes very dense, dark yellowish brown, fine to coarse SAND, abundant small to large gravel,			DS
0										
	40		8	4 13 22			**Poorly-graded SAND with silt (SP-SM)**, dense, saturated, medium gray (salt and pepper), fine SAND, no HCl reaction, with no gravel			<#200=5.5%
-5										
	45		9	18 31 50/3"			becomes very dense, olive brown	19	112.3	
-10										
	50		10	34 50/3"			Alternating layers of **Silty SAND (SM)** and **Poorly-sorted SAND with gravel (SP)** , very dense, saturated, fine to coarse SAND, no HCl reaction			
							Total Depth = 50.75' bgs Groundwater observed at ~30' bgs during drilling Backfilled with cement bentonite grout on 12/21/2021			
-15										
	55									
-20										
	60									
-25										
	65									

Report: GP SOIL BA LOG; File: 21013A TOPANGA LAGOON BRIDGE .GPJ; 3/21/2022

Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-M2

Sheet 1 of 2

Date(s) Drilled	**12/21/2021**	Logged By	**R. Wakefield**	Checked By	**S. Duke**
Drilling Method	**Hollow Stem Auger**	Drill Bit Size/Type	**8" bullet bit**	Total Depth of Borehole	**50.8 feet**
Drill Rig Type	**CME-75**	Drilling Contractor	**Martini Drilling**	Approximate Surface Elevation	**38 ft msl**
Groundwater Level(s)	**~30 ft bgs**	Sampling Method	**Bulk, Grab, Mod Cal, SPT**	Hammer Data	**Automatic hammer 140 lbs/30" drop**
Borehole Location	**Lat: 34.039982° Long: -118.581986°**	Borehole Completion	**Backfilled with cement-grout via tremie, cuttings spread on site**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Blows per 6"	Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
35	0						Surface: covered by dead leaves, twigs, bark and branches **[Undocumented Fill (Afu)]** **Lean CLAY (CL)**, moist, medium plasticity; moderate HCl reaction, large sandstone clasts up to 3" in diameter.			
30	5			7 20 24			becomes hard	8	101.2	
25	10			7 10 17			**Clayey SAND (SC)**, medium dense, moist, reddish brown, fine SAND; slight HCl reaction			<#200=17.9%
20	15			16 27 46			becomes dense, yellowish brown, mottled colors and material			LL=26 PI=9 DS
15	20			11 16 12			becomes medium dense, brown, moderate HCl reaction			SA:G=25% S=40% F=35%
10	25			11 34 22			**[Beach Deposits]** **Sandy SILT (ML)**, hard, moist, nonplastic; no HCl reaction	10	112.6	DS
	30									

Report: GP SOIL BA LOG; File: 21013A TOPANGA LAGOON BRIDGE .GPJ; 3/21/2022

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Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-M2

Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Blows per 6"	Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
30				4 6 6			**Poorly-graded SAND with silt (SP-SM)**, medium dense, saturated, yellowish brown, fine SAND; slight HCl reaction, iron oxide stained grains			<#200=11.9%
5										
35				7 19 37			**Poorly-graded SAND (SP)**, dense, saturated, dark gray, fine to medium SAND, no HCL reaction, no iron oxide staining			DS
0										
40				5 15 24			becomes fine to coarse SAND			
-5										
45				19 42 40			becomes very dense, siltier zones a few inches thick	14	120.8	
-10										
50				16 50/3"						
-15							**Total Depth = 50.75' bgs** Groundwater observed at ~30' bgs during drilling Backfilled with cement bentonite grout on 12/21/2021			
55										
-20										
60										
-25										
65										

Report: GP SOIL BA LOG; File: 21013A TOPANGA LAGOON BRIDGE .GPJ; 3/21/2022

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Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-1

Sheet 1 of 2

Date(s) Drilled	**12/20/2021**	Logged By	**R. Wakefield**	Checked By	**S. Duke**
Drilling Method	**Hollow Stem Auger**	Drill Bit Size/Type	**8" bullet bit**	Total Depth of Borehole	**33.3 feet**
Drill Rig Type	**CME-75**	Drilling Contractor	**Martini Drilling**	Approximate Surface Elevation	**38 ft msl**
Groundwater Level(s)	**Not Observed During Drilling**	Sampling Method	**Grab, SPT**	Hammer Data	**Automatic hammer 140 lbs/30" drop**
Borehole Location	**Lat: 34.04012° Long: -118.58340°**	Borehole Completion	**Backfilled with cement-grout via tremie, cuttings spread on site**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Blows per 6"	Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
	0						**[Undocumented Fill (Afu)]**			
35		☒	1				**SILT (ML)**, dry, brown, nonplastic; slight HCl reaction, common rootlets/root hairs			
	5			7						
			2	8			**Clayey SAND (SC)**, medium dense, dry, reddish brown, fine SAND; slight HCl reaction, roots, sandstone clasts			<#200=39%
				9						
30			3	14			becomes dense, dark olive; moderate HCl reaction, abundant gravel			
				16						
	10			16						
			4	8			becomes medium dense, moist, brown; slight HCl reaction			<#200=18%
				11						
				19						
25			5	8			**Silty SAND (SM)**, dense, moist, yellowish brown, fine SAND; moderate HCl reaction, slight mica			
				16						
	15			27						
			6	13			becomes olive brown, some mica			<#200=35%
				17						
				17						
20			7	19						
				13						
	20			26						
			8	17			becomes olive; strong localized HCl reaction from calcium carbonate stringers, highly mottled colors			<#200=44%
				19						
15			9	16			becomes medium dense, less mottled			
				7						
	25			7						
			10	8			become loose; moderate HCl reaction			<#200=30%
				3						
				5						
10			11	5			becomes medium dense, strong HCl reaction			
				12						
				8						
	30			17						

Report: GP SOIL BA LOG; File: 21013A TOPANGA LAGOON BRIDGE .GPJ; 3/23/2022

Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-1

Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Blows per 6"	SAMPLES Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
30							**[Bedrock (Shale)]**			
			12	11 19 25			**SHALE**, hard, moist, dark olive gray, low plasticity; moderate HCl reaction, speckled iron oxide staining			
5			13	30 50/4"			**Total Depth = 33.3' bgs** No groundwater observed during drilling Backfilled with cement bentonite grout on 12/20/2021			
35										
0										
40										
-5										
45										
-10										
50										
-15										
55										
-20										
60										
-25										
65										

Report: GP SOIL BA LOG; File: 21013A TOPANGA LAGOON BRIDGE .GPJ; 3/23/2022

Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-2

Sheet 1 of 2

Date(s) Drilled	**12/20/2021**	Logged By	**R. Wakefield**	Checked By	**S. Duke**
Drilling Method	**Hollow Stem Auger**	Drill Bit Size/Type	**8" bullet bit**	Total Depth of Borehole	**31.5 feet**
Drill Rig Type	**CME-75**	Drilling Contractor	**Martini Drilling**	Approximate Surface Elevation	**36 ft msl**
Groundwater Level(s)	**~30 ft bgs**	Sampling Method	**Grab, SPT**	Hammer Data	**Automatic hammer 140 lbs/30" drop**
Borehole Location	**Lat: 34.03946° Long: -118.58359°**	Borehole Completion	**Backfilled with cement-grout via tremie, cuttings spread on site**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Blows per 6"	Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
35	0						**[Undocumented Fill (Afu)]**			
		☒	1				**Clayey SAND (SC)**, dry, brownish gray, fine sand; moderate HCl reaction, sandstone and shale chunks and fragments, occasional coarse gravel			
30	5		2	10 15 17			becomes dense			<#200=31%
			3	7 12 16			**Silty SAND (SM)**, medium dense, moist, fine SAND; slight HCl reaction, highly mottled with layers of material			
25	10		4	8 15 18			**Clayey SAND (SC)**, dense, moist, yellowish brown, fine SAND; slight HCl reaction			<#200=28%
			5	8 15 16			becomes some sandier layers			
20	15		6	22 23 24			becomes moderate HCl reaction			
			7	10 9 16			becomes medium dense, moist, dark olive; moderate HCl reaction, highly mottled with sandstone and shale clasts			<#200=24%
15	20		8	18 31 26			**Silty SAND (SM)**, very dense, moist, gray, fine SAND; slight HCl reaction			
			9	16 20 32			becomes olive brown			<#200=23%
10	25		10	13 10 10			**Clayey SAND (SC)**, medium dense, moist, dark yellowish brown, fine SAND; moderate HCl reaction			
			11	6 7 5			**Silty SAND (SM)**, medium dense, moist, greenish gray, fine SAND; moderate HCl reaction			<#200=23%
	30						▽			

Report: GP SOIL BA LOG; File: 21013A TOPANGA LAGOON BRIDGE .GPJ; 3/23/2022

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Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-2

Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Blows per 6"	SAMPLES Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
	30									
5			12	5 7 4			**[Beach Deposits]** **Silty SAND (SM)**, medium dense, saturated, greenish gray, fine SAND; moderate HCl reaction, common small gravel			
							Total Depth = 31.5' bgs Groundwater observed at ~30' bgs during drilling Backfilled with cement bentonite grout on 12/20/2021			
	35									
0										
	40									
-5										
	45									
-10										
	50									
-15										
	55									
-20										
	60									
-25										
	65									

Report: GP SOIL BA LOG; File: 21013A TOPANGA LAGOON BRIDGE .GPJ; 3/23/2022

Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-3a

Sheet 1 of 1

Date(s) Drilled	**12/20/2021**	Logged By	**R. Wakefield**	Checked By	**S. Duke**
Drilling Method	**Hollow Stem Auger**	Drill Bit Size/Type	**8" bullet bit**	Total Depth of Borehole	**16.5 feet**
Drill Rig Type	**CME-75**	Drilling Contractor	**Martini Drilling**	Approximate Surface Elevation	**32 ft msl**
Groundwater Level(s)	**Not Observed During Drilling**	Sampling Method	**Grab, SPT**	Hammer Data	**Automatic hammer 140 lbs/30" drop**
Borehole Location	**Lat: 34.03921° Long: -118.58350°**	Borehole Completion	**Backfilled with cement-grout via tremie, cuttings spread on site**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Blows per 6"	SAMPLES Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
	0						2" asphalt, 8" base			
							[Undocumented Fill (Afu)] **Sandy SILT (ML)**, dry, brown, nonplastic; slight HCl reaction, occasional small gravel			
30		☒	1							
	5		2	3 5 7			**Clayey SAND with gravel (SC)**, medium dense, mottled dark greenish gray and brown, fine SAND; slight HCl reaction			<#200=19%
25			3	15 12 10			becomes poor recovery of grayish brown SAND			
	10		4	4 4 15			**Clayey SAND (SC)**, medium dense, moist, mottled dark greenish gray and brown, fine SAND; slight HCl reaction			<#200=28%
20			5	12 16 19			**Silty SAND (SM)**, medium dense, moist, yellowish brown, fine SAND; no HCl reaction			
	15		6	4 5 12			**Clayey SAND (SC)**, medium dense, moist, olive brown, fine SAND; moderate HCl reaction			
15							Hollow Stem Auger Refusal at 16.5 ft Move Location 5-ft and Redrill at HSA-3b CONTINUED ON LOG FOR HSA-3b			
	20									
10										
	25									
5										
	30									

Report: GP SOIL BA LOG; File: 21013A TOPANGA LAGOON BRIDGE .GPJ; 3/23/2022

Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-3b

Sheet 1 of 2

Date(s) Drilled	**12/20/2021**	Logged By	**R. Wakefield**	Checked By	**S. Duke**
Drilling Method	**Hollow Stem Auger**	Drill Bit Size/Type	**8" bullet bit**	Total Depth of Borehole	**31.5 feet**
Drill Rig Type	**CME-75**	Drilling Contractor	**Martini Drilling**	Approximate Surface Elevation	**32 ft msl**
Groundwater Level(s)	**~27 ft bgs**	Sampling Method	**Grab, SPT**	Hammer Data	**Automatic hammer 140 lbs/30" drop**
Borehole Location	**Lat: 34.03921° Long: -118.58350°**	Borehole Completion	**Backfilled with cement-grout via tremie, cuttings spread on site**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Blows per 6"	SAMPLES Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
30	0						SEE LOG FOR HSA-3a			
25	5									
20	10									
15	15									
15							**[Undocumented Fill (Afu)]** **Clayey SAND (SC)**, medium dense, moist, olive brown, fine SAND; moderate HCl reaction			
			7	6 20 26			becomes dense, brown, fine SAND, varying lifts visible including some white sands			
20			8	5 11 16			becomes medium dense			<#200=23%
10			9	5 6 10						
25			10	6 9 22			becomes dense			
5							▽			
			11	9 7 10			**[Beach Deposits]** **Poorly-graded Sand with Clay (SP-SC)**, medium dense, saturated, gray, fine to medium SAND; slight HCl reaction			<#200=8%
30										

Report: GP SOIL BA LOG; File: 21013A TOPANGA LAGOON BRIDGE .GPJ; 3/23/2022

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Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-3b

Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Blows per 6"	SAMPLES Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
	30		12	15 8 8			**Poorly-graded SAND**, medium dense, saturated, gray, fine to coarse SAND, no HCl reaction			
0							**Total Depth = 31.5' bgs** Groundwater observed at ~27' bgs during drilling Backfilled with cement bentonite grout on 12/20/2021			
	35									
-5										
	40									
-10										
	45									
-15										
	50									
-20										
	55									
-25										
	60									
-30										
	65									

Report: GP SOIL BA LOG; File: 21013A TOPANGA LAGOON BRIDGE .GPJ; 3/23/2022

Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-4

Sheet 1 of 2

Date(s) Drilled	**12/20/2021**	Logged By	**R. Wakefield**	Checked By	**S. Duke**
Drilling Method	**Hollow Stem Auger**	Drill Bit Size/Type	**8" bullet bit**	Total Depth of Borehole	**29.0 feet**
Drill Rig Type	**CME-75**	Drilling Contractor	**Martini Drilling**	Approximate Surface Elevation	**35 ft msl**
Groundwater Level(s)	**Not Observed During Drilling**	Sampling Method	**Grab, SPT**	Hammer Data	**Automatic hammer 140 lbs/30" drop**
Borehole Location	**Lat: 34.038804° Long: -118.583594°**	Borehole Completion	**Backfilled with cement-grout via tremie, cuttings spread on site**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Blows per 6"	Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
35	0						**[Undocumented Fill (Afu)]**			
							Silty SAND (SM), dry, brown, fine SAND; moderate HCl reaction			
		☒	1							
30	5		2	3 4 4			becomes loose			<#200=21%
			3	4 12 10			becomes medium dense, yellowish brown, slight HCl reaction, some gray sand layers			
25	10		4	3 4 5			becomes loose, no sand layers			<#200=24%
			5	8 8 7			becomes medium dense			
20	15		6	3 4 4			**Lean CLAY (CL)**, medium stiff, moist, low plasticity; heavily mottled material sandstone and shale fragments with color varieties			
			7	5 9 12			**Clayey SAND (SC)**, medium dense, moist, fine SAND; slight HCl reaction, blocky texture, sandstone clast inclusions			<#200=28%
15	20		8	8 8 11						
			9	3 4 7			becomes gray			
10	25		10	5 5 8			becomes light gray on top and dark gray in middle of sample			<#200=47%
							SILT (ML), stiff, moist, light yellowish brown, nonplastic; no HCl reaction, mottled material with common small sandstone clast inclusions,			
			11	5 7 10			**Lean CLAY (CL)**, very stiff, moist, dark yellowish brown; slight HCl reaction, low plasticity			
							Fat CLAY (CH), very stiff, moist, black; slight HCl reaction, organic rich with strong organic odor, occasional roots			Historic lagoon deposits?
5	30									

Report: GP SOIL BA LOG; File: 21013A TOPANGA LAGOON BRIDGE .GPJ; 3/23/2022

Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-4

Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Blows per 6"	Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
5	30						**Total Depth = 29' bgs** No groundwater observed during drilling Backfilled with cement bentonite grout on 12/20/2021			
0	35									
-5	40									
-10	45									
-15	50									
-20	55									
-25	60									
-30	65									

Report: GP SOIL BA LOG; File: 21013A TOPANGA LAGOON BRIDGE .GPJ; 3/23/2022

Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-5

Sheet 1 of 1

Date(s) Drilled	**12/22/2021**	Logged By	**D. Wahl**	Checked By	**S. Duke**
Drilling Method	**Hollow Stem Auger**	Drill Bit Size/Type	**8" bullet bit**	Total Depth of Borehole	**14.0 feet**
Drill Rig Type	**CME-75**	Drilling Contractor	**Martini Drilling**	Approximate Surface Elevation	**17 ft msl**
Groundwater Level(s)	**~7 ft bgs**	Sampling Method	**Grab, SPT**	Hammer Data	**Automatic hammer 140 lbs/30" drop**
Borehole Location	**Lat: 34.038404° Long: -118.583924°**	Borehole Completion	**Backfilled with cement-grout via tremie, cuttings spread on site**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Blows per 6"	SAMPLES Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
15	0						**[Undocumented Fill (Afu)]** **Sandy Lean CLAY (CL)**, moist, dark brown; occasional cobbles, some gravel to 1" in diameter			
		☒	1							
10	5		2	1 4 4			becomes medium stiff			<#200=59%
5	10		3	5 6 5			▽ becomes stiff, occasional sand layers 2" thick			
							[Beach Deposits] **Poorly-graded beach SAND (SP)**, medium dense, moist, light brown, fine SAND			
0	15		4	3 4 7						<#200=4%
-5			5	4 5 6			becomes brownish gray, coarse SAND			GW@13' rising to about 7' after pulling augers
-10	20						**Total Depth = 14' bgs** Groundwater observed at ~7' bgs during drilling Backfilled with cement bentonite grout on 12/22/2021			
	25									
	30									

Report: GP SOIL BA LOG; File: 21013A TOPANGA LAGOON BRIDGE .GPJ; 3/23/2022

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Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-6

Sheet 1 of 2

Date(s) Drilled	**12/21/2021**	Logged By	**R. Wakefield**	Checked By	**S. Duke**
Drilling Method	**Hollow Stem Auger**	Drill Bit Size/Type	**8" bullet bit**	Total Depth of Borehole	**31.5 feet**
Drill Rig Type	**CME-75**	Drilling Contractor	**Martini Drilling**	Approximate Surface Elevation	**37 ft msl**
Groundwater Level(s)	**~30 ft bgs**	Sampling Method	**Grab, SPT**	Hammer Data	**Automatic hammer 140 lbs/30" drop**
Borehole Location	**Lat: 34.03989° Long: -118.58266°**	Borehole Completion	**Backfilled with cement-grout via tremie, cuttings spread on site**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Blows per 6"	Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
37	0						**[Undocumented Fill (Afu)]**			
							Silty SAND (SM), dry, brown, fine SAND; slight HCl reaction			
35		☒	1							
	5			4			becomes medium dense			
			2	10						<#200=34%
				16						
30							becomes dense, olive yellow; no HCl reaction, siltier material at top of sample			
			3	13						
	10			25						
				22						
				5			**Clayey SAND (SC)**, medium dense, moist, olive, fine SAND; slight HCl reaction, highly mottled, iron-oxide staining			
			4	7						<#200=25%
				16						
25							becomes very dense, cored and broken up big gray rock fragment			
			5	21						
				40						
	15			20						
				9			**Silty SAND (SM)**, dense, moist, very dark gray, fine SAND; slight HCl reaction			
			6	11						<#200=28%
20				20						
							becomes medium dense, dark gray, with occasional cobble sized rock fragments			
			7	21						
	20			20						
				7						
				2			**SILT (ML)**, medium stiff, moist, dark greenish gray, nonplastic			
			8	3						
				4			**Clayey SAND (SC)**, loose, moist, black, fine SAND; slight HCl reaction with associated strong H2S odor, strong organic odor			
15							becomes dark greenish gray, less organic odor, roots			
			9	2						<#200=46%
				3						
				5						
	25						becomes black, more organic			
			10	2						
				3						
10				3						
				5			becomes medium dense, dark gray, with alternating sandy clay and clayey sand layers			
			11	10						
	30			9						

▽

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Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-6

Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Blows per 6"	SAMPLES Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
	30		12	17 25 20			**[Beach Deposits]** **Poorly-graded SAND with silt (SP-SM)**, dense, saturated, dark gray, fine to coarse SAND			
-5	35						**Total Depth = 31.5' bgs** Groundwater observed at ~30' bgs during drilling Backfilled with cement bentonite grout on 12/21/2021			
0	40									
-5	45									
-10	50									
-15	55									
-20	60									
-25	65									

Report: GP SOIL BA LOG; File: 21013A TOPANGA LAGOON BRIDGE .GPJ; 3/23/2022

Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-7

Sheet 1 of 1

Date(s) Drilled	**12/21/2021**	Logged By	**R. Wakefield**	Checked By	**S. Duke**
Drilling Method	**Hollow Stem Auger**	Drill Bit Size/Type	**8" bullet bit**	Total Depth of Borehole	**26.5 feet**
Drill Rig Type	**CME-75**	Drilling Contractor	**Martini Drilling**	Approximate Surface Elevation	**34 ft msl**
Groundwater Level(s)	**Not Observed During Drilling**	Sampling Method	**Grab, SPT**	Hammer Data	**Automatic hammer 140 lbs/30" drop**
Borehole Location	**Lat: 34.03955° Long: -118.58275°**	Borehole Completion	**Backfilled with cement-grout via tremie, cuttings spread on site**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Blows per 6"	Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
30	0						3/4" asphalt, 7" base			
							[Undocumented Fill (Afu)]			
		☒	1				**Silty SAND (SM)**, dry, yellowish brown, fine SAND; moderate HCl reaction, occasional medium gravel			
25	5	▨	2	5 15 18			becomes dense, dark yellowish brown, mottled, clast inclusions, abundant gravel			
		▨	3	18 17 18			becomes more highly mottled with abundant clasts of sandstone and shale with variety of colors, slight HCl reaction			<#200=21%
20	10	▨	4	10 20 16						
		▨	5	11 14 20						
15	15	▨	6	6 17 40			becomes very dense, moist; highly mottled with variable colors			<#200=26%
		▨	7	13 25 22			**Clayey SAND (SC)**, dense, moist, very dark gray, fine SAND; no HCl reaction, some gravel			
10	20	▨	8	22 13 7			becomes medium dense, yellowish brown, slight HCl reaction			<#200=23%
		▨	9	8 14 22			becomes dense, dark olive; mottled with variable colors			
5	25	▨	10	6 8 9			becomes medium dense, very dark green, fine SAND; iron-oxide stained stringers, gray sand at top of sample, less mottled			<#200=21%
0	30						**Total Depth = 26.5' bgs** No groundwater observed during drilling Backfilled with cement bentonite grout on 12/21/2021			

Report: GP SOIL BA LOG; File: 21013A TOPANGA LAGOON BRIDGE .GPJ; 3/23/2022

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Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-8

Sheet 1 of 1

Date(s) Drilled	**12/22/2021**	Logged By	**D. Wahl**	Checked By	**S. Duke**
Drilling Method	**Hollow Stem Auger**	Drill Bit Size/Type	**8" bullet bit**	Total Depth of Borehole	**26.5 feet**
Drill Rig Type	**CME-75**	Drilling Contractor	**Martini Drilling**	Approximate Surface Elevation	**33 ft msl**
Groundwater Level(s)	**Not Observed During Drilling**	Sampling Method	**Grab, SPT**	Hammer Data	**Automatic hammer 140 lbs/30" drop**
Borehole Location	**Lat: 34.039427° Long: -118.582869°**	Borehole Completion	**Backfilled with cement-grout via tremie, cuttings spread on site**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Blows per 6"	Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
	0						3" asphalt, 3" base			
							[Undocumented Fill (Afu)]			
							Clayey SAND (SC), moist, dark brown, fine SAND; cobble near surface, occasional subangular gravel			
30		☒	1							
	5			7			becomes medium dense			
			2	9						
				10						
25			3	8			becomes discs of intact sandstone, very weak to friable, massive			<#200=27%
				5						
	10			6						
			4	13						No Recovery
				8						
				8						
20			5	11			**Silty SAND (SM)**, dense, moist, light brown, fine SAND; mottled with black and orange, occasional gravel and cobble			<#200=30%
				16						
				16						
	15			13			**Clayey SAND (SC)**, medium dense, moist, light orangish brown, fine SAND; chunks of intact very strong sandstone			
			6	15						
				10						
15			7	9			becomes dark brown			<#200=24%
				15						
				15						
	20			7			becomes light brown			
			8	10						
				7						
10			9	17			becomes dense			<#200=18%
				19						
				14						
	25			9			becomes medium dense, ~6" of recovery (upper sample)			
			10	8						
				10						
5							**Total Depth = 26.5' bgs**			
							No groundwater observed during drilling			
							Backfilled with cement bentonite grout on 12/22/2021			
	30									

Report: GP SOIL BA LOG; File: 21013A TOPANGA LAGOON BRIDGE .GPJ; 3/23/2022

GeoPentech
Geotechnical & Geoscience Consultants

Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-S1

Sheet 1 of 2

Date(s) Drilled	**12/22/2021**	Logged By	**S. Duke**	Checked By	
Drilling Method	**Hollow Stem Auger**	Drill Bit Size/Type	**8" bullet bit**	Total Depth of Borehole	**43.0 feet**
Drill Rig Type	**CME-75**	Drilling Contractor	**Martini Drilling**	Approximate Surface Elevation	**64 ft msl**
Groundwater Level(s)	**Not Observed During Drilling**	Sampling Method	**SPT**	Hammer Data	**Automatic hammer 140 lbs/30" drop**
Borehole Location	**Lat: 34.042807° Long: -118.579238°**	Borehole Completion	**Backfilled with cement-grout via tremie, cuttings spread on site**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Blows per 6"	SAMPLES Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
60	0						**[Undocumented Fill (Afu)]** **Clayey SAND (SC)**, moist, dark brown and yellowish brown, fine SAND; occasional gravel and sandstone angular rock fragments, trace roots			
	5		1	5 8 15			becomes medium dense			<#200=42% LL=31 PI=15
55	10		2	28 18 21			**Clayey SAND with gravel (SC)**, dense, moist, dark brown to yellowish brown, fine SAND; angular fragments of sandstone			
50	15		3	4 6 9			becomes medium dense, dark brown and light reddish brown			<#200=44% LL=31 PI=15
45	20		4	3 7 7			becomes dark brown and light brown			
40	25		5	6 9 9			becomes predominantly black and dark brown with gravel size angular fragments of sandstone and shale			
35	30									

Report: GP SOIL BA LOG; File: 21013A TOPANGA LAGOON BRIDGE .GPJ; 3/23/2022

Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-S1

Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Blows per 6"	SAMPLES Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
	30									
			6	9 5 4			**Clayey SAND with gravel (SC)**, loose, moist, reddish brown; coarse angular gravel fragments <2"			more difficult drilling
30										
	35						becomes dense, predominantly clayey SAND to sandy CLAY (SC to CL), dense/hard; fine angular gravel fragments			
			7	5 10 22						<#200=35% LL=29 PI=13
25										
	40						**[Alluvium]**			
			8	9 7 30			**Silty SAND (SM)**, dense, moist, brown; some subrounded fine gravel			
										Very difficult drilling bedrock?
20							**Total Depth = 43' bgs (refusal)**			
	45						No groundwater observed during drilling Backfilled with cement bentonite grout on 12/22/2021			
15										
	50									
10										
	55									
5										
	60									
0										
	65									

Report: GP SOIL BA LOG; File: 21013A TOPANGA LAGOON BRIDGE .GPJ; 3/23/2022

GeoPentech
Geotechnical & Geoscience Consultants

December 22, 2021

GeoPentech
Attn: James Heins

Subject: CPT Site Investigation
Topanga Ranch Motel
Malibu, California
GREGG Project Number: D1215107

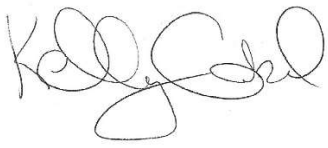
Dear James:

The following report presents the results of GREGG Drilling Cone Penetration Test investigation for the above referenced site. The following testing services were performed:

1	Cone Penetration Tests	(CPTU)	☒
2	Pore Pressure Dissipation Tests	(PPD)	☒
3	Seismic Cone Penetration Tests	(SCPTU)	☐
4	Membrane Interface Probe	(MIP)	☐
5	Hydraulic Profiling Tool	(HPT)	☐
6	Groundwater Sampling	(GWS)	☐
7	Soil Sampling	(SS)	☐
8	Vapor Sampling	(VS)	☐

A list of reference papers providing additional background on the specific tests conducted is provided in the bibliography following the text of the report. If you would like a copy of any of these publications or should you have any questions or comments regarding the contents of this report, please do not hesitate to contact me at 949-903-6873.

Sincerely,
Gregg Drilling, LLC.



CPT Reports Team
Gregg Drilling, LLC.

Cone Penetration Test Sounding Summary

-Table 1-

CPT Sounding Identification	Date	Termination Depth (feet)	Depth of Groundwater Samples (feet)	Depth of Soil Samples (feet)	Depth of Pore Pressure Dissipation Tests (feet)
CPT-1	12/21/2021	17.22	-	-	-
CPT-2	12/21/2021	18.21	-	-	-
CPT-3	12/21/2021	39.04	-	-	39.04
CPT-4	12/21/2021	25.10	-	-	-
CPT-5	12/21/2021	24.93	-	-	24.93

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DeGroot, D.J. and A.J. Lutenegger, "Reliability of Soil Gas Sampling and Characterization Techniques", International Site Characterization Conference - Atlanta, 1998.

Woeller, D.J., P.K. Robertson, T.J. Boyd and Dave Thomas, "Detection of Polyaromatic Hydrocarbon Contaminants Using the UVIF-CPT", 53rd Canadian Geotechnical Conference Montreal, QC October pp. 733-739, 2000.

Zemo, D.A., T.A. Delfino, J.D. Gallinatti, V.A. Baker and L.R. Hilpert, "Field Comparison of Analytical Results from Discrete-Depth Groundwater Samplers" BAT EnviroProbe and QED HydroPunch, Sixth national Outdoor Action Conference, Las Vegas, Nevada Proceedings, 1992, pp 299-312.

Copies of ASTM Standards are available through www.astm.org

Cone Penetration Testing Procedure (CPT)

Gregg Drilling carries out all Cone Penetration Tests (CPT) using an integrated electronic cone system, *Figure CPT*.

The cone takes measurements of tip resistance (q_c), sleeve resistance (f_s), and penetration pore water pressure (u_2). Measurements are taken at either 2.5 or 5 cm intervals during penetration to provide a nearly continuous profile. CPT data reduction and basic interpretation is performed in real time facilitating on-site decision making. The above mentioned parameters are stored electronically for further analysis and reference. All CPT soundings are performed in accordance with revised ASTM standards (D 5778-12).

The 5mm thick porous plastic filter element is located directly behind the cone tip in the u_2 location. A new saturated filter element is used on each sounding to measure both penetration pore pressures as well as measurements during a dissipation test (*PPDT*). Prior to each test, the filter element is fully saturated with oil under vacuum pressure to improve accuracy.

When the sounding is completed, the test hole is backfilled according to client specifications. If grouting is used, the procedure generally consists of pushing a hollow tremie pipe with a "knock out" plug to the termination depth of the CPT hole. Grout is then pumped under pressure as the tremie pipe is pulled from the hole. Disruption or further contamination to the site is therefore minimized.

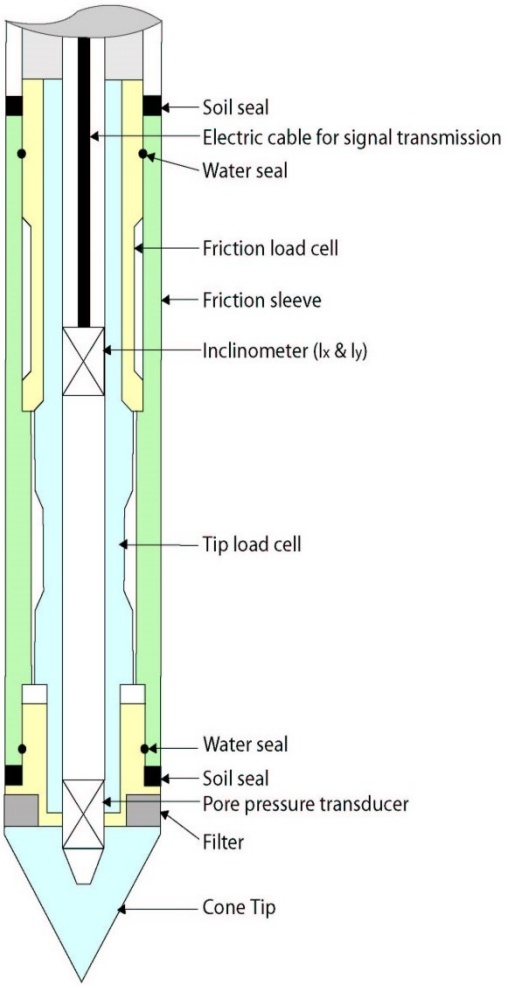


Figure CPT

Gregg 15cm^2 Standard Cone Specifications

Dimensions	
Cone base area	15 cm^2
Sleeve surface area	225 cm^2
Cone net area ratio	0.85
Specifications	
Cone load cell	
Full scale range	180 kN (20 tons)
Overload capacity	150%
Full scale tip stress	120 MPa (1,200 tsf)
Repeatability	120 kPa (1.2 tsf)
Sleeve load cell	
Full scale range	31 kN (3.5 tons)
Overload capacity	150%
Full scale sleeve stress	1,400 kPa (15 tsf)
Repeatability	1.4 kPa (0.015 tsf)
Pore pressure transducer	
Full scale range	7,000 kPa (1,000 psi)
Overload capacity	150%
Repeatability	7 kPa (1 psi)

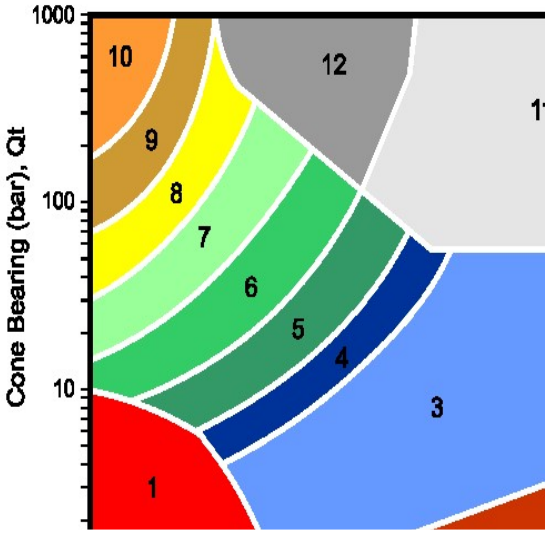
Note: The repeatability during field use will depend somewhat on ground conditions, abrasion, maintenance and zero load stability.

Cone Penetration Test Data & Interpretation

The Cone Penetration Test (CPT) data collected are presented in graphical and electronic form in the report. The plots include interpreted Soil Behavior Type (SBT) based on the charts described by Robertson (1990). Typical plots display SBT based on the non-normalized charts of Robertson et al (1986). For CPT soundings deeper than 30m, we recommend the use of the normalized charts of Robertson (1990) which can be displayed as SBTn, upon request. The report also includes spreadsheet output of computer calculations of basic interpretation in terms of SBT and SBTn and various geotechnical parameters using current published correlations based on the comprehensive review by Lunne, Robertson and Powell (1997), as well as recent updates by Professor Robertson (Guide to Cone Penetration Testing, 2015). The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed. Gregg Drilling LLC does not warranty the correctness or the applicability of any of the geotechnical parameters interpreted by the software and does not assume any liability for use of the results in any design or review. The user should be fully aware of the techniques and limitations of any method used in the software. Some interpretation methods require input of the groundwater level to calculate vertical effective stress. An estimate of the in-situ groundwater level has been made based on field observations and/or CPT results, but should be verified by the user.

A summary of locations and depths is available in Table 1. Note that all penetration depths referenced in the data are with respect to the existing ground surface.

Note that it is not always possible to clearly identify a soil type based solely on q_t, f_s, and u_2. In these situations, experience, judgment, and an assessment of the pore pressure dissipation data should be used to infer the correct soil behavior type.



ZONE		SBT
1		Sensitive, fine grained
2		Organic materials
3		Clay
4		Silty clay to clay
5		Clayey silt to silty clay
6		Sandy silt to clayey silt
7		Silty sand to sandy silt
8		Sand to silty sand
9		Sand
10		Gravely sand to sand
11		Very stiff fine grained*
12		Sand to clayey sand*

*over consolidated or cemented

Figure SBT (After Robertson et al., 1986) – Note: Colors may vary slightly compared to plots

Cone Penetration Test (CPT) Interpretation

Gregg uses a proprietary CPT interpretation and plotting software. The software takes the CPT data and performs basic interpretation in terms of soil behavior type (SBT) and various geotechnical parameters using current published empirical correlations based on the comprehensive review by Lunne, Robertson and Powell (1997). The interpretation is presented in tabular format using MS Excel. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed. Gregg does not warranty the correctness or the applicability of any of the geotechnical parameters interpreted by the software and does not assume any liability for any use of the results in any design or review. The user should be fully aware of the techniques and limitations of any method used in the software.

The following provides a summary of the methods used for the interpretation. Many of the empirical correlations to estimate geotechnical parameters have constants that have a range of values depending on soil type, geologic origin and other factors. The software uses 'default' values that have been selected to provide, in general, conservatively low estimates of the various geotechnical parameters.

Input:

1 Units for display (Imperial or metric) (atm. pressure, p_a = 0.96 tsf or 0.1 MPa)
2 Depth interval to average results (ft or m). Data are collected at either 0.02 or 0.05m and can be averaged every 1, 3 or 5 intervals.
3 Elevation of ground surface (ft or m)
4 Depth to water table, z_w (ft or m) – input required
5 Net area ratio for cone, a (default to 0.85)
6 Relative Density constant, C_{Dr} (default to 350)
7 Young's modulus number for sands, α (default to 5)
8 Small strain shear modulus number
  a. for sands, S_G (default to 180 for SBT_n 5, 6, 7)
  b. for clays, C_G (default to 50 for SBT_n 1, 2, 3 & 4)
9 Undrained shear strength cone factor for clays, N_{kt} (default to 15)
10 Over Consolidation ratio number, k_{ocr} (default to 0.3)
11 Unit weight of water, (default to γ_w = 62.4 lb/ft^3 or 9.81 kN/m^3)

Column

1 Depth, z, (m) – CPT data is collected in meters
2 Depth (ft)
3 Cone resistance, q_c (tsf or MPa)
4 Sleeve resistance, f_s (tsf or MPa)
5 Penetration pore pressure, u (psi or MPa), measured behind the cone (i.e. u_2)
6 Other – any additional data
7 Total cone resistance, q_t (tsf or MPa) $q_t = q_c + u\,(1\text{-}a)$

8	Friction Ratio, R_f (%)	$R_f = (f_s/q_t) \times 100\%$
9	Soil Behavior Type (non-normalized), SBT	see note
10	Unit weight, γ (pcf or kN/m^3)	based on SBT, see note
11	Total overburden stress, σ_v (tsf)	$\sigma_{vo} = \sigma\, z$
12	In-situ pore pressure, u_o (tsf)	$u_o = \gamma_w (z - z_w)$
13	Effective overburden stress, σ'_{vo} (tsf)	$\sigma'_{vo} = \sigma_{vo} - u_o$
14	Normalized cone resistance, Q_{t1}	$Q_{t1} = (q_t - \sigma_{vo}) / \sigma'_{vo}$
15	Normalized friction ratio, F_r (%)	$F_r = f_s / (q_t - \sigma_{vo}) \times 100\%$
16	Normalized Pore Pressure ratio, B_q	$B_q = u - u_o / (q_t - \sigma_{vo})$
17	Soil Behavior Type (normalized), SBT_n	see note
18	SBT_n Index, I_c	see note
19	Normalized Cone resistance, Q_{tn} (n varies with I_c)	see note
20	Estimated permeability, k_{SBT} (cm/sec or ft/sec)	see note
21	Equivalent SPT N_{60}, blows/ft	see note
22	Equivalent SPT $(N_1)_{60}$ blows/ft	see note
23	Estimated Relative Density, D_r, (%)	see note
24	Estimated Friction Angle, ϕ', (degrees)	see note
25	Estimated Young's modulus, E_s (tsf)	see note
26	Estimated small strain Shear modulus, Go (tsf)	see note
27	Estimated Undrained shear strength, s_u (tsf)	see note
28	Estimated Undrained strength ratio	s_u/σ_v'
29	Estimated Over Consolidation ratio, OCR	see note

Notes:

1 Soil Behavior Type (non-normalized), SBT (Lunne et al., 1997 and table below)

2 Unit weight, γ either constant at 119 pcf or based on Non-normalized SBT (Lunne et al., 1997 and table below)

3 Soil Behavior Type (Normalized), SBT_n Lunne et al. (1997)

4 SBT_n Index, I_c $I_c = ((3.47 - \log Q_{t1})^2 + (\log F_r + 1.22)^2)^{0.5}$

5 Normalized Cone resistance, Q_{tn} (n varies with Ic)

$Q_{tn} = ((q_t - \sigma_{vo})/pa)\ (pa/(\sigma'_{vo})^n$ and recalculate I_c, then iterate:

When $I_c < 1.64$, n = 0.5 (clean sand)
When $I_c > 3.30$, n = 1.0 (clays)
When $1.64 < I_c < 3.30$, $n = (I_c - 1.64)0.3 + 0.5$
Iterate until the change in n, $\Delta n < 0.01$

6 Estimated permeability, k_{SBT} based on Normalized SBT_n (Lunne et al., 1997 and table below)

7 Equivalent SPT N_{60}, blows/ft Lunne et al. (1997)

$$\frac{(q_t/p_a)}{N_{60}} = 8.5\left(1 - \frac{I_c}{4.6}\right)$$

8 Equivalent SPT $(N_1)_{60}$ blows/ft $(N_1)_{60} = N_{60}\, C_N$,
where $C_N = (pa/\sigma'_{vo})^{0.5}$

9 Relative Density, D_r, (%) $D_r^2 = Q_{tn} / C_{Dr}$
Only SBT_n 5, 6, 7 & 8 *Show 'N/A' in zones 1, 2, 3, 4 & 9*

10 Friction Angle, ϕ', (degrees) $\tan\phi' = \frac{1}{2.68}\left[\log\left(\frac{q_c}{\sigma'_{vo}}\right) + 0.29\right]$
Only SBT_n 5, 6, 7 & 8 *Show'N/A' in zones 1, 2, 3, 4 & 9*

11 Young's modulus, E_s $E_s = \alpha\, q_t$
Only SBT_n 5, 6, 7 & 8 *Show 'N/A' in zones 1, 2, 3, 4 & 9*

12 Small strain shear modulus, Go

a. $G_o = S_G\,(q_t\ \sigma'_{vo}\ pa)^{1/3}$ *For SBT_n 5, 6, 7*

b. $G_o = C_G\, q_t$ *For SBT_n 1, 2, 3& 4*

Show 'N/A' in zones 8 & 9

13 Undrained shear strength, s_u $s_u = (q_t - \sigma_{vo}) / N_{kt}$
Only SBT_n 1, 2, 3, 4 & 9 *Show 'N/A' in zones 5, 6, 7 & 8*

14 Over Consolidation ratio, OCR $OCR = k_{ocr}\, Q_{t1}$
Only SBT_n 1, 2, 3, 4 & 9 *Show 'N/A' in zones 5, 6, 7 & 8*

The following updated and simplified SBT descriptions have been used in the software:

SBT Zones		**SBT_n Zones**	
1	sensitive fine grained	1	sensitive fine grained
2	organic soil	2	organic soil
3	clay	3	clay
4	clay & silty clay	4	clay & silty clay
5	clay & silty clay		
6	sandy silt & clayey silt		

7	silty sand & sandy silt	5	silty sand & sandy silt
8	sand & silty sand	6	sand & silty sand
9	sand		
10	sand	7	sand
11	very dense/stiff soil*	8	very dense/stiff soil*
12	very dense/stiff soil*	9	very dense/stiff soil*

*heavily overconsolidated and/or cemented

Track when soils fall with zones of same description and print that description (i.e. if soils fall only within SBT zones 4 & 5, print ‘clays & silty clays’)

Estimated Permeability (see Lunne et al., 1997)

SBT_n	Permeability (ft/sec)	(m/sec)
1	$3x\ 10^{-8}$	$1x\ 10^{-8}$
2	$3x\ 10^{-7}$	$1x\ 10^{-7}$
3	$1x\ 10^{-9}$	$3x\ 10^{-10}$
4	$3x\ 10^{-8}$	$1x\ 10^{-8}$
5	$3x\ 10^{-6}$	$1x\ 10^{-6}$
6	$3x\ 10^{-4}$	$1x\ 10^{-4}$
7	$3x\ 10^{-2}$	$1x\ 10^{-2}$
8	$3x\ 10^{-6}$	$1x\ 10^{-6}$
9	$1x\ 10^{-8}$	$3x\ 10^{-9}$

Estimated Unit Weight (see Lunne et al., 1997)

SBT	Approximate Unit Weight (lb/ft^3)	(kN/m^3)
1	111.4	17.5
2	79.6	12.5
3	111.4	17.5
4	114.6	18.0
5	114.6	18.0
6	114.6	18.0
7	117.8	18.5
8	120.9	19.0
9	124.1	19.5
10	127.3	20.0
11	130.5	20.5
12	120.9	19.0

Pore Pressure Dissipation Tests (PPDT)

Pore Pressure Dissipation Tests (PPDT's) conducted at various intervals can be used to measure equilibrium water pressure (at the time of the CPT). If conditions are hydrostatic, the equilibrium water pressure can be used to determine the approximate depth of the ground water table. A PPDT is conducted when penetration is halted at specific intervals determined by the field representative. The variation of the penetration pore pressure (*u)* with time is measured behind the tip of the cone and recorded.

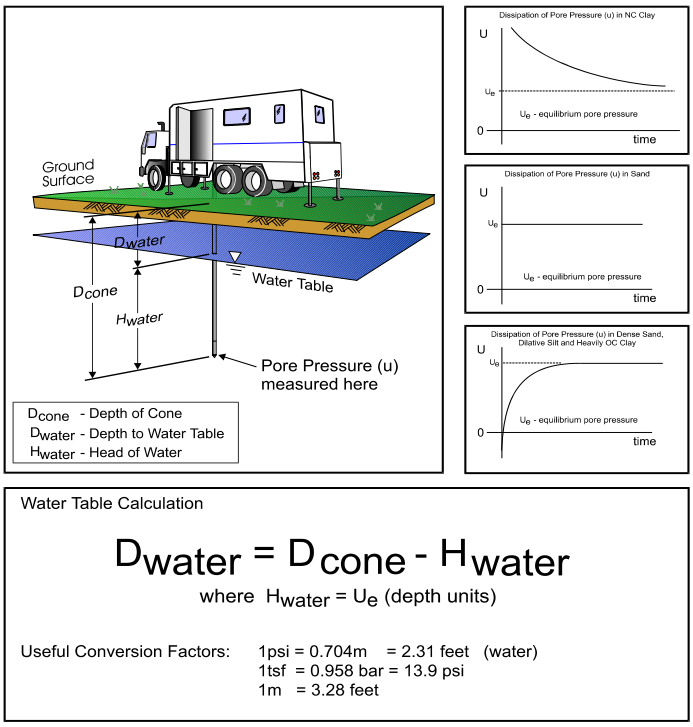
Pore pressure dissipation data can be interpreted to provide estimates of:

- Equilibrium piezometric pressure
- Phreatic Surface
- In situ horizontal coefficient of consolidation (c_h)
- In situ horizontal coefficient of permeability (k_h)

In order to correctly interpret the equilibrium piezometric pressure and/or the phreatic surface, the pore pressure must be monitored until it reaches equilibrium, *Figure PPDT*. This time is commonly referred to as t_{100}, the point at which 100% of the excess pore pressure has dissipated.

A complete reference on pore pressure dissipation tests is presented by Robertson et al. 1992 and Lunne et al. 1997.

A summary of the pore pressure dissipation tests completed for this project is included in Table 1.



Water Table Calculation

$$D_{water} = D_{cone} - H_{water}$$

where $H_{water} = U_e$ (depth units)

Useful Conversion Factors: 1psi = 0.704m = 2.31 feet (water)
1tsf = 0.958 bar = 13.9 psi
1m = 3.28 feet

Figure PPDT

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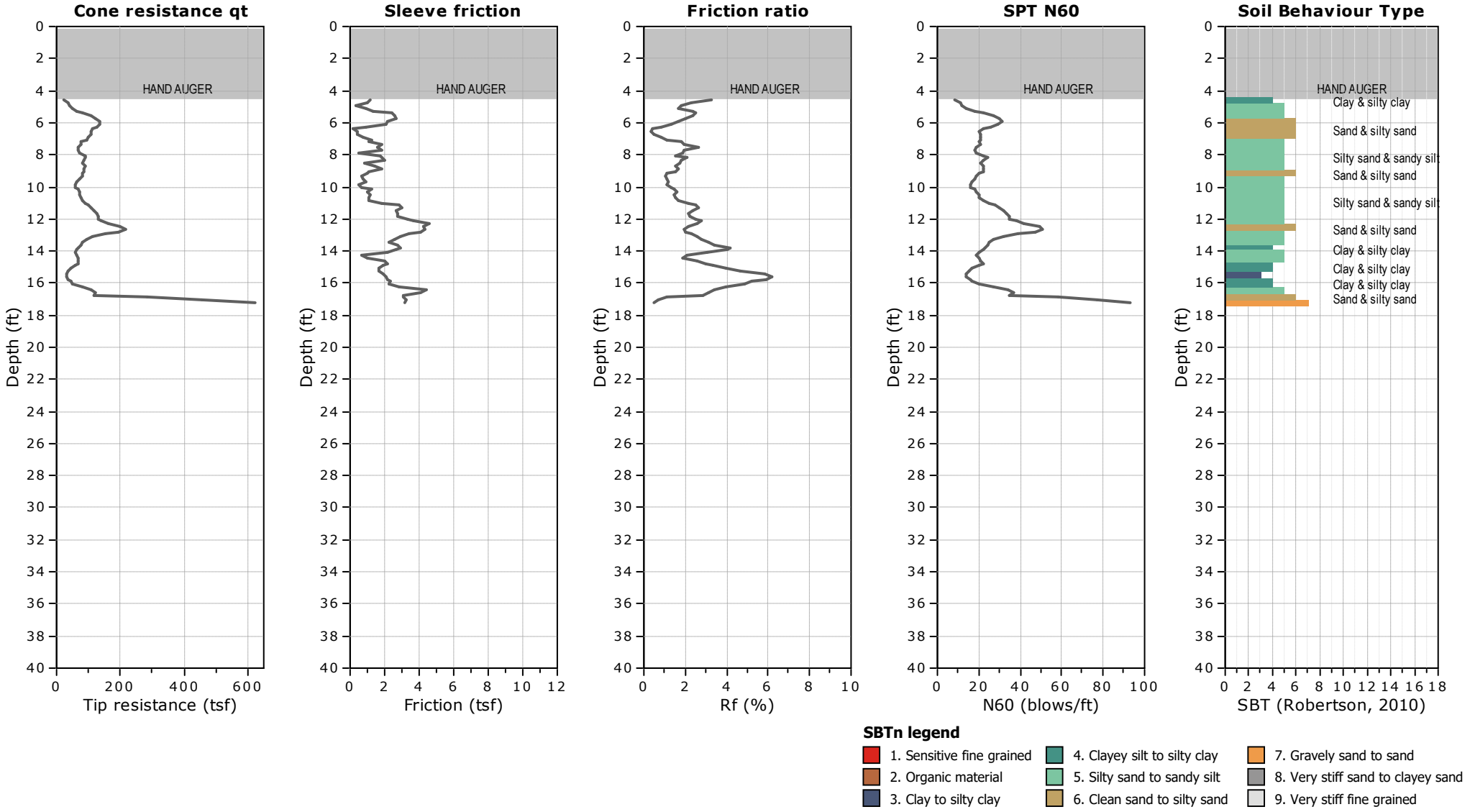
CPT: CPT-1

FIELD REP: JAMES
Elevation:
Cone ID: GDC-59
Lat/Lon: Unknown/Unknown

CLIENT: GEOPENTECH
SITE: TOPANGA RANCH MOTEL

Total depth: 17.22 ft, Date: 12/21/2021

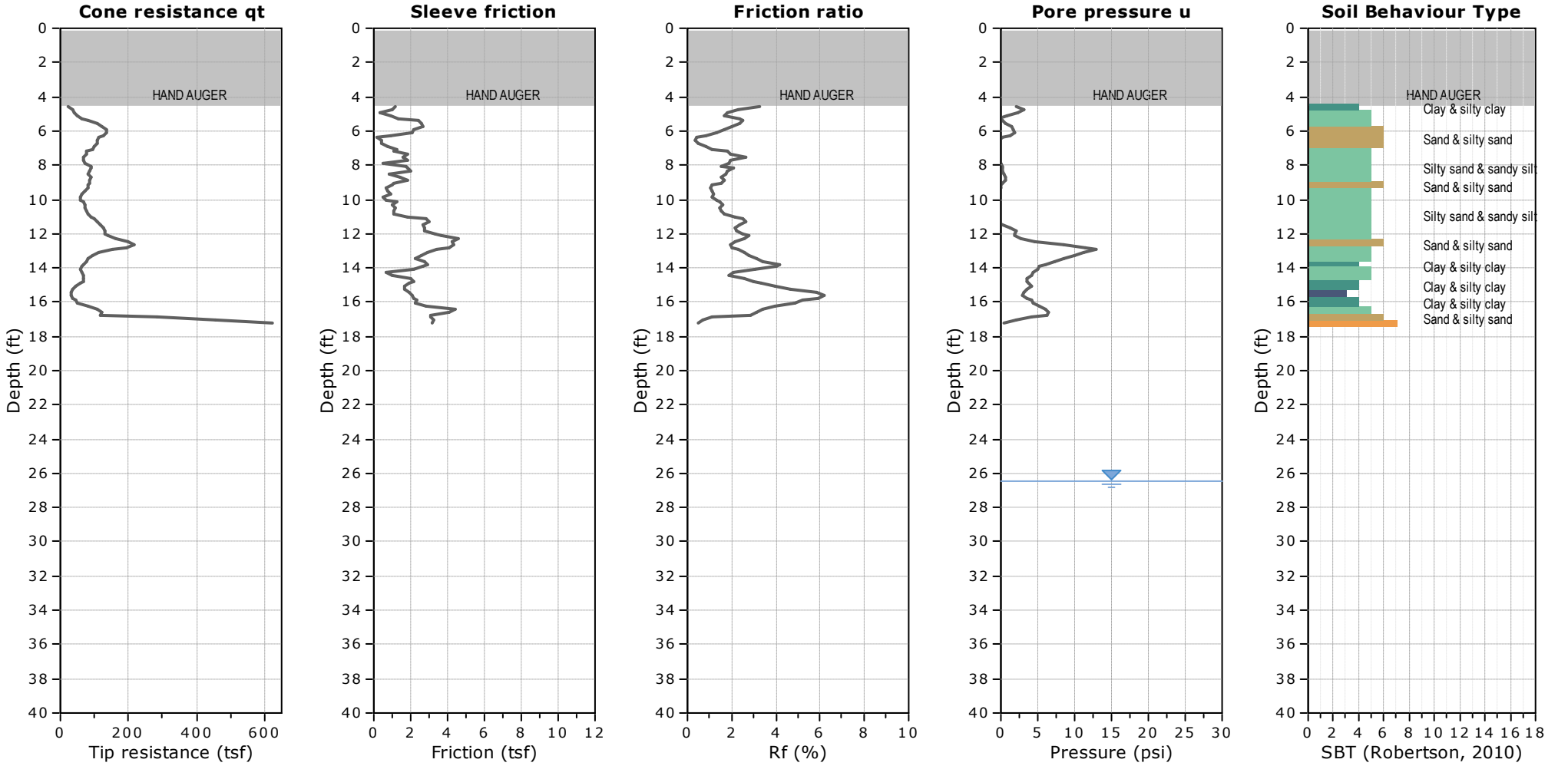


CPT: CPT-1

FIELD REP: JAMES
Elevation:
Cone ID: GDC-59
Lat/Lon: Unknown/Unknown

CLIENT: GEOPENTECH
SITE: TOPANGA RANCH MOTEL

Total depth: 17.22 ft, Date: 12/21/2021



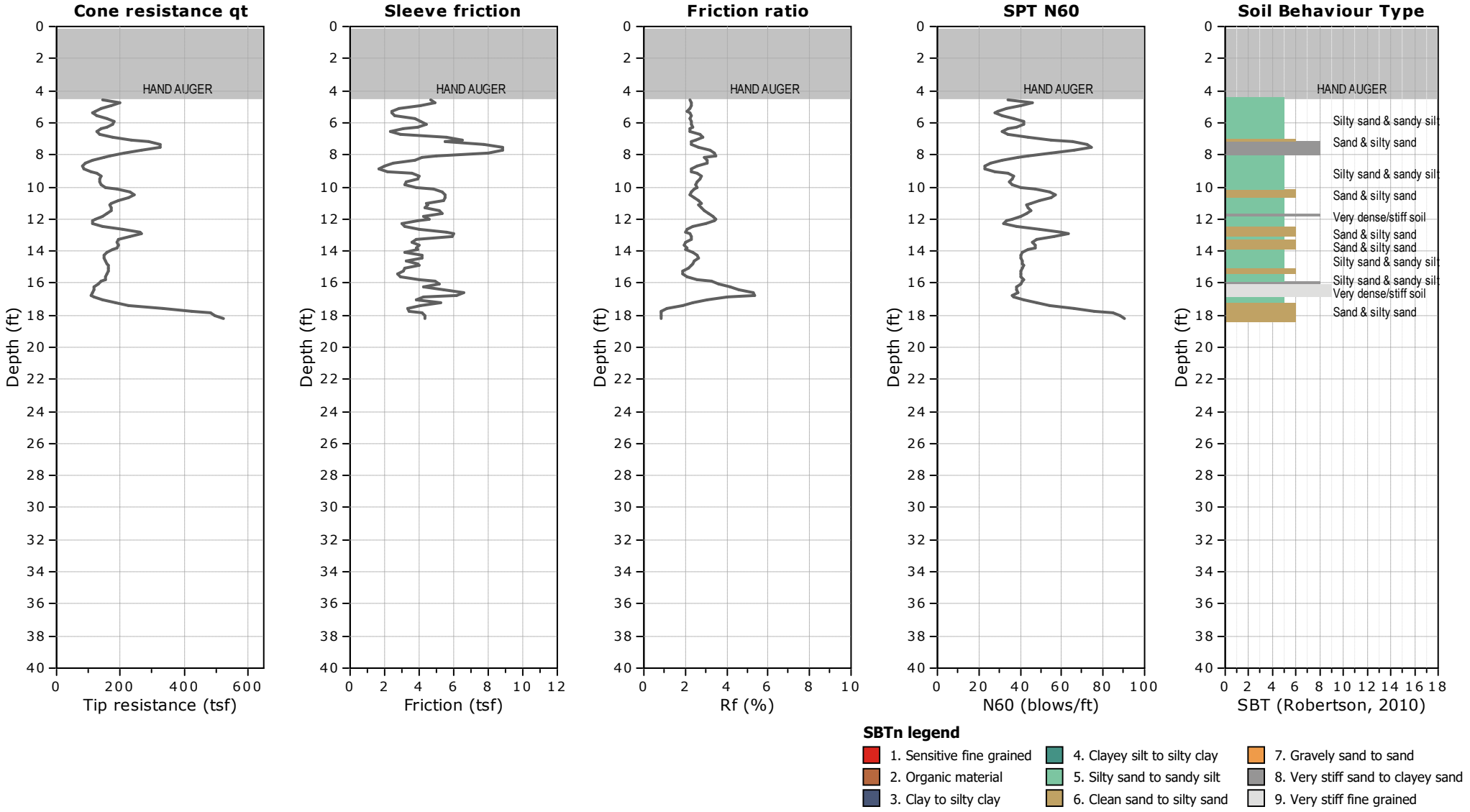
WATER TABLE FOR ESTIMATING PURPOSES ONLY

CPT: CPT-2

FIELD REP: JAMES
Elevation:
Cone ID: GDC-59
Lat/Lon: Unknown/Unknown

CLIENT: GEOPENTECH
SITE: TOPANGA RANCH MOTEL

Total depth: 18.21 ft, Date: 12/21/2021

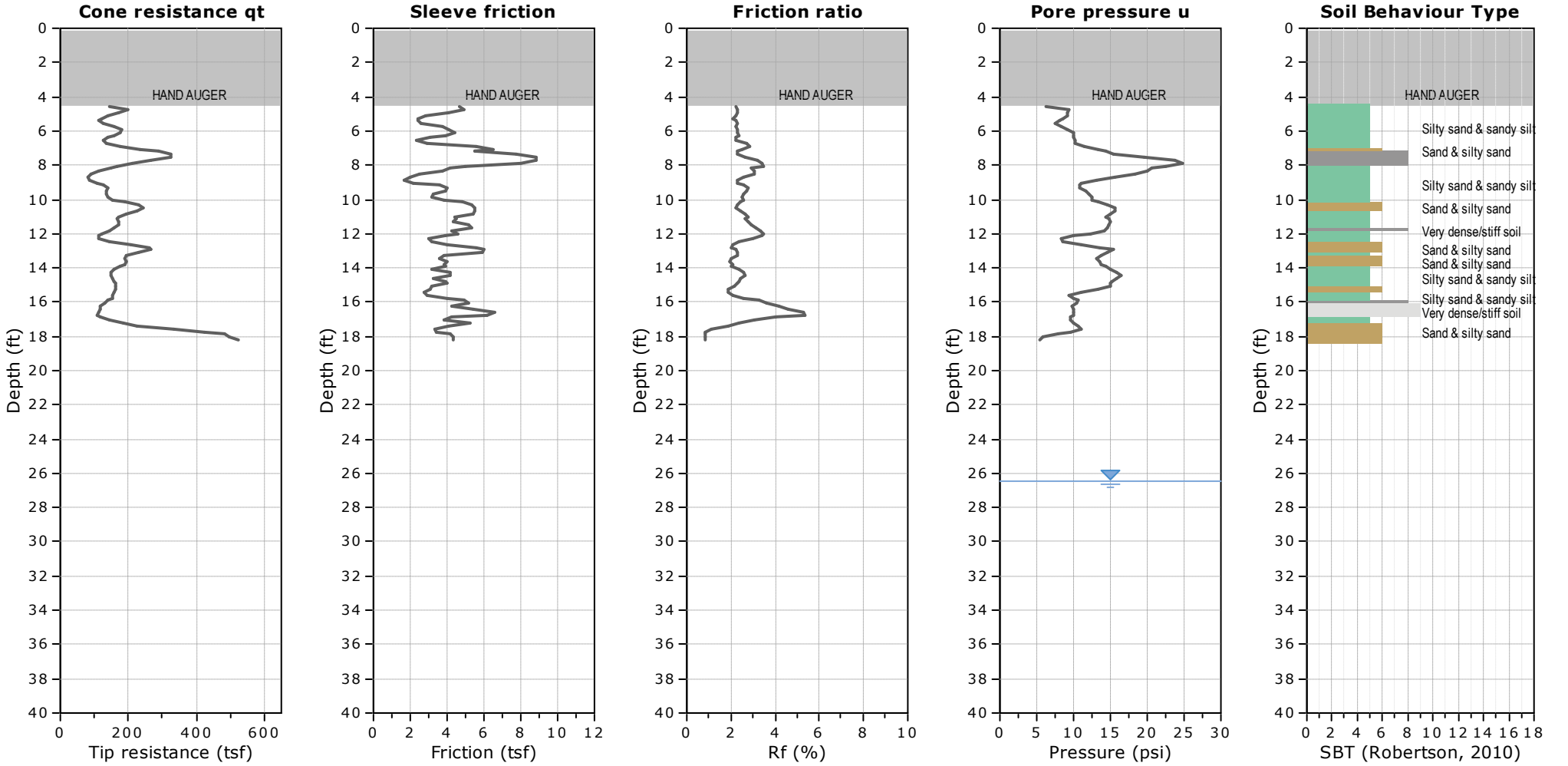


CPT: CPT-2

FIELD REP: JAMES
Elevation:
Cone ID: GDC-59
Lat/Lon: Unknown/Unknown

CLIENT: GEOPENTECH
SITE: TOPANGA RANCH MOTEL

Total depth: 18.21 ft, Date: 12/21/2021



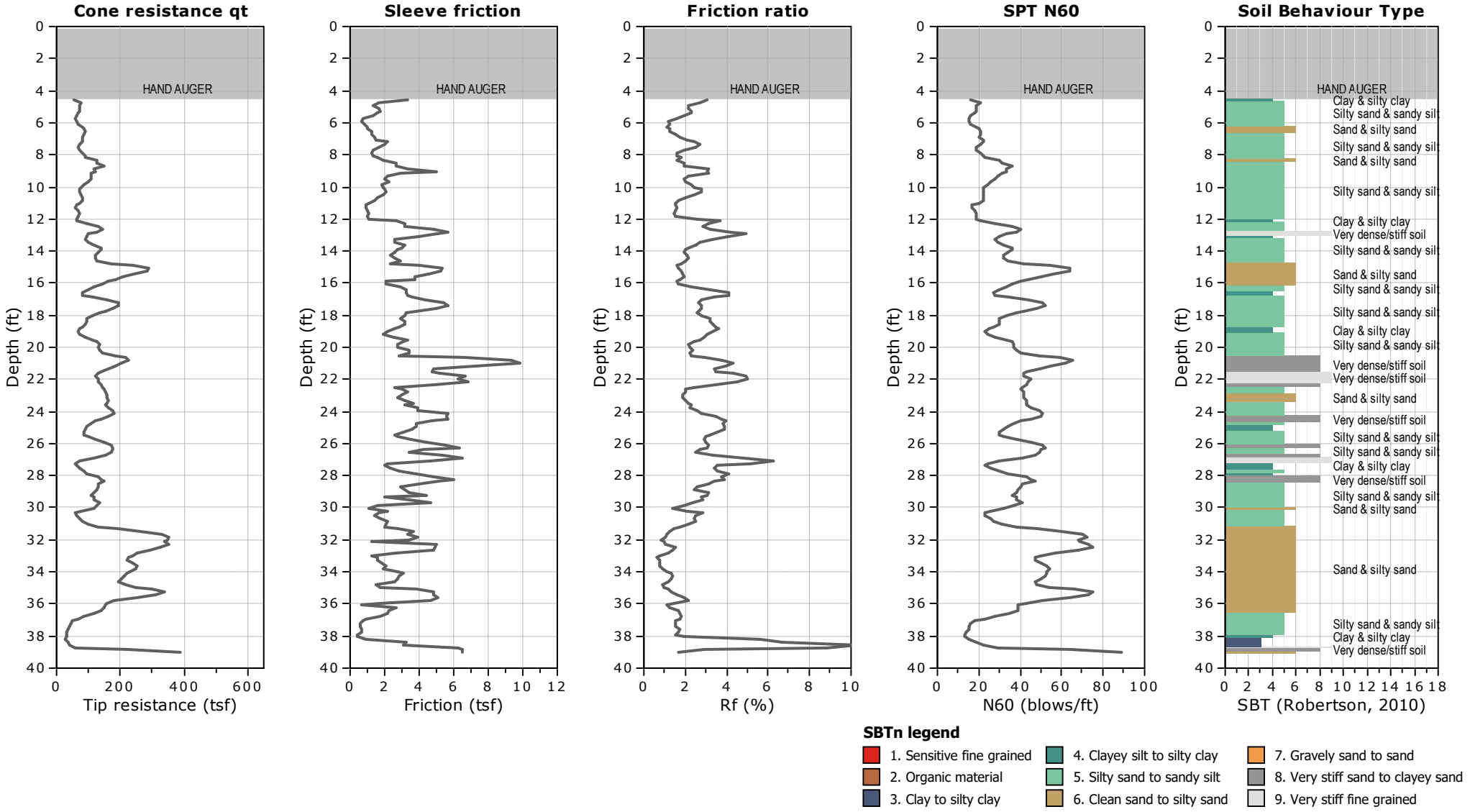
WATER TABLE FOR ESTIMATING PURPOSES ONLY

CPT: CPT-3

FIELD REP: JAMES
Elevation:
Cone ID: GDC-59
Lat/Lon: Unknown/Unknown

CLIENT: GEOPENTECH
SITE: TOPANGA RANCH MOTEL

Total depth: 39.04 ft, Date: 12/21/2021

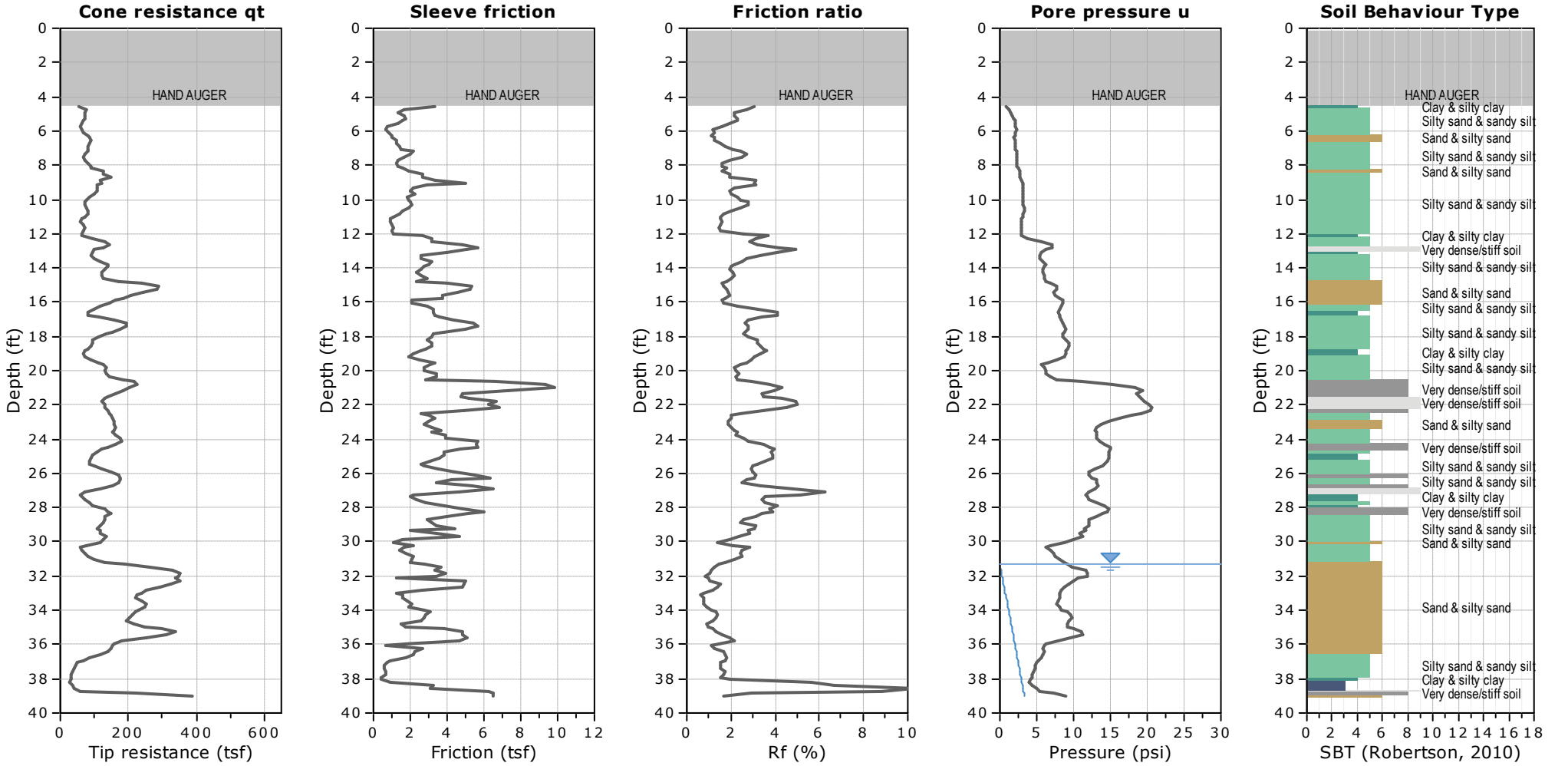


CPT: CPT-3

FIELD REP: JAMES
Elevation:
Cone ID: GDC-59
Lat/Lon: Unknown/Unknown

CLIENT: GEOPENTECH
SITE: TOPANGA RANCH MOTEL

Total depth: 39.04 ft, Date: 12/21/2021



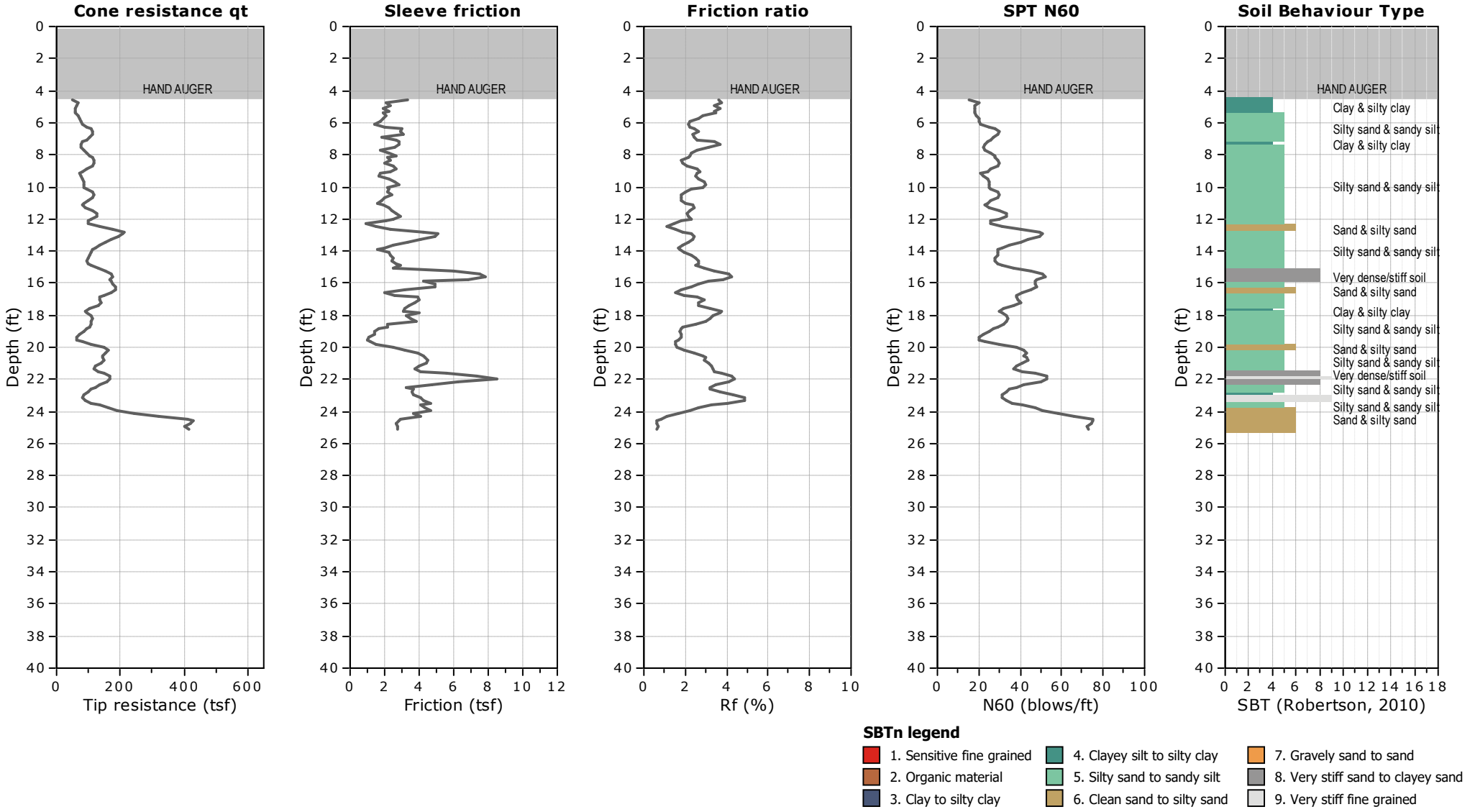
WATER TABLE FOR ESTIMATING PURPOSES ONLY

CPT: CPT-4

FIELD REP: JAMES
Elevation:
Cone ID: GDC-59
Lat/Lon: Unknown/Unknown

CLIENT: GEOPENTECH
SITE: TOPANGA RANCH MOTEL

Total depth: 25.10 ft, Date: 12/21/2021



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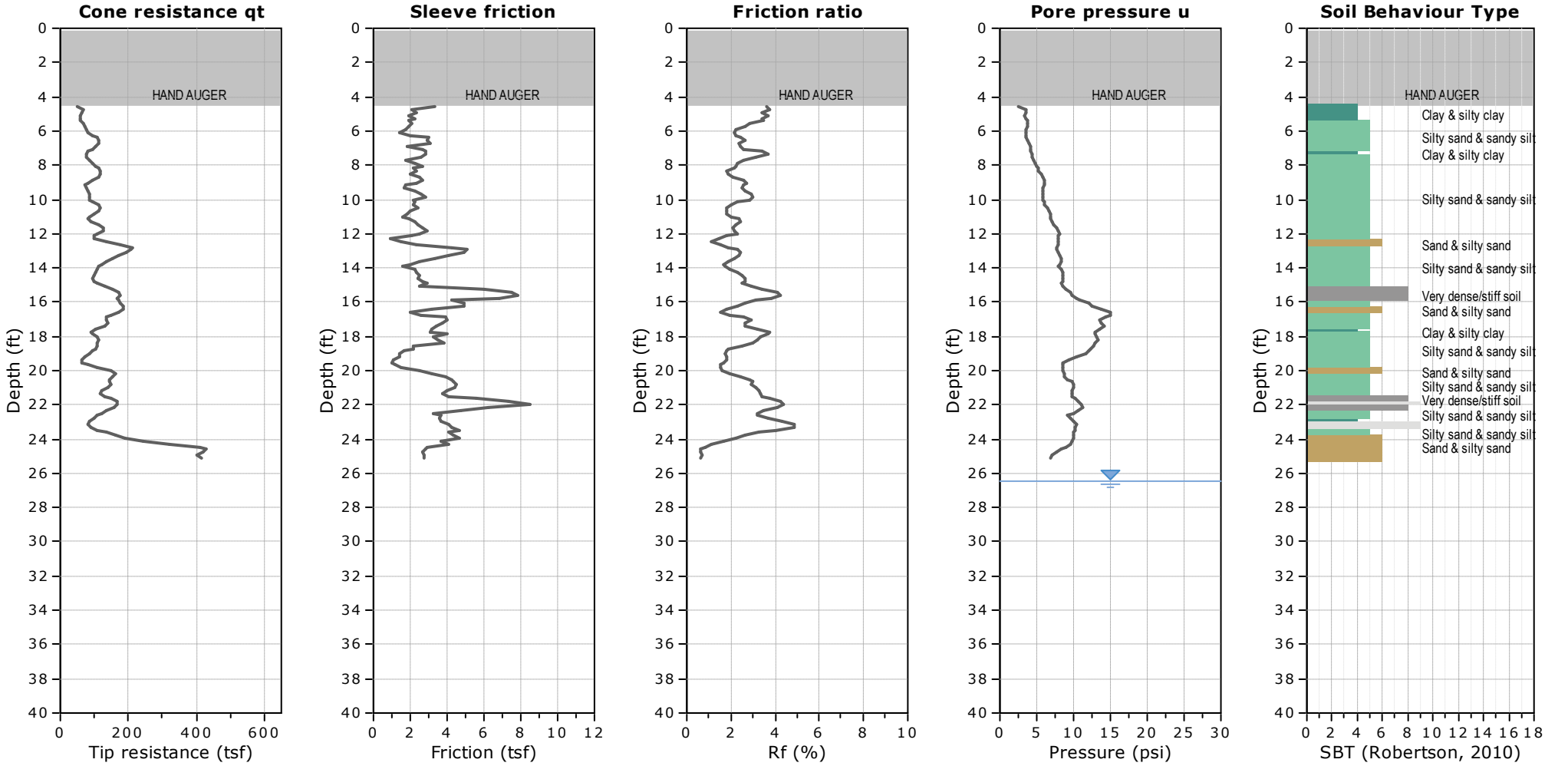
CPT: CPT-4

FIELD REP: JAMES
Elevation:
Cone ID: GDC-59
Lat/Lon: Unknown/Unknown

CLIENT: GEOPENTECH
SITE: TOPANGA RANCH MOTEL

Total depth: 25.10 ft, Date: 12/21/2021



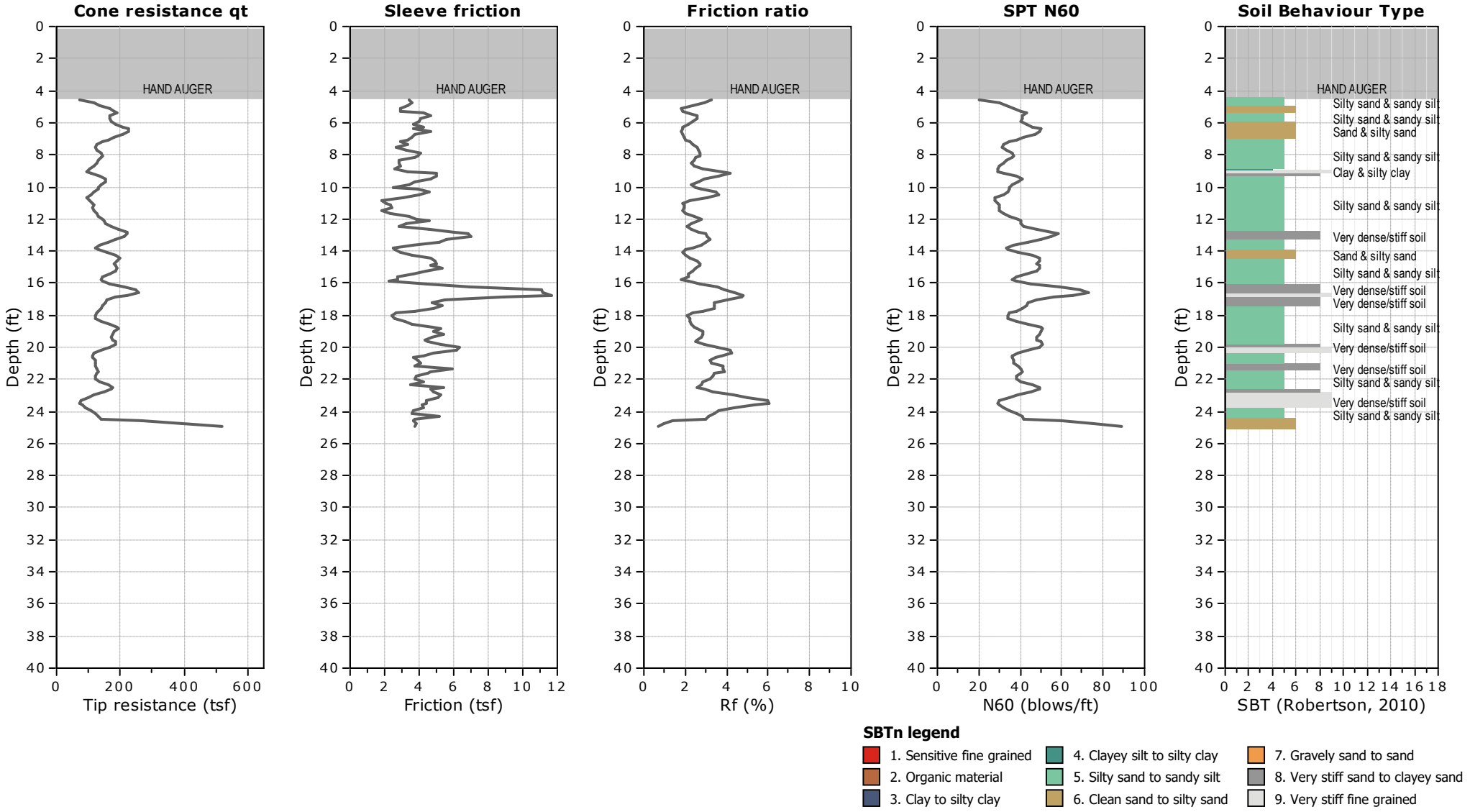
WATER TABLE FOR ESTIMATING PURPOSES ONLY

CPT: CPT-5

FIELD REP: JAMES
Elevation:
Cone ID: GDC-59
Lat/Lon: Unknown/Unknown

CLIENT: GEOPENTECH
SITE: TOPANGA RANCH MOTEL

Total depth: 24.93 ft, Date: 12/21/2021



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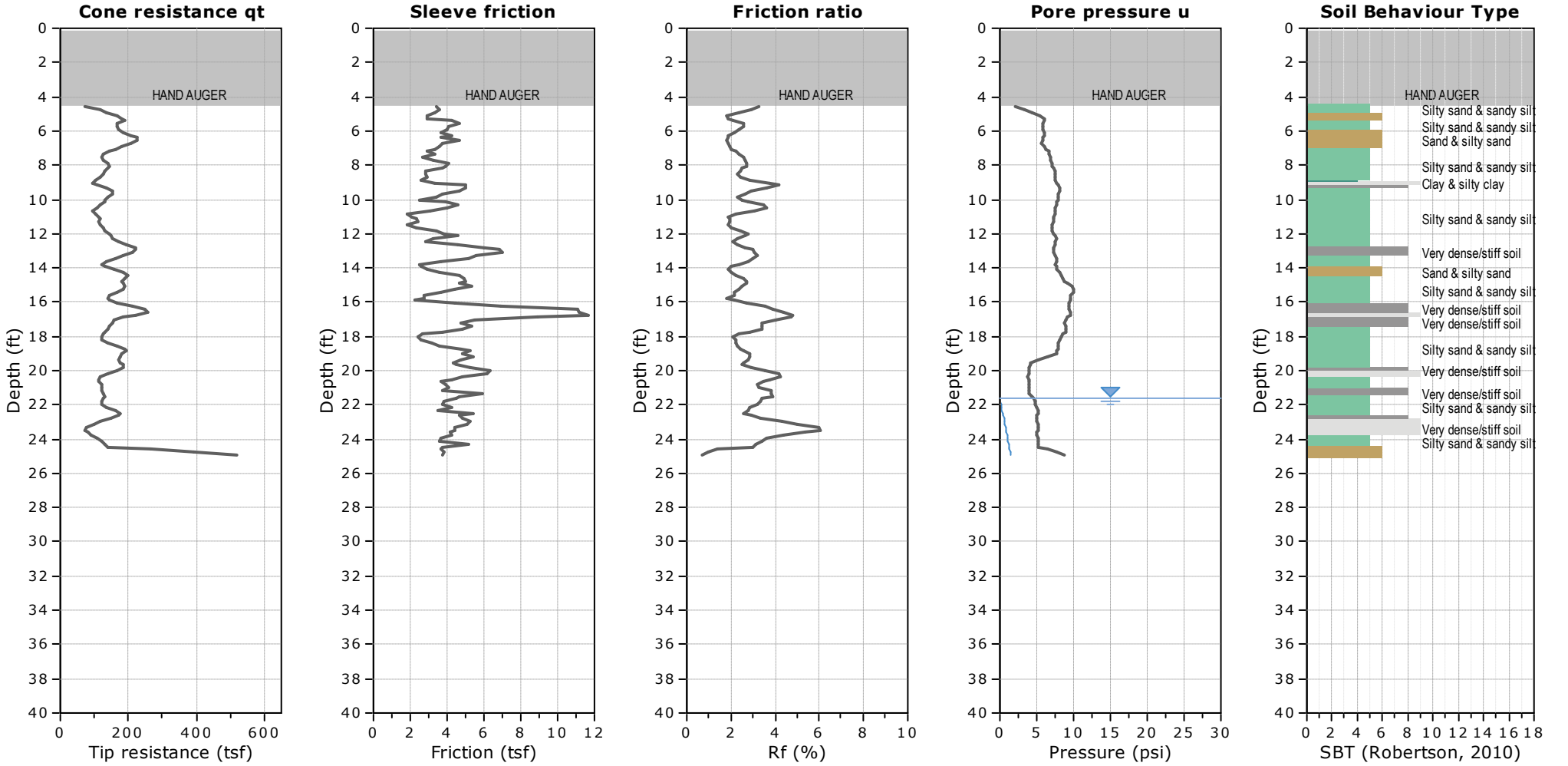
CPT: CPT-5

FIELD REP: JAMES
Elevation:
Cone ID: GDC-59
Lat/Lon: Unknown/Unknown

CLIENT: GEOPENTECH
SITE: TOPANGA RANCH MOTEL

Total depth: 24.93 ft, Date: 12/21/2021

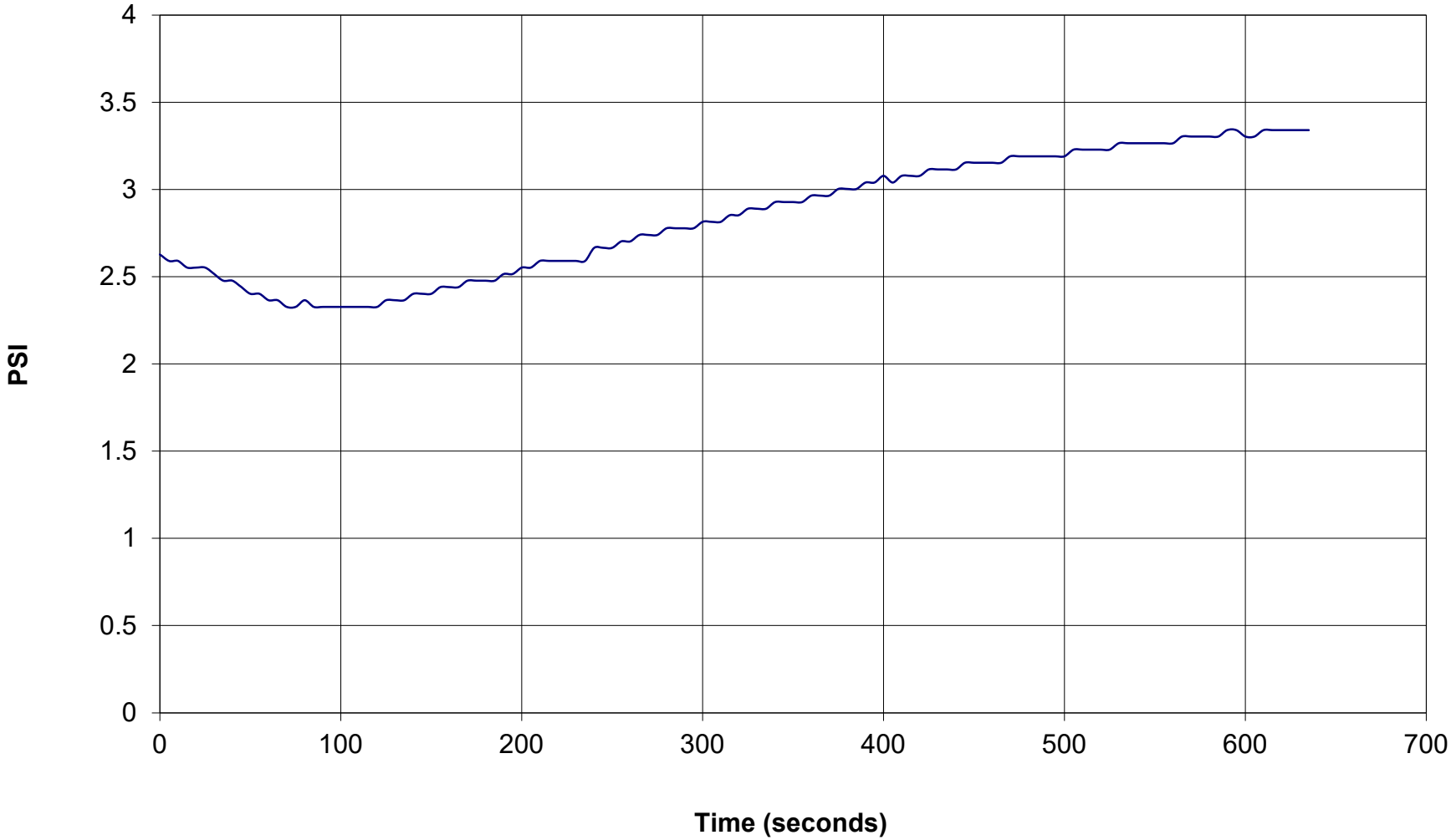


WATER TABLE FOR ESTIMATING PURPOSES ONLY

GREGG DRILLING & TESTING

Pore Pressure Dissipation Test

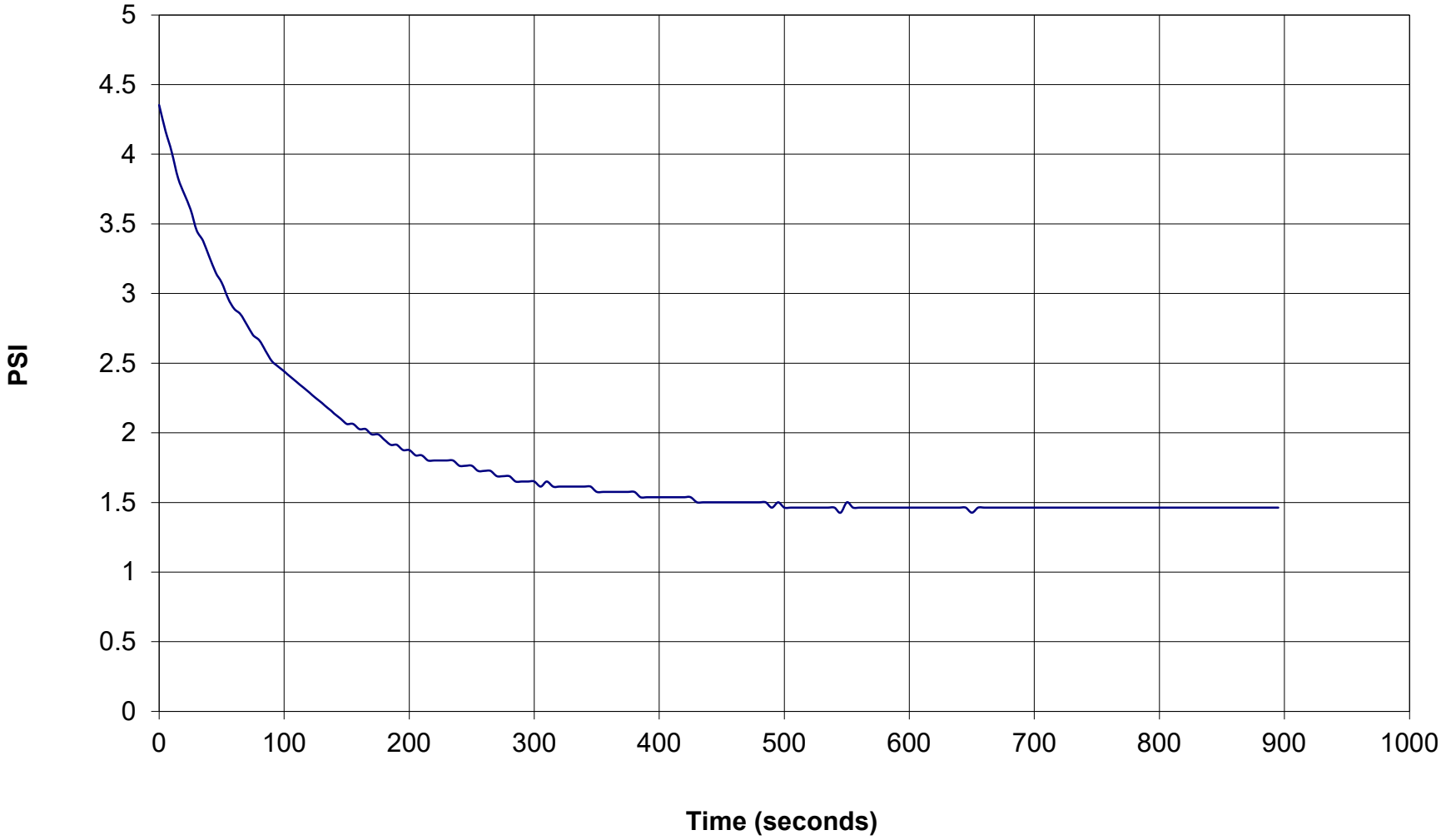
Sounding: CPT-3
Depth (ft): 39.04
Site: Topanga Ranch Motel
Engineer: James Heins



GREGG DRILLING & TESTING

Pore Pressure Dissipation Test

Sounding: CPT-5
Depth (ft): 24.93
Site: Topanga Ranch Motel
Engineer: James Heins



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MOISTURE AND DENSITY TEST RESULTS

ASTM D2216 and ASTM D7263 (Method B)

Client: GeoPentech
Project Name: RCDSMM - Topanga Lagoon Bridge
Project No.: 21013A

AP Lab No.: 22-0226
Test Date: 02/11/22

Boring No.	Sample No.	Sample Depth (ft.)	Moisture Content (%)	Dry Density (pcf)
HSA-M1	1	5	7.1	113.0
HSA-M1	5	25	10.5	99.0
HSA-M1	9	45	19.2	112.3

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MOISTURE AND DENSITY TEST RESULTS

ASTM D2216 and ASTM D7263 (Method B)

Client: GeoPentech
Project Name: RCDSMM - Topanga Lagoon Bridge
Project No.: 21013A

AP Lab No.: 22-0226
Test Date: 02/11/22

Boring No.	Sample No.	Sample Depth (ft.)	Moisture Content (%)	Dry Density (pcf)
HSA-M2	1	5	8.1	101.2
HSA-M2	5	25	10.4	112.6
HSA-M2	9	45	14.2	120.8

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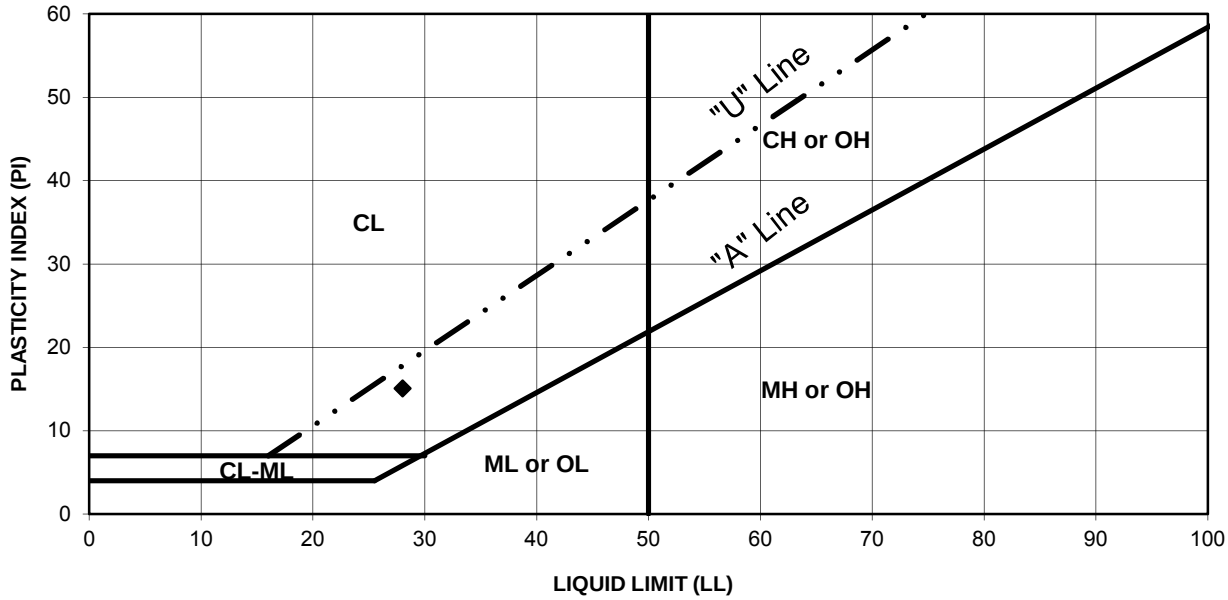
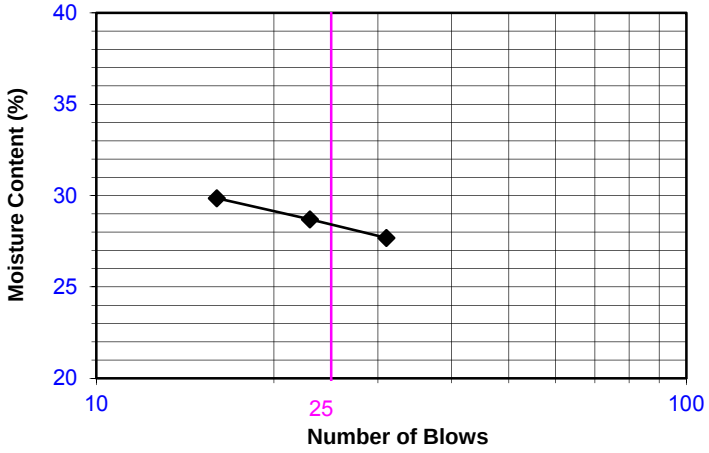
ATTERBERG LIMITS
ASTM D 4318

Client Name:	GeoPentech	Tested By:	DK	Date:	02/14/22
Project Name:	RCDSMM - Topanga Lagoon Bridge	Computed By:	NR	Date:	02/16/22
Project No.:	21013A	Checked By:	AP	Date:	02/17/22



PROCEDURE USED

- ☐ Wet Preparation
- ☒ Dry Preparation
- ☒ Procedure A Multipoint Test
- ☐ Procedure B One-point Test



Symbol	Boring Number	Sample Number	Depth (feet)	LL	PL	PI	Plasticity Chart Symbol
♦	HSA-M1	4	20	28	13	15	CL

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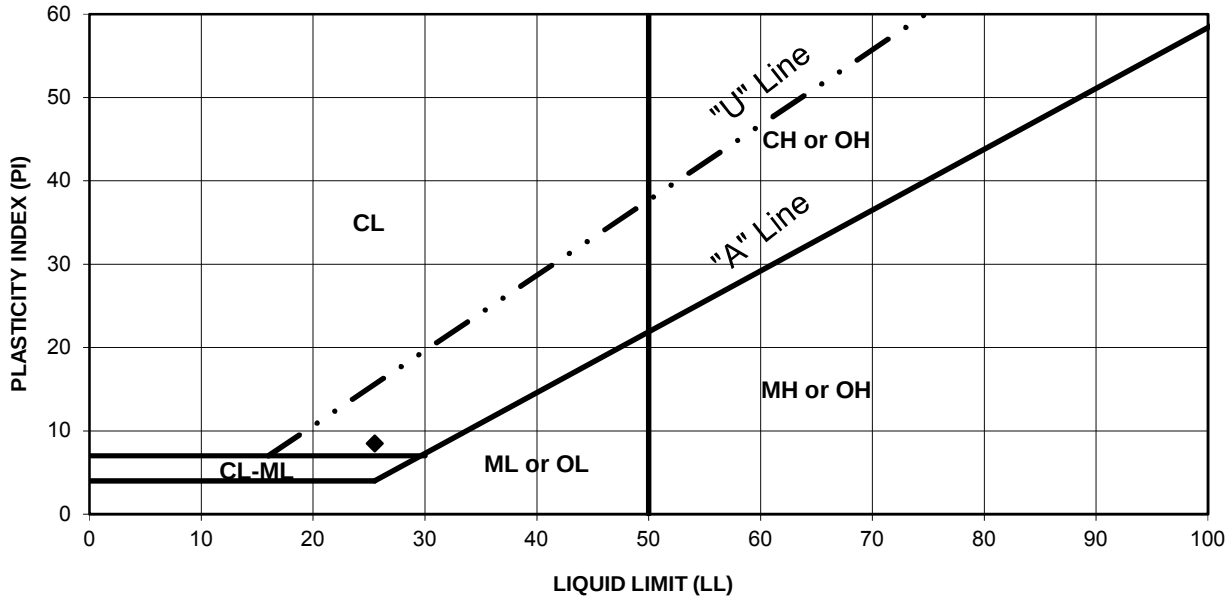
ATTERBERG LIMITS
ASTM D 4318

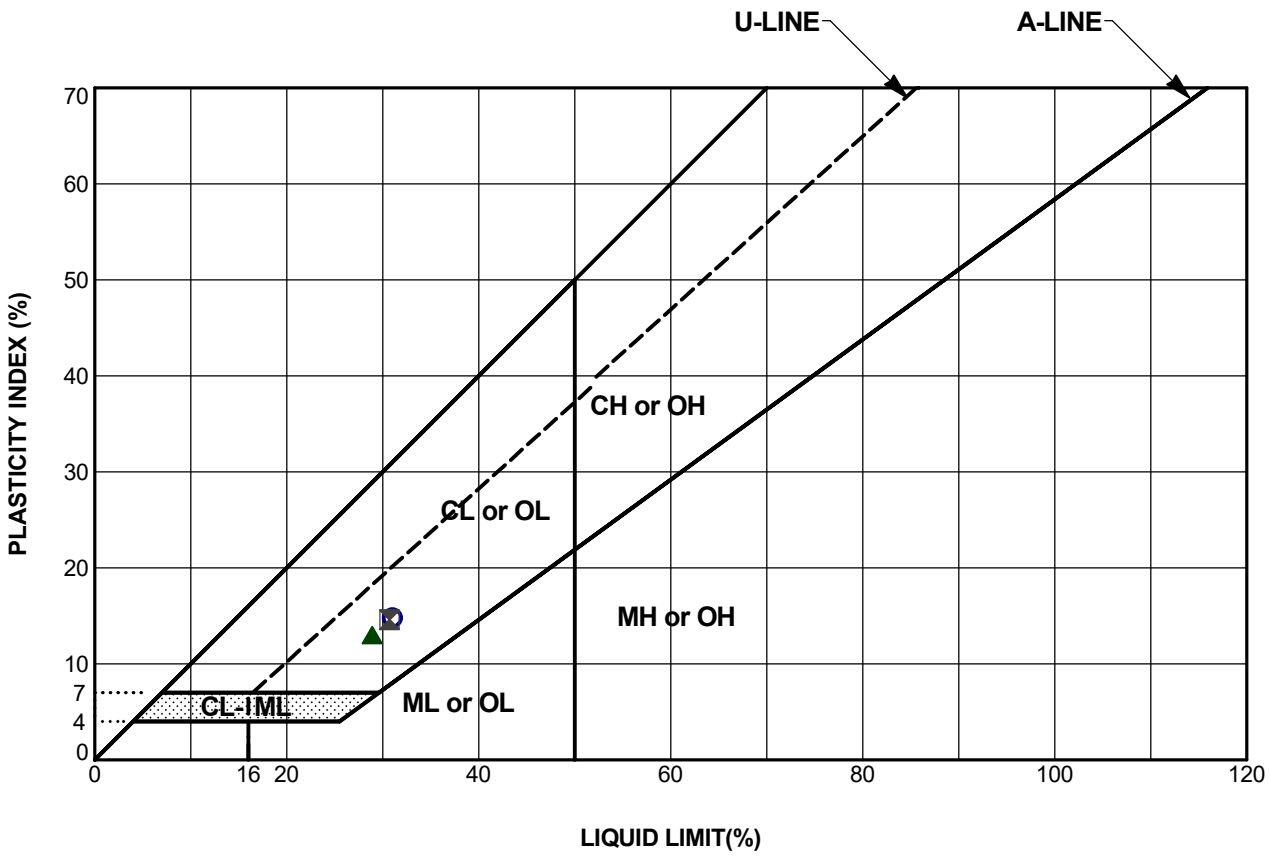
Client Name:	GeoPentech	Tested By:	DK	Date:	02/14/22
Project Name:	RCDSMM - Topanga Lagoon Bridge	Computed By:	NR	Date:	02/16/22
Project No.:	21013A	Checked By:	AP	Date:	02/17/22



PROCEDURE USED

- ☐ Wet Preparation
- ☒ Dry Preparation
- ☒ Procedure A Multipoint Test
- ☐ Procedure B One-point Test

Symbol	Boring Number	Sample Number	Depth (feet)	LL	PL	PI	Plasticity Chart Symbol
♦	HSA-M2	3	15	26	17	9	CL



Symbol	Boring Number	Sample Number	Depth (feet)	Passing No. 200 Sieve (%)	LL	PI	USCS	Description
○	HSA-S1	1	5.0	42	31	15	SC	(Afu) Reddish brown clayey SAND
⊠	HSA-S1	3	15.0	44	31	15	SC	(Afu) Dark yellowish brown clayey SAND
▲	HSA-S1	7	35.0	35	29	13	SC	(Afu) Reddish brown clayey SAND

PLASTICITY CHART

Geopentech / RCDSMM Topanga Lagoon Bridge (21013A)

PROJECT NO. 19122-03

NMG Geotechnical, Inc.

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PERCENT PASSING NO. 200 SIEVE

ASTM D1140

Client:	GeoPentech	AP Lab No.:	22-0226
Project Name:	RCDSMM - Topanga Lagoon Bridge	Test Date:	02/14/22
Project Number:	21013A		

Boring No.	Sample No.	Depth (ft)	Percent Fines (%)
HSA-M1	1	5	26.0
HSA-M1	3	15	20.7
HSA-M1	8	40	5.5

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PERCENT PASSING NO. 200 SIEVE

ASTM D1140

Client:	GeoPentech	AP Lab No.:	22-0226
Project Name:	RCDSMM - Topanga Lagoon Bridge	Test Date:	02/14/22
Project Number:	21013A		

Boring No.	Sample No.	Depth (ft)	Percent Fines (%)
HSA-M2	2	10	17.9
HSA-M2	6	30	11.9

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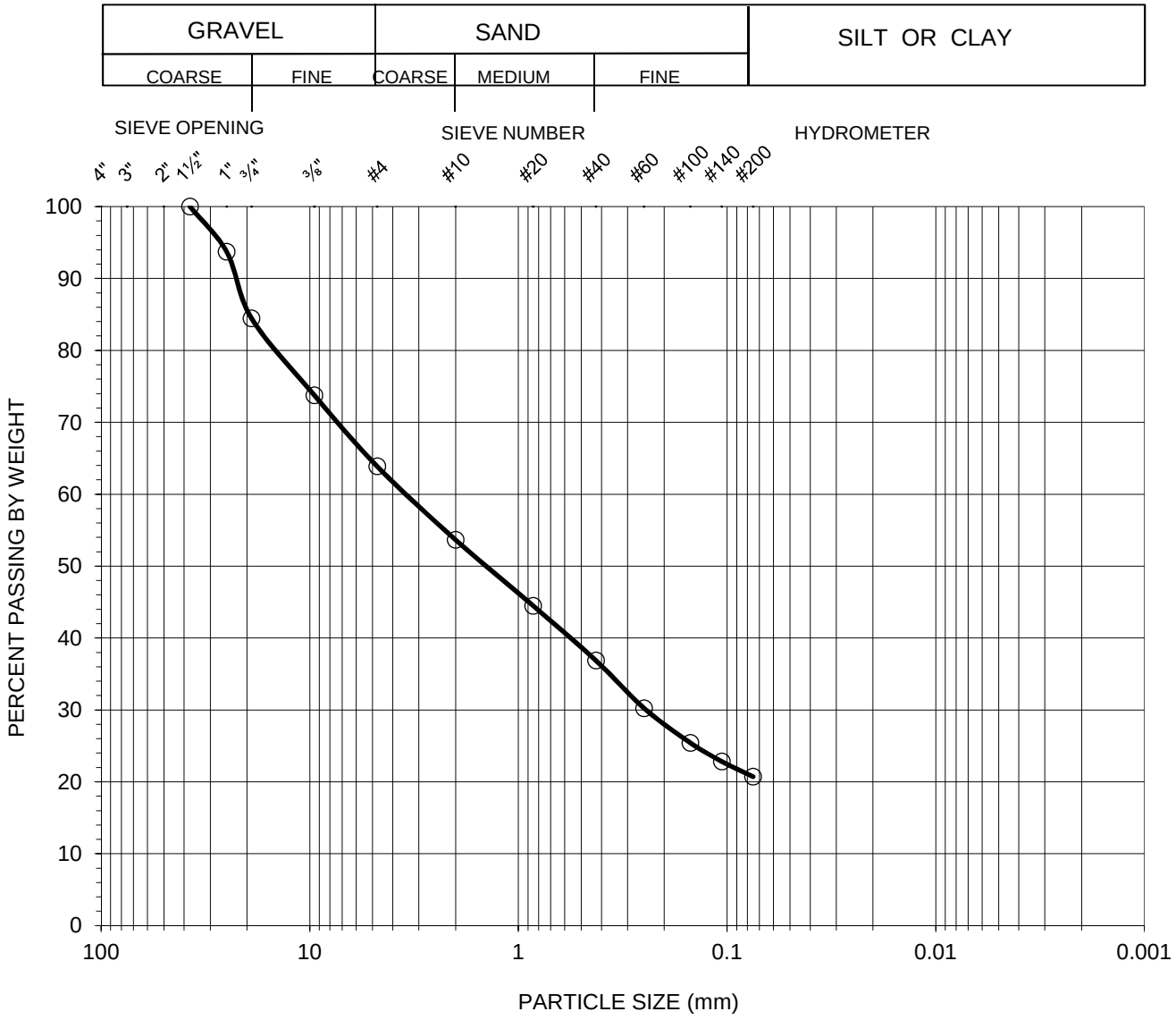
GRAIN SIZE DISTRIBUTION CURVE
ASTM D 6913

Client Name: GeoPentech — Tested by: TV — Date: 02/16/22
Project Name: RCDSMM - Topanga Lagoon Bridge — Computed by: NR — Date: 02/16/22
Project No.: 21013A — Checked by: AP — Date: 02/17/22



Symbol	Boring No.	Sample No.	Sample Depth (feet)	Percent			Atterberg Limits LL:PL:PI	Soil Type U.S.C.S
				Gravel	Sand	Silt & Clay		
○	HSA-M1	2	10	36	43	21	N/A	SM

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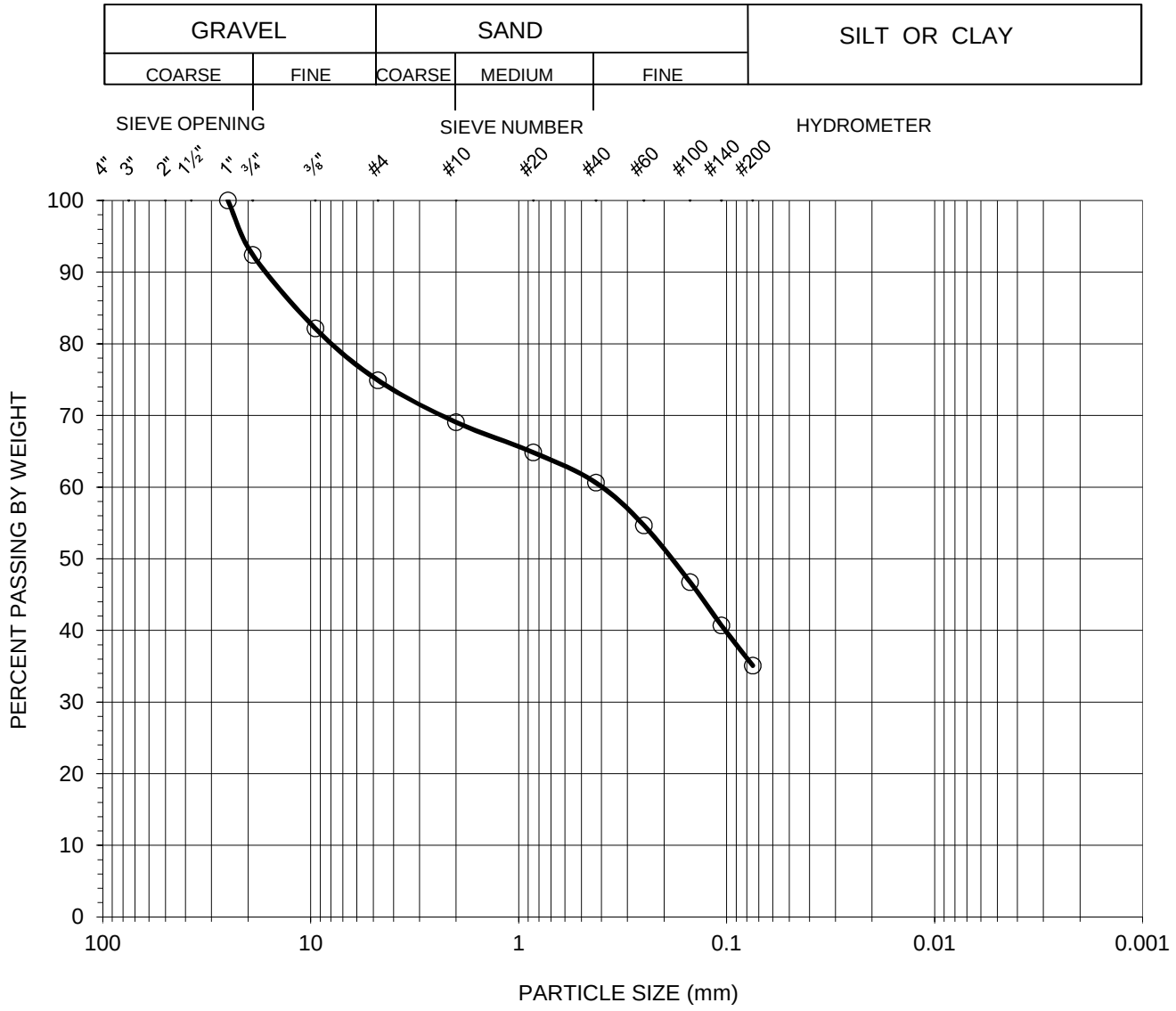
GRAIN SIZE DISTRIBUTION CURVE
ASTM D 6913

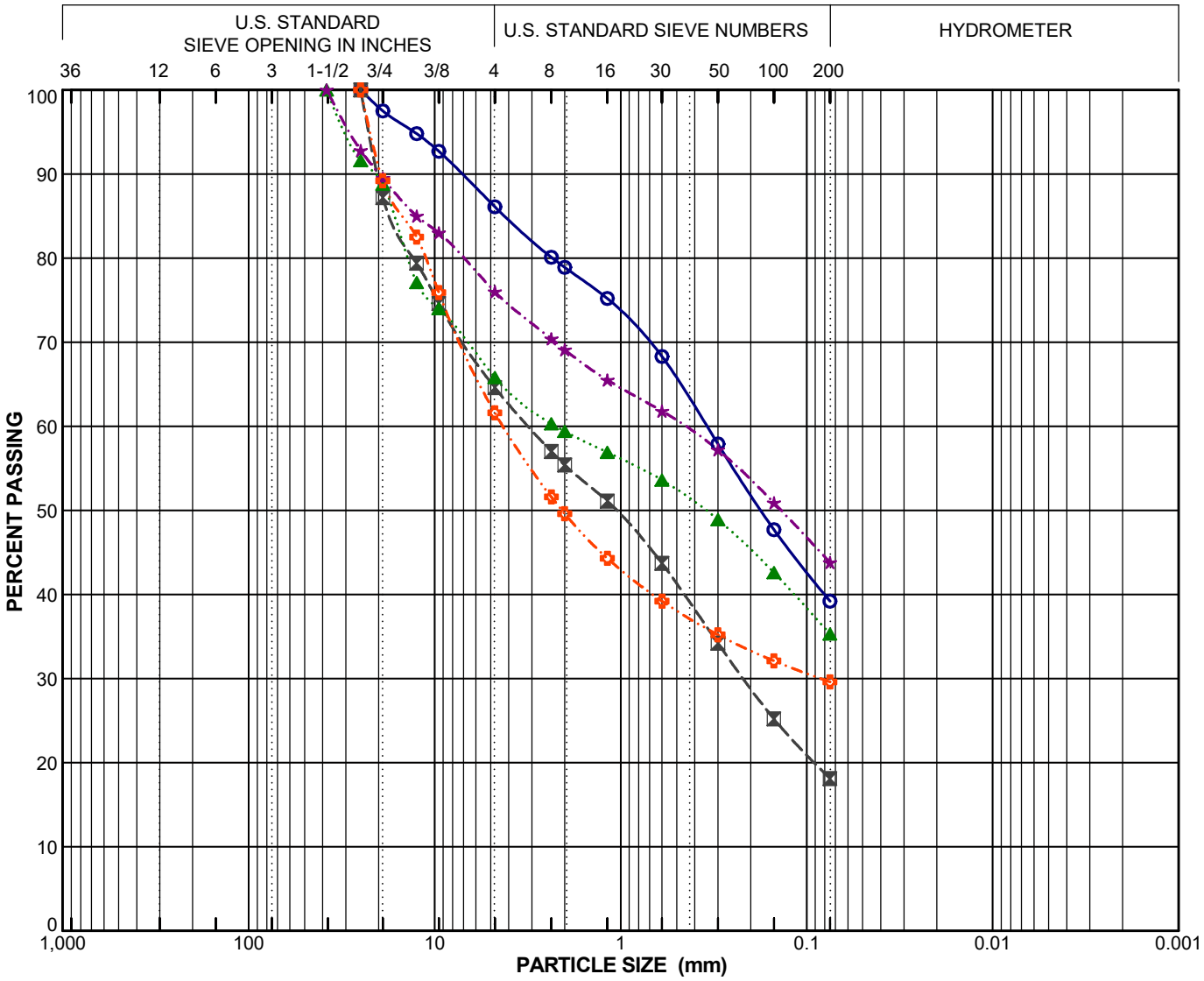
Client Name: GeoPentech — Tested by: TV — Date: 02/16/22
Project Name: RCDSMM - Topanga Lagoon Bridge — Computed by: NR — Date: 02/16/22
Project No.: 21013A — Checked by: AP — Date: 02/17/22



Symbol	Boring No.	Sample No.	Sample Depth (feet)	Percent			Atterberg Limits LL:PL:PI	Soil Type U.S.C.S
				Gravel	Sand	Silt & Clay		
○	HSA-M2	4	20	25	40	35	N/A	SC*

**Note: Based on visual classification of sample*

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



Symbol	Boring Number	Sample Number	Depth (feet)	Field Moisture (%)	LL	PI	Activity PI/-2μ	C_u	C_c	Passing No. 200 Sieve (%)	Passing 2μ (%)	USCS
○	HSA-1	2	5.0							39		SC/SM
⊠	HSA-1	4	10.0							18		SC/SM
▲	HSA-1	6	15.0							35		SC/SM
★	HSA-1	8	20.0							44		SC/SM
✿	HSA-1	10	25.0							30		SC/SM

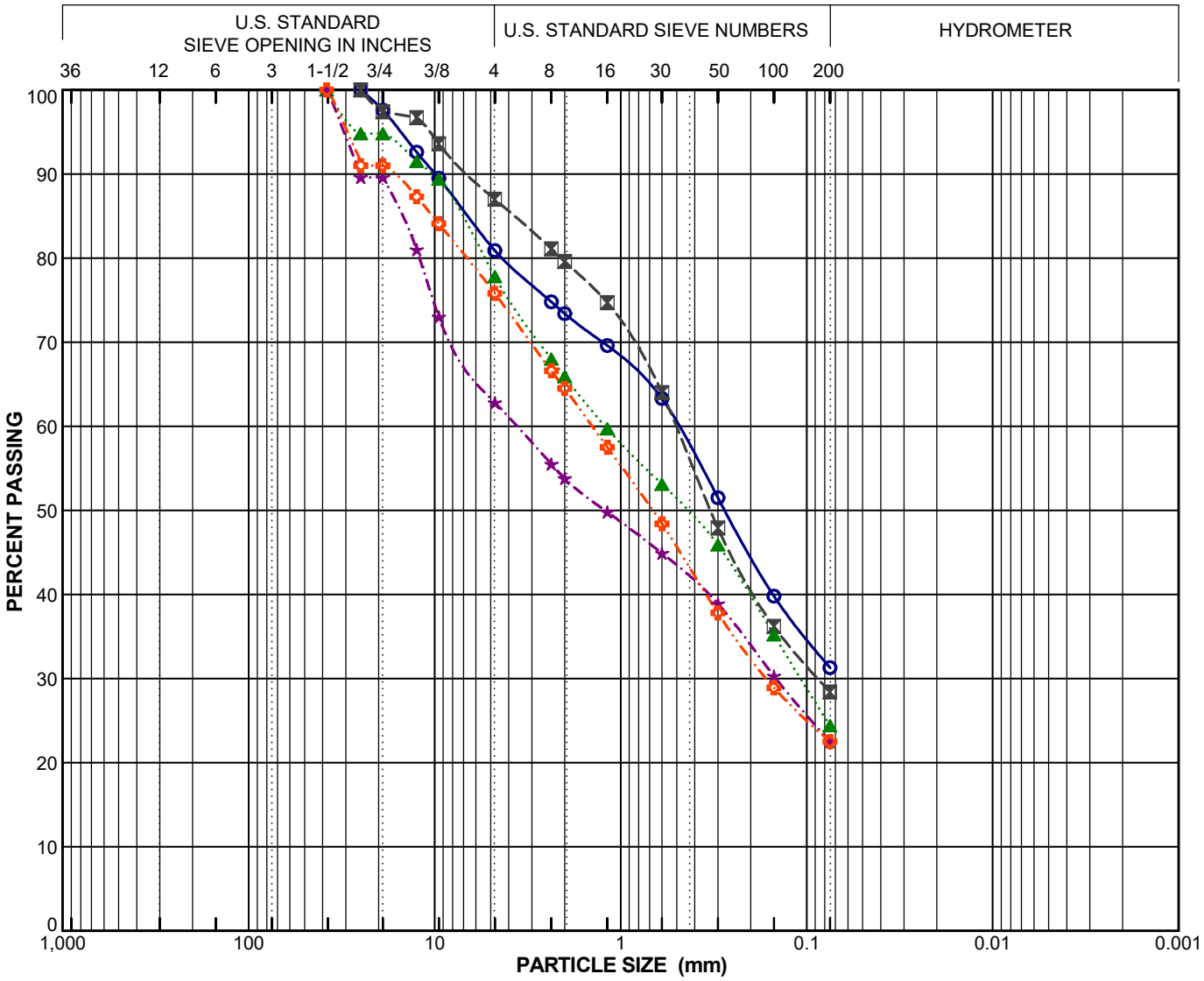
PARTICLE SIZE DISTRIBUTION

Geopentech / RCDSMM Topanga Lagoon Bridge (21013A)

PROJECT NO. 19122-03

NMG Geotechnical, Inc.

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



Symbol	Boring Number	Sample Number	Depth (feet)	Field Moisture (%)	LL	PI	Activity PI/-2μ	C_u	C_c	Passing No. 200 Sieve (%)	Passing 2μ (%)	USCS
○	HSA-2	2	5.0							31		SC/SM
⊠	HSA-2	4	10.0							28		SC/SM
▲	HSA-2	7	17.5							24		SC/SM
★	HSA-2	9	22.5							23		SC/SM
✿	HSA-2	11	27.5							23		SC/SM

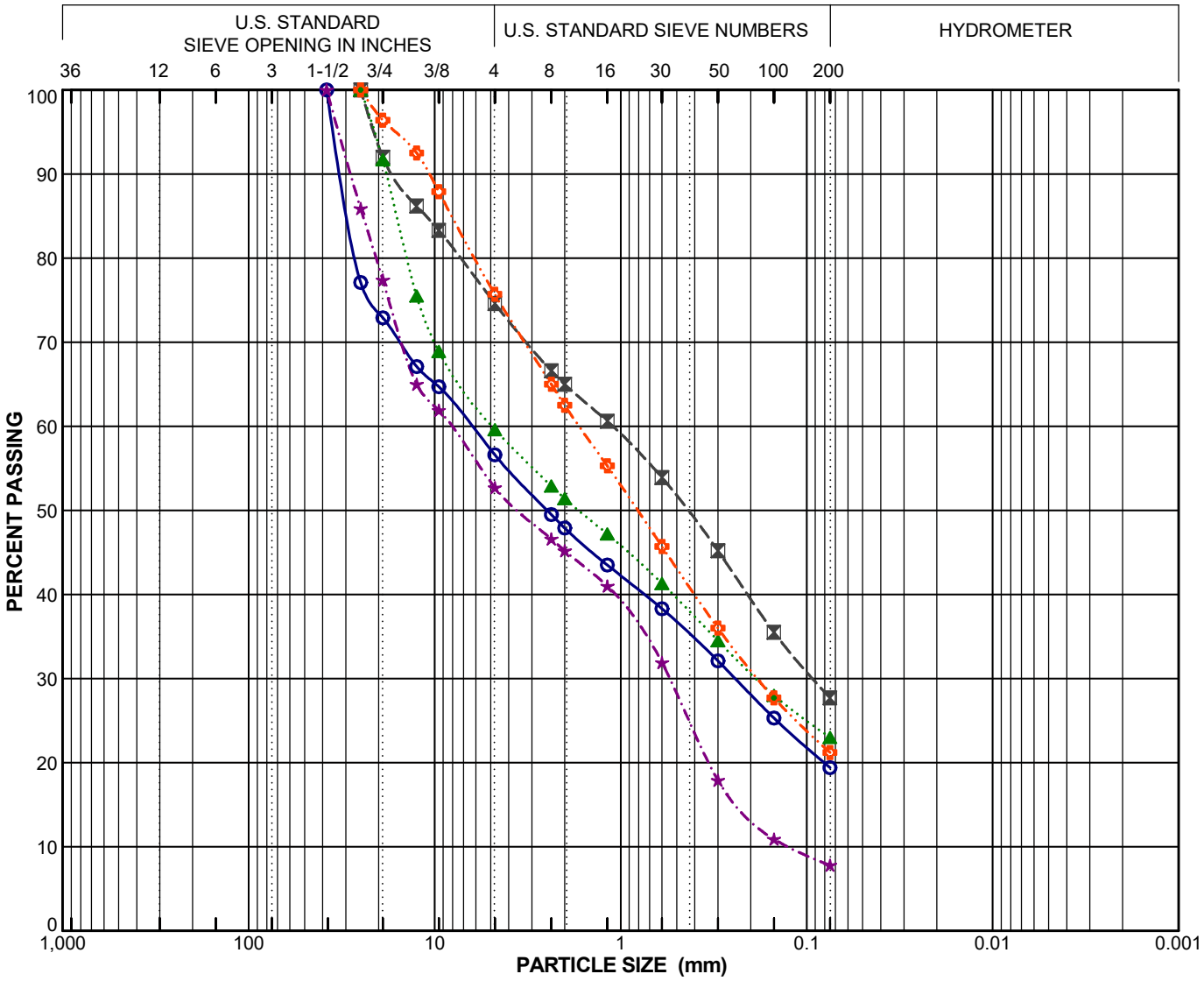
PARTICLE SIZE DISTRIBUTION

Geopentech / RCDSMM Topanga Lagoon Bridge (21013A)

PROJECT NO. 19122-03

NMG Geotechnical, Inc.

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



Symbol	Boring Number	Sample Number	Depth (feet)	Field Moisture (%)	LL	PI	Activity PI/-2μ	C_u	C_c	Passing No. 200 Sieve (%)	Passing 2μ (%)	USCS
○	HSA-3	2	5.0							19		SC/SM
⊠	HSA-3	4	10.0							28		SC/SM
▲	HSA-3	8	20.0							23		SC/SM
★	HSA-3	11	27.5					67.1	0.3	8		SP-SC
✿	HSA-4	2	5.0							21		SC/SM

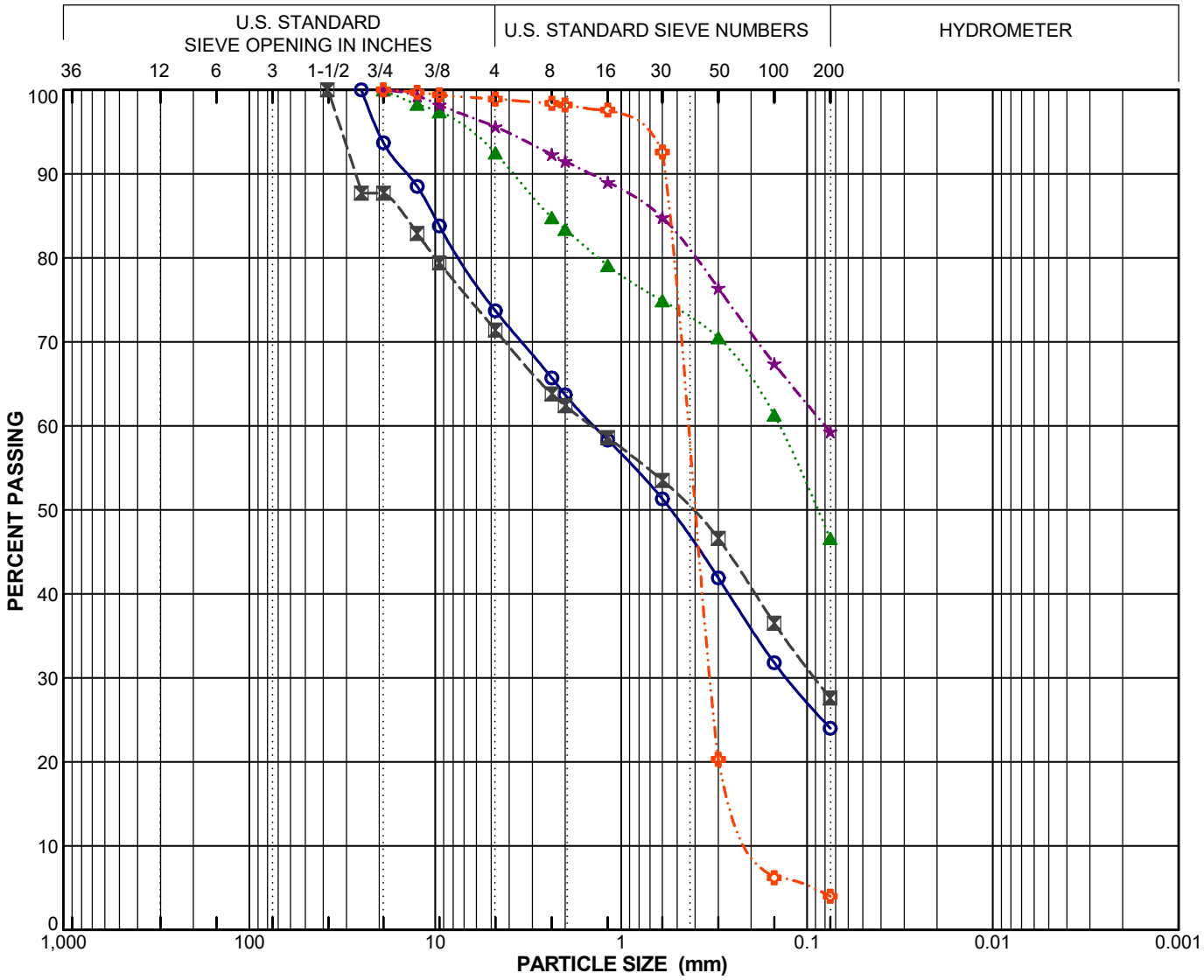
PARTICLE SIZE DISTRIBUTION

Geopentech / RCDSMM Topanga Lagoon Bridge (21013A)

PROJECT NO. 19122-03

NMG Geotechnical, Inc.

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



Symbol	Boring Number	Sample Number	Depth (feet)	Field Moisture (%)	LL	PI	Activity PI/-2μ	C_u	C_c	Passing No. 200 Sieve (%)	Passing 2μ (%)	USCS
○	HSA-4	4	10.0							24		SC/SM
⊠	HSA-4	7	17.5							28		SC/SM
▲	HSA-4	10	25.0							47		SC/SM
★	HSA-5	2	5.0							59		CL/ML
✿	HSA-5	4	10.0					2.4	1.4	4		SP

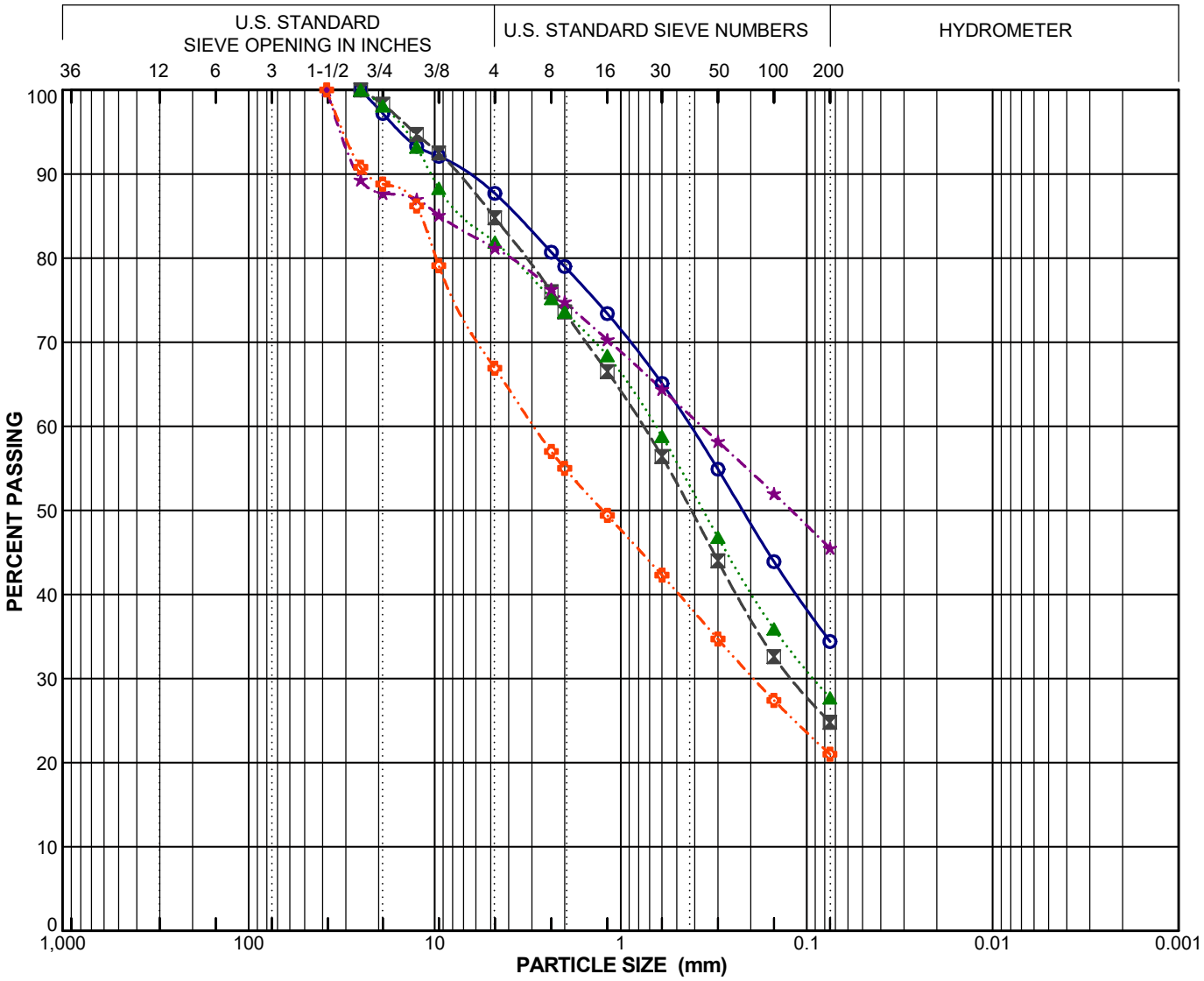
PARTICLE SIZE DISTRIBUTION

Geopentech / RCDSMM Topanga Lagoon Bridge (21013A)

PROJECT NO. 19122-03

NMG Geotechnical, Inc.

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



Symbol	Boring Number	Sample Number	Depth (feet)	Field Moisture (%)	LL	PI	Activity PI/-2μ	C_u	C_c	Passing No. 200 Sieve (%)	Passing 2μ (%)	USCS
○	HSA-6	2	5.0							34		SC/SM
⊠	HSA-6	4	10.0							25		SC/SM
▲	HSA-6	6	15.0							28		SC/SM
★	HSA-6	9	22.5							46		SC/SM
✿	HSA-7	3	7.5							21		SC/SM

PARTICLE SIZE DISTRIBUTION

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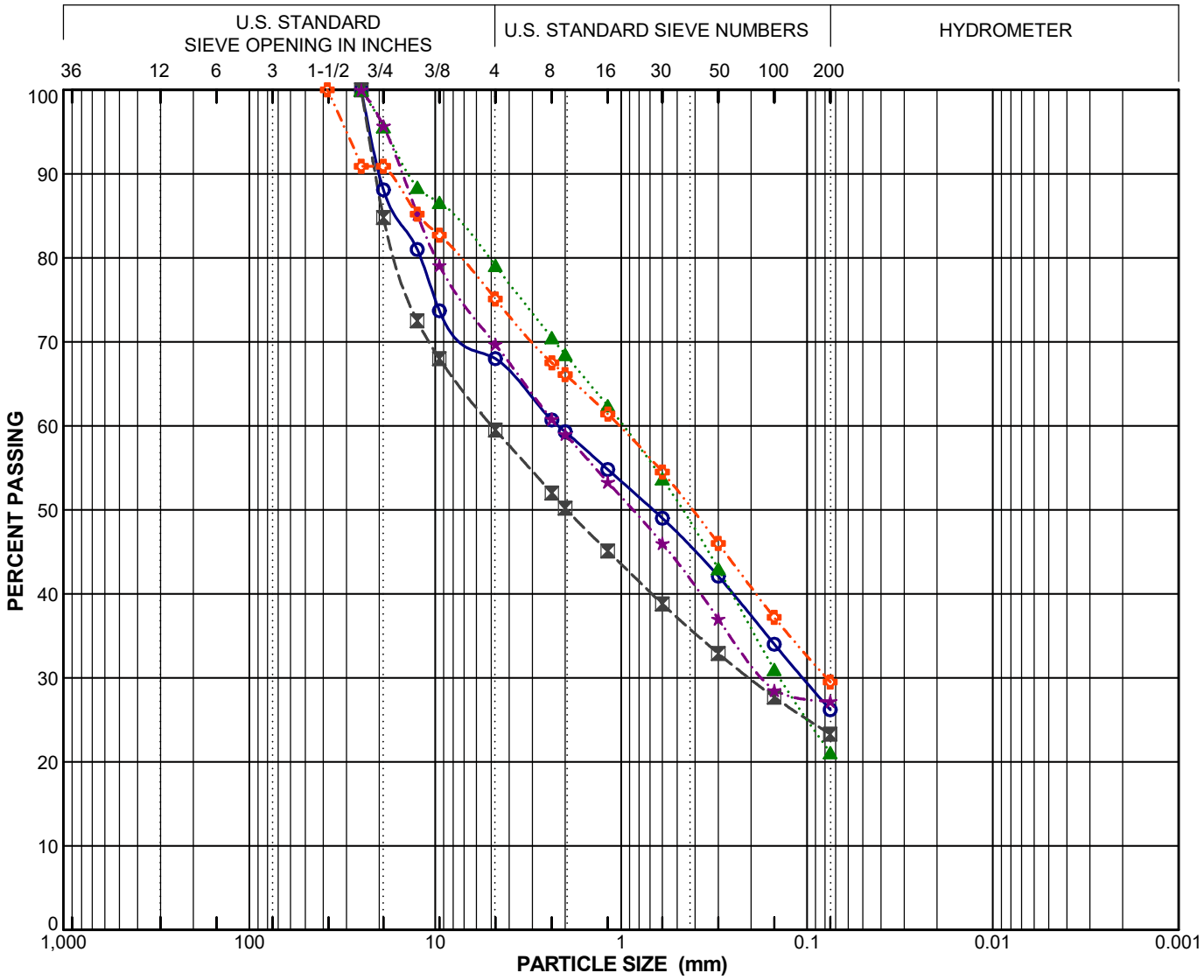
PROJECT NO. 19122-03

NMG Geotechnical, Inc.

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



Symbol	Boring Number	Sample Number	Depth (feet)	Field Moisture (%)	LL	PI	Activity PI/-2μ	C_u	C_c	Passing No. 200 Sieve (%)	Passing 2μ (%)	USCS
○	HSA-7	6	15.0							26		SC/SM
⊠	HSA-7	8	20.0							23		SC/SM
▲	HSA-7	10	25.0							21		SC/SM
★	HSA-8	3	7.5							27		SC/SM
✿	HSA-8	5	12.5							30		SC/SM

PARTICLE SIZE DISTRIBUTION

Geopentech / RCDSMM Topanga Lagoon Bridge (21013A)

PROJECT NO. 19122-03

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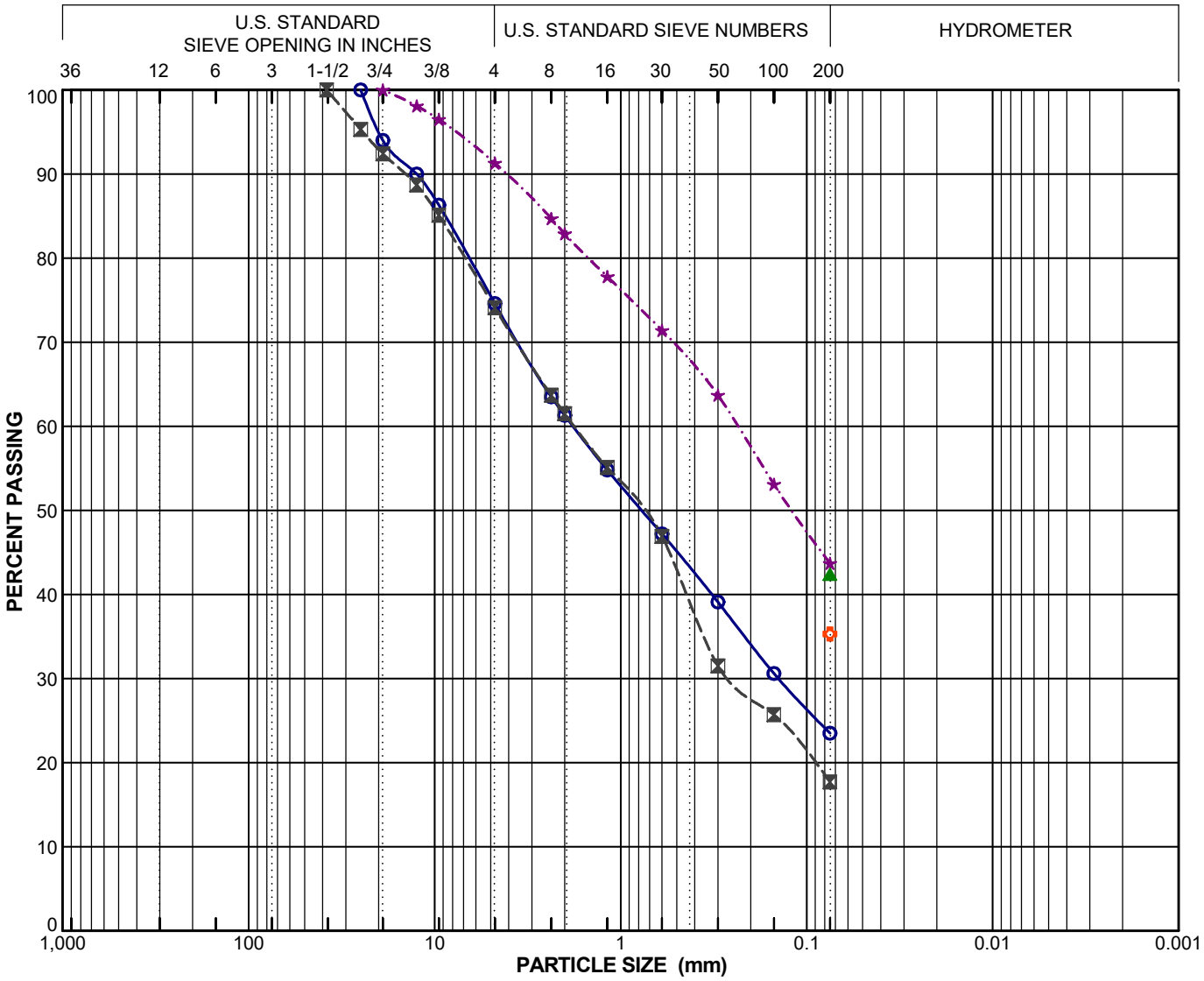
BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



Symbol	Boring Number	Sample Number	Depth (feet)	Field Moisture (%)	LL	PI	Activity PI/-2μ	C_u	C_c	Passing No. 200 Sieve (%)	Passing 2μ (%)	USCS
○	HSA-8	7	17.5							24		SC/SM
⊠	HSA-8	9	22.5							18		SC/SM
▲	HSA-S1	1	5.0		31	15				42		SC
★	HSA-S1	3	15.0		31	15				44		SC
✿	HSA-S1	7	35.0		29	13				35		SC

PARTICLE SIZE DISTRIBUTION

Geopentech / RCDSMM Topanga Lagoon Bridge (21013A)

PROJECT NO. 19122-03

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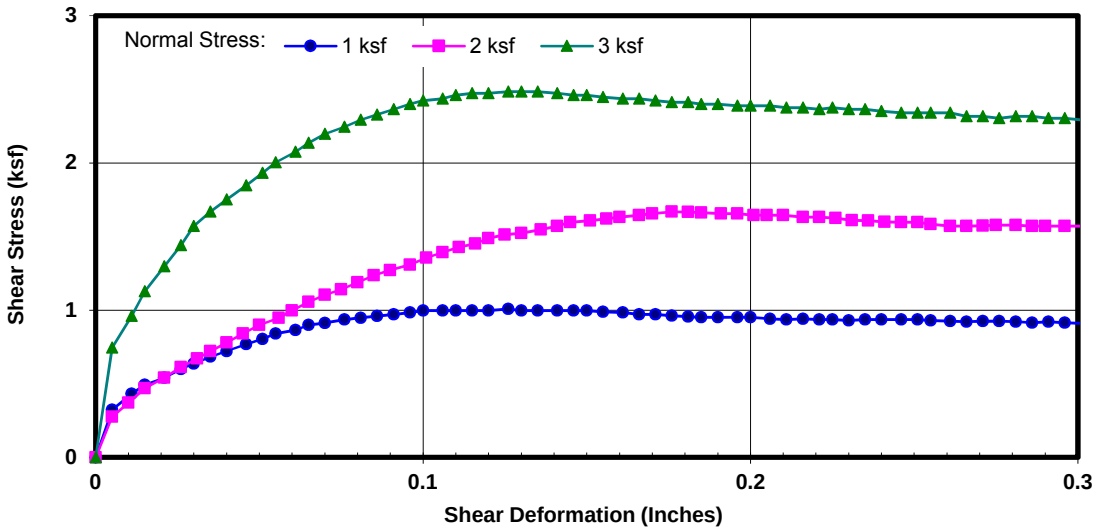
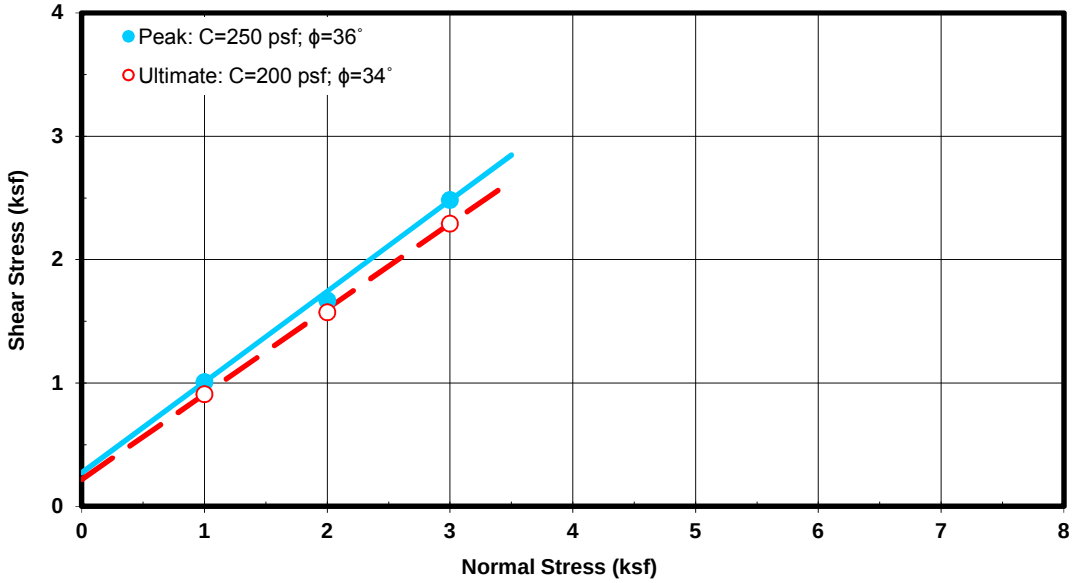
DIRECT SHEAR TEST RESULTS
ASTM D 3080

Client:	GeoPentech		**Tested By:**	LS	**Date:** 02/16/22
Project Name:	RCDSMM - Topanga Lagoon Bridge		**Computed By:**	NR	**Date:** 02/16/22
Project No.:	21013A		**Checked by:**	AP	**Date:** 02/17/22
Boring No.:	HSA-M1				
Sample No.:	3	**Depth (ft):** 15			
Sample Type:	Mod. Cal.				
Soil Description:	Clayey Sand w/gravel				
Test Condition:	Inundated	**Shear Type:** Regular			

Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Initial Moisture Content (%)	Final Moisture Content (%)	Initial Degree Saturation (%)	Final Degree Saturation (%)	Normal Stress (ksf)	Peak Shear Stress (ksf)	Ultimate Shear Stress (ksf)
125.0	118.2	5.7	15.8	36	100	1	1.008	0.909
						2	1.668	1.572
						3	2.484	2.292





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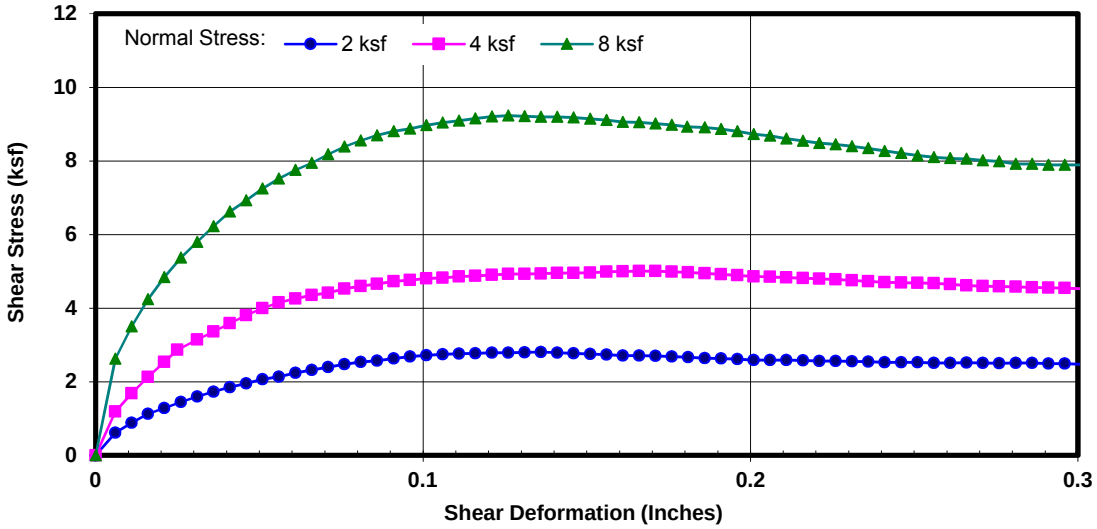
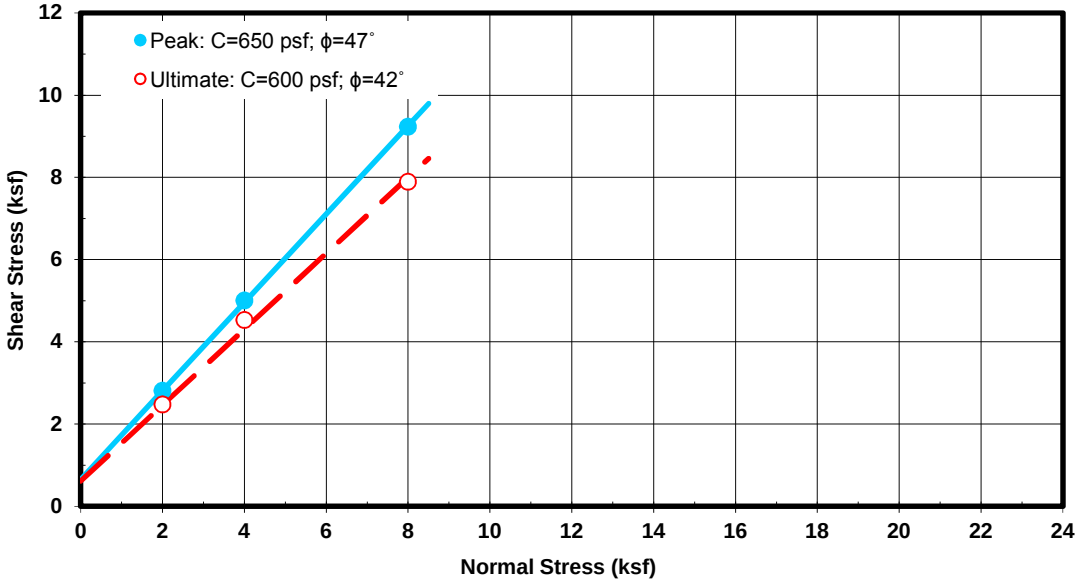
DIRECT SHEAR TEST RESULTS
ASTM D 3080

Client:	GeoPentech		**Tested By:**	LS	**Date:** 02/14/22
Project Name:	RCDSMM - Topanga Lagoon Bridge		**Computed By:**	NR	**Date:** 02/15/22
Project No.:	21013A		**Checked by:**	AP	**Date:** 02/17/22
Boring No.:	HSA-M1				
Sample No.:	7	**Depth (ft):** 35			
Sample Type:	Mod. Cal.				
Soil Description:	Silty Sand w/gravel				
Test Condition:	Inundated	**Shear Type:** Regular			

Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Initial Moisture Content (%)	Final Moisture Content (%)	Initial Degree Saturation (%)	Final Degree Saturation (%)	Normal Stress (ksf)	Peak Shear Stress (ksf)	Ultimate Shear Stress (ksf)
132.7	114.5	15.8	17.5	91	100	2	2.808	2.478
						4	5.004	4.531
						8	9.232	7.894





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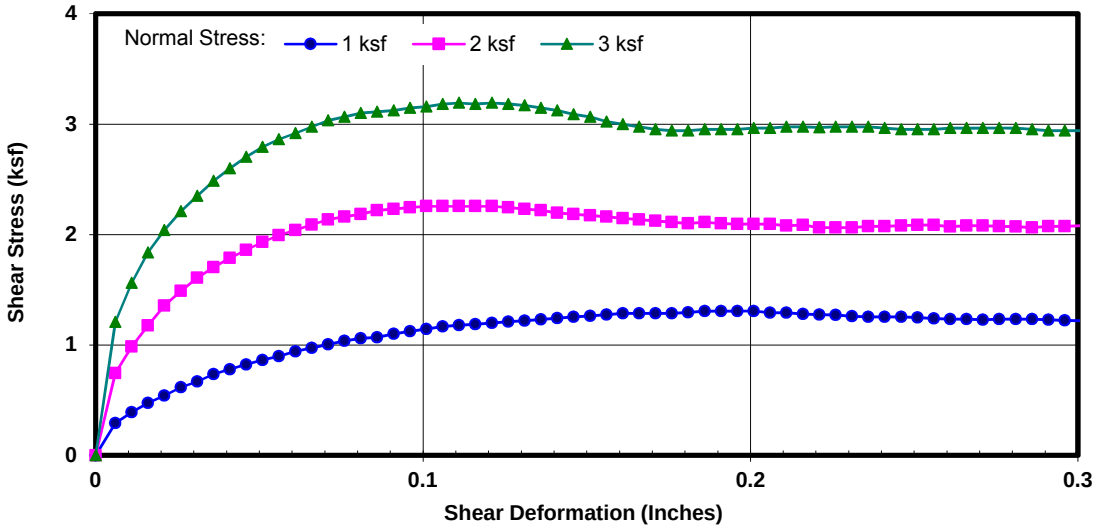
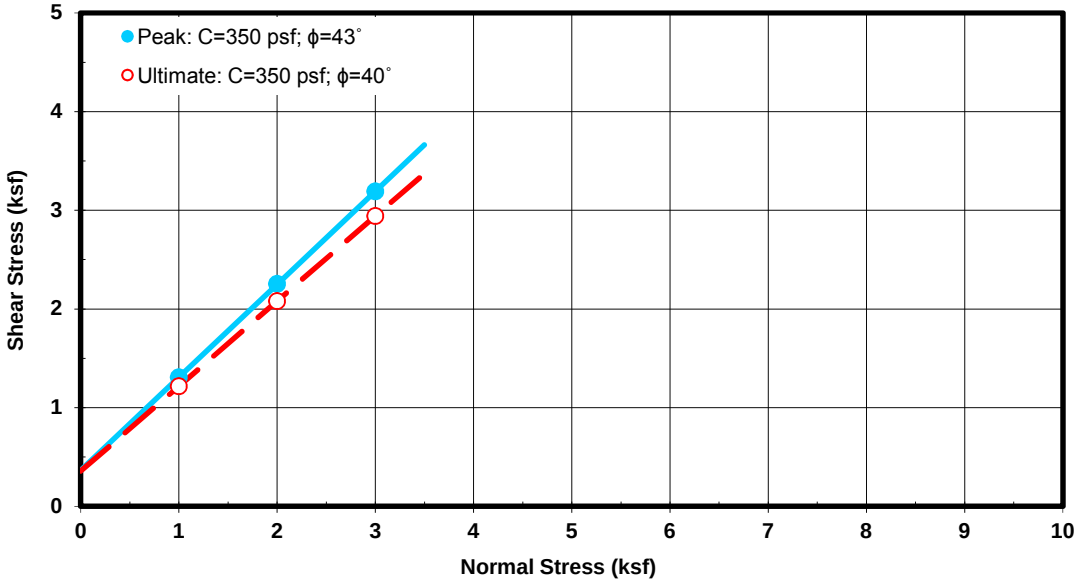
DIRECT SHEAR TEST RESULTS
ASTM D 3080

Client:	GeoPentech		**Tested By:**	LS	**Date:** 02/16/22
Project Name:	RCDSMM - Topanga Lagoon Bridge		**Computed By:**	NR	**Date:** 02/16/22
Project No.:	21013A		**Checked by:**	AP	**Date:** 02/17/22
Boring No.:	HSA-M2				
Sample No.:	3	**Depth (ft):** 15			
Sample Type:	Mod. Cal.				
Soil Description:	Clayey Sand				
Test Condition:	Inundated	**Shear Type:** Regular			

Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Initial Moisture Content (%)	Final Moisture Content (%)	Initial Degree Saturation (%)	Final Degree Saturation (%)	Normal Stress (ksf)	Peak Shear Stress (ksf)	Ultimate Shear Stress (ksf)
126.1	121.2	4.1	14.5	28	100	1	1.307	1.218
						2	2.256	2.080
						3	3.192	2.941





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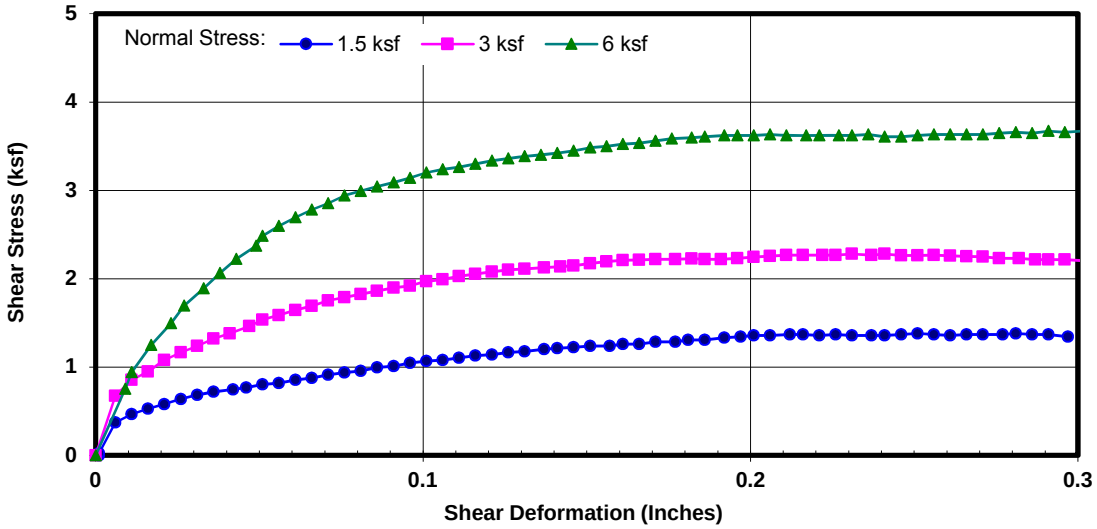
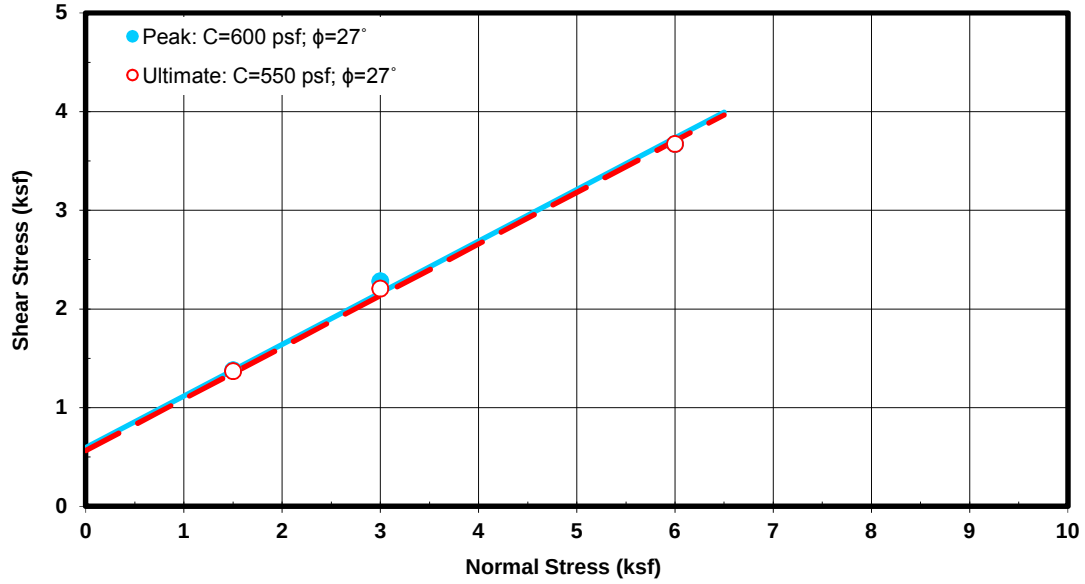
DIRECT SHEAR TEST RESULTS
ASTM D 3080

Client:	GeoPentech		**Tested By:**	LS	**Date:** 02/16/22
Project Name:	RCDSMM - Topanga Lagoon Bridge		**Computed By:**	NR	**Date:** 02/16/22
Project No.:	21013A		**Checked by:**	AP	**Date:** 02/17/22
Boring No.:	HSA-M2				
Sample No.:	5	**Depth (ft):** 25			
Sample Type:	Mod. Cal.				
Soil Description:	Clay w/sand				
Test Condition:	Inundated	**Shear Type:** Regular			

Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Initial Moisture Content (%)	Final Moisture Content (%)	Initial Degree Saturation (%)	Final Degree Saturation (%)	Normal Stress (ksf)	Peak Shear Stress (ksf)	Ultimate Shear Stress (ksf)
119.4	108.1	10.4	19.4	50	94	1.5	1.380	1.368
						3	2.280	2.206
						6	3.671	3.671





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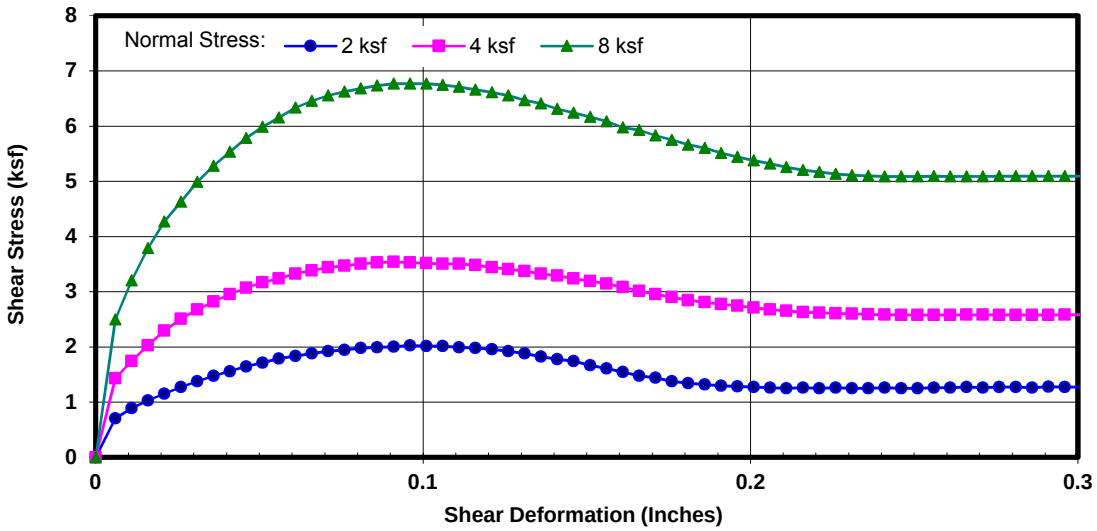
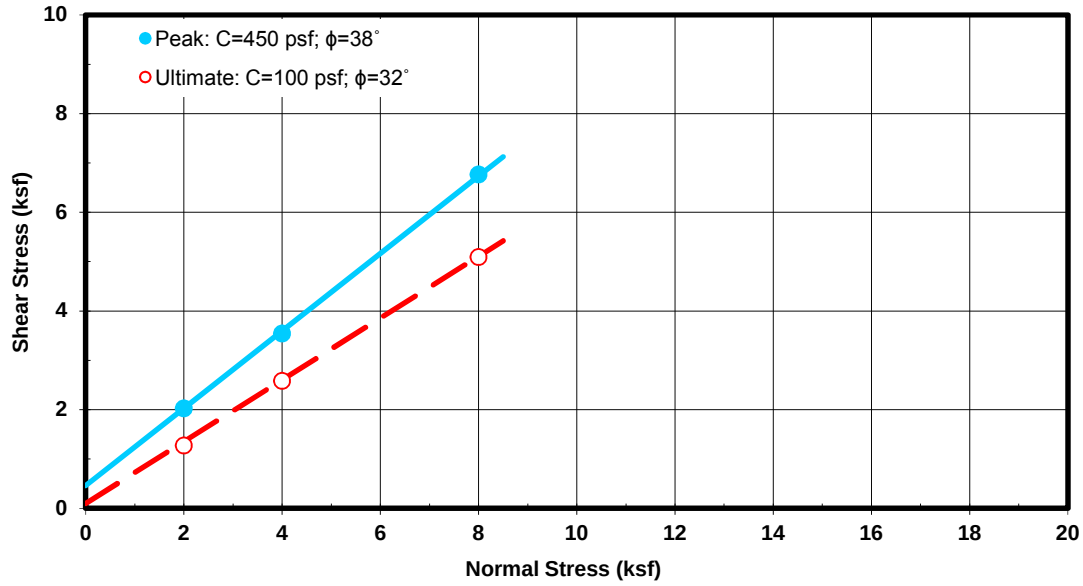
DIRECT SHEAR TEST RESULTS
ASTM D 3080

Client:	GeoPentech		**Tested By:**	LS	**Date:** 02/15/22
Project Name:	RCDSMM - Topanga Lagoon Bridge		**Computed By:**	NR	**Date:** 02/16/22
Project No.:	21013A		**Checked by:**	AP	**Date:** 02/17/22
Boring No.:	HSA-M2				
Sample No.:	7	**Depth (ft):** 35			
Sample Type:	Mod. Cal.				
Soil Description:	Silty Sand				
Test Condition:	Inundated	**Shear Type:** Regular			

Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Initial Moisture Content (%)	Final Moisture Content (%)	Initial Degree Saturation (%)	Final Degree Saturation (%)	Normal Stress (ksf)	Peak Shear Stress (ksf)	Ultimate Shear Stress (ksf)
131.1	110.6	18.6	19.5	96	100	2	2.028	1.272
						4	3.540	2.582
						8	6.768	5.091





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t. 909.869.6316 | f. 909.869.6318 | www.aplaboratory.com

CORROSION TEST RESULTS

Client Name: GeoPentech
Project Name: RCDSMM - Topanga Lagoon Bridge
Project No.: 21013A

AP Job No.: 22-0226
Date: 02/14/22

Boring No.	Sample No.	Depth (feet)	Soil Description	Minimum Resistivity (ohm-cm)	pH	Sulfate Content (ppm)	Chloride Content (ppm)
HSA-M1	Bulk-1	0-5	Silty Sand w/gravel & traces of clay	1,367	8.8	223	46

NOTES: Resistivity Test and pH: California Test Method 643
Sulfate Content : California Test Method 417
Chloride Content : California Test Method 422
ND = Not Detectable
NA = Not Sufficient Sample
NR = Not Requested

APPENDIX C

Slope Stability Analyses

APPENDIX C – SLOPE STABILITY ANALYSES

C.1 General

This appendix presents the results of the static and seismic slope stability evaluation of the existing slope configurations (Alternative 1) adjacent to the Topanga Ranch Motel for a non-liquefied and liquefied state. The stability of the slopes was evaluated using SLOPE/W, as discussed in detail below.

C.2 Material Properties

A summary of the material properties used in the slope stability analyses is presented in Table C-1. The properties of the Fill and Beach Deposits are based on results of the laboratory density and direct shear tests and engineering judgement.

For the liquefied state, the properties of the Beach Deposits are based on field blow counts and correlations made by Idriss and Boulanger (2008) for residual soil strength of liquified soil. Laboratory results, blow counts, and liquefaction potential are shown on Figures C-3a,b and Figure C-4a,b for borings HSA-M1 and HSA-M2, respectively. As shown on these figures, one layer between a depth of 30 and 35 feet (Elevation 3 to 8 feet) was considered as a liquefied layer.

Table C-1
Material Properties used in Slope Stability Analyses

Material	Unit Weight (pcf)	Cohesion (psf)	Friction Angle (degrees)	Tau/Sigma Ratio
Fill	120	300	39	-
Beach Deposits	130	500	36	-
Liquefied Beach Deposits	130	-	-	0.11

C.3 Geologic Profiles

The slope stability analysis sections were developed from Geologic Sections 1 through 4 shown on Figure C-2 in this appendix. The locations of these geologic profiles are shown on Figure C-1. For each section, analyses were performed for the existing slope configuration (Alternative 1).

C.4 SLOPE/W Analysis Procedure

Stability analyses for the existing slope configuration (Alternative 1) were conducted using the computer program SLOPE/W to evaluate (1) the static factor of safety of the existing slope configuration, (2) yield acceleration (k_y) values based on Bray and others (1998), and (3) the pseudostatic factors of safety for given displacements. These evaluations were done for a non-liquefied and liquefied state. Note that the yield acceleration (k_y) is the horizontal acceleration

value that when applied to the mass above a potential shear surface would result in a computed factor of safety of 1.0. Typically for design, a k_y value greater than 0.15 is desired.

Using Spencer's method, entry-exit and fully specified circular methods were used to determine the critical potential surfaces for each of the sections under the current configurations.

The critical surface in the existing slope configuration for the non-liquefied static and seismic cases are shown on Figure C-2 for Cross Sections 1 through 4. Table C-2 summarizes the results of these analyses. As shown on Figure C-2 and summarized in Table C-2, the computed factors of safety for the existing slope exceed 1.5 for the static condition and the calculated yield coefficients for the pseudostatic condition exceed 0.15, both typical values used for permanent design.

Table C-2
Slope Stability Analysis Results Summary – Non-Liquefied State

Sections	Static	Pseudostatic				
	FS	K_y	K_{eq}		FS	
			5cm	15cm	5cm	15cm
1	2.97	0.82	0.436	0.427	1.56	1.57
2	2.9	0.81			1.46	1.48
3	1.79	0.46			1.03	1.04
4	2.62	0.62			1.25	1.27

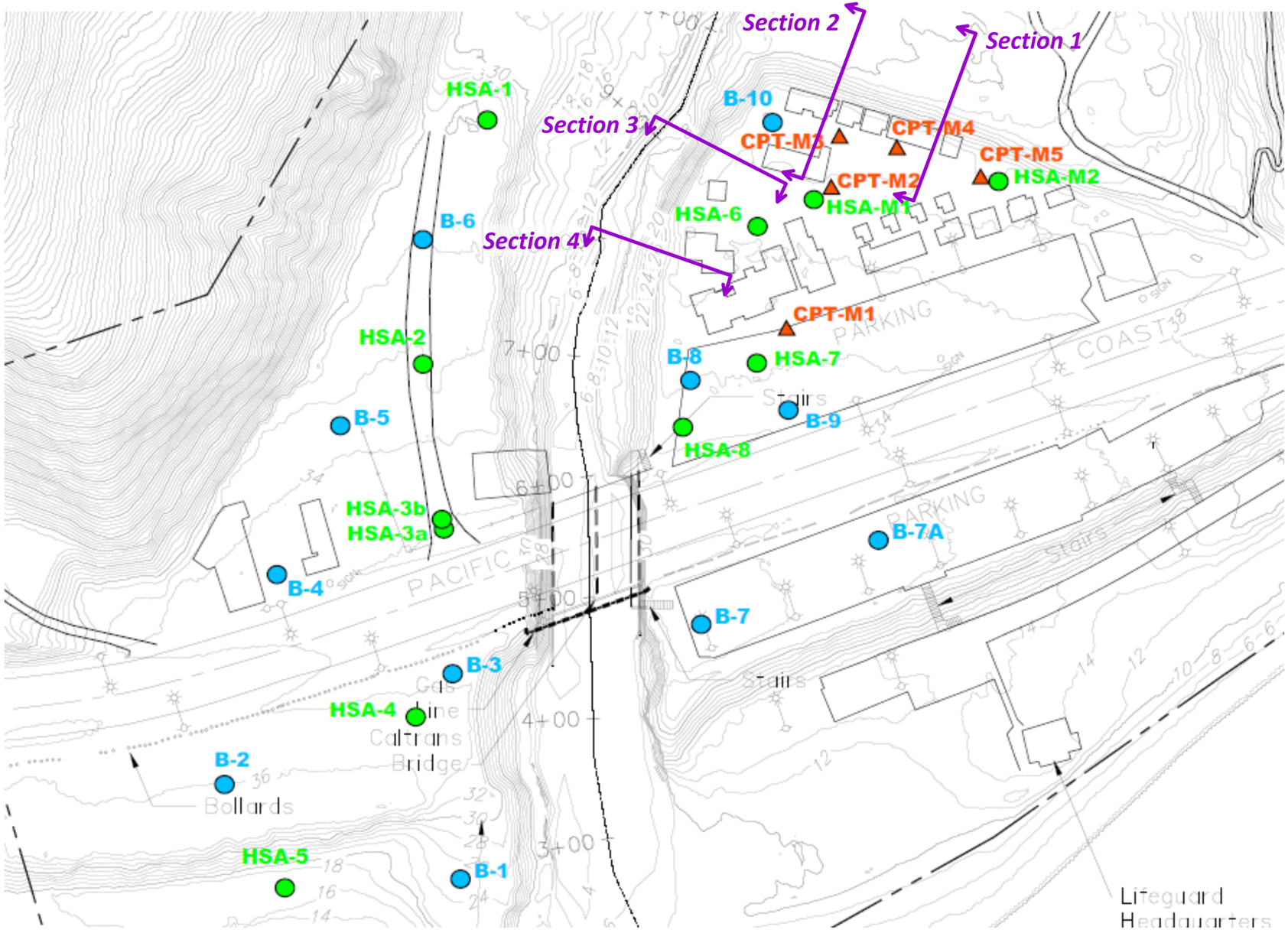
The critical surface in the existing slope configuration for the liquefied static and seismic cases are shown on Figure C-5 for Cross Sections 3 and 4. Table C-3 summarizes the results of these analyses. As shown on Figure C-5 and summarized in Table C-3, the computed factors of safety for the existing slope does not exceed 1.5 for the static condition or 0.15 for the pseudostatic condition, showing these slopes could fail if liquefaction occurs.

Table C-3
Slope Stability Analysis Results Summary – Liquefied State

Sections	Static	Pseudostatic				
	FS	K_y	K_{eq}		FS	
			5cm	15cm	5cm	15cm
3	1.27	0.07	0.436	0.427	0.37	0.38
4	1.35	0.09			0.32	0.34

C.5 Conclusions

Based on the results of the analyses performed, the existing slopes have adequate factors of safety for static conditions. However, the slopes are not considered stable when considering potential liquefaction under seismic conditions.



Legend

- GeoPentech 2021 CPTs
- GeoPentech 2002 Borings
- GeoPentech 2021 Borings
- Slope Stability Sections

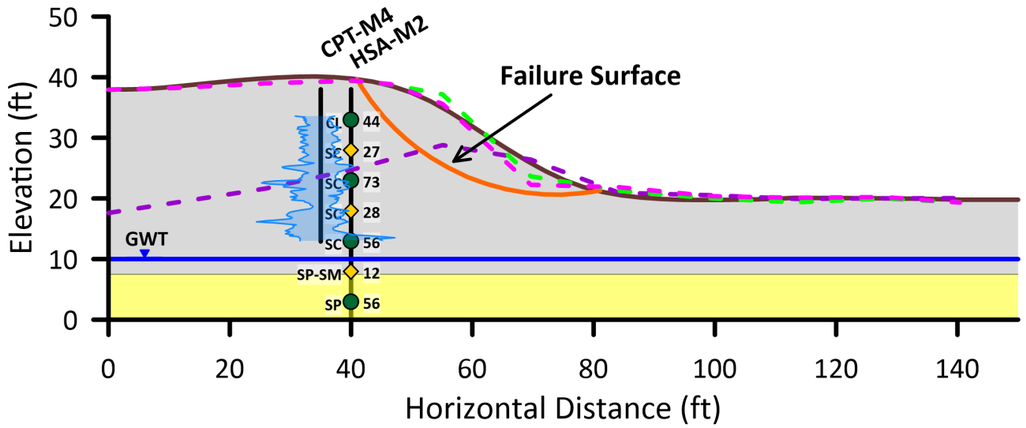
N

0 100 200 ft

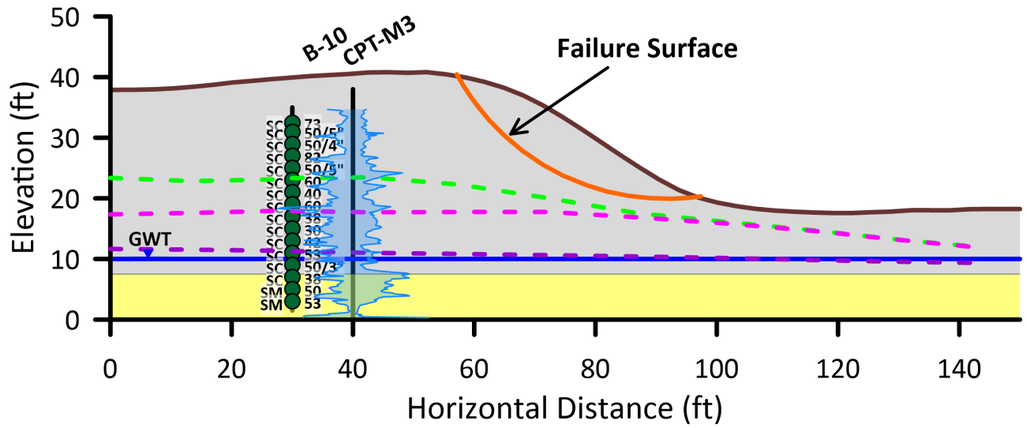
SITE PLAN		
Project: TOPANGA LAGOON BRIDGE		Figure C-1
Project No.: 21013A	Date: APR 2022	

GeoPentech

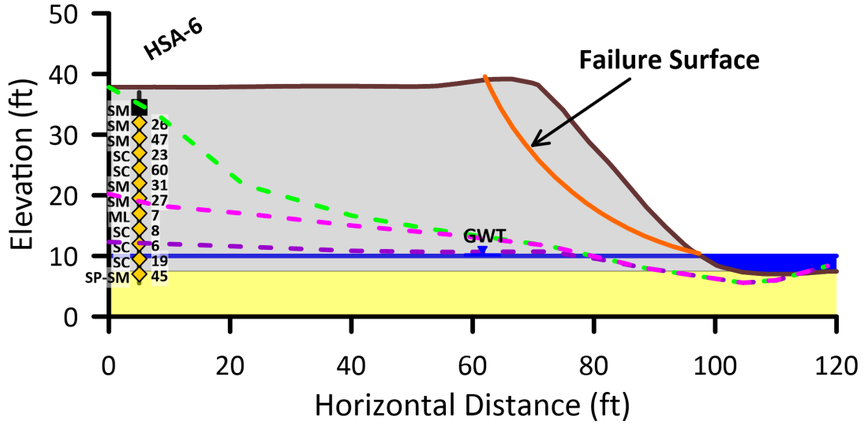
Section 1 Cross Section



Section 2 Cross Section



Section 3 Cross Section



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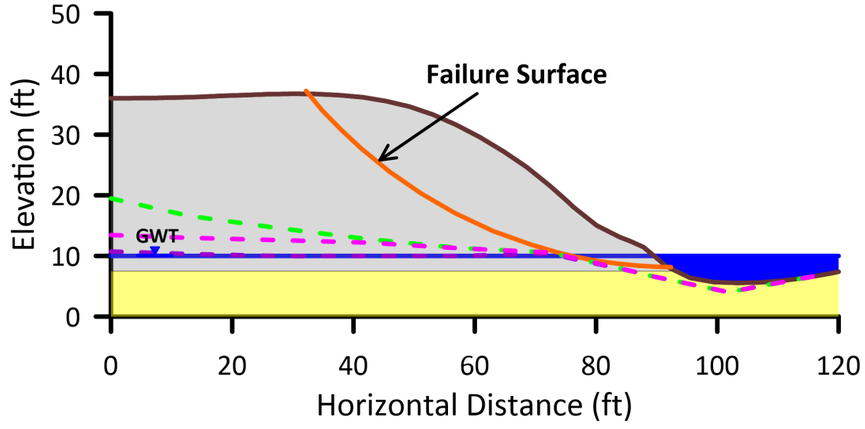
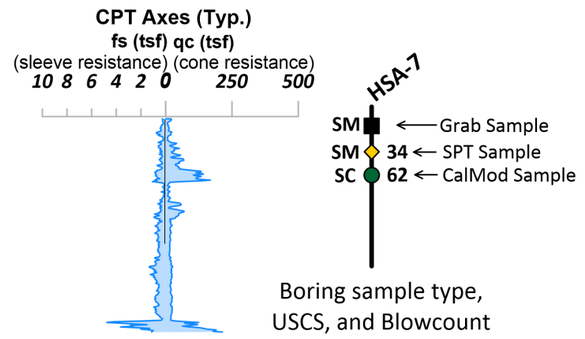


Legend

- Alternative 2 Topo
- Alternative 3 Topo
- Alternative 4 Topo

Sections	Static	Pseudostatic				
	FS	K_y	K_{eq}		FS	
			5cm	15cm	5cm	15cm
1	2.97	0.82	0.436	0.427	1.56	1.57
2	2.9	0.81			1.46	1.48
3	1.79	0.46			1.03	1.04
4	2.62	0.62			1.25	1.27

	Unit Weight (pcf)	Cohesion (psf)	Friction Angle (degrees)
Fill	120	300	39
Beach Deposits	130	500	36



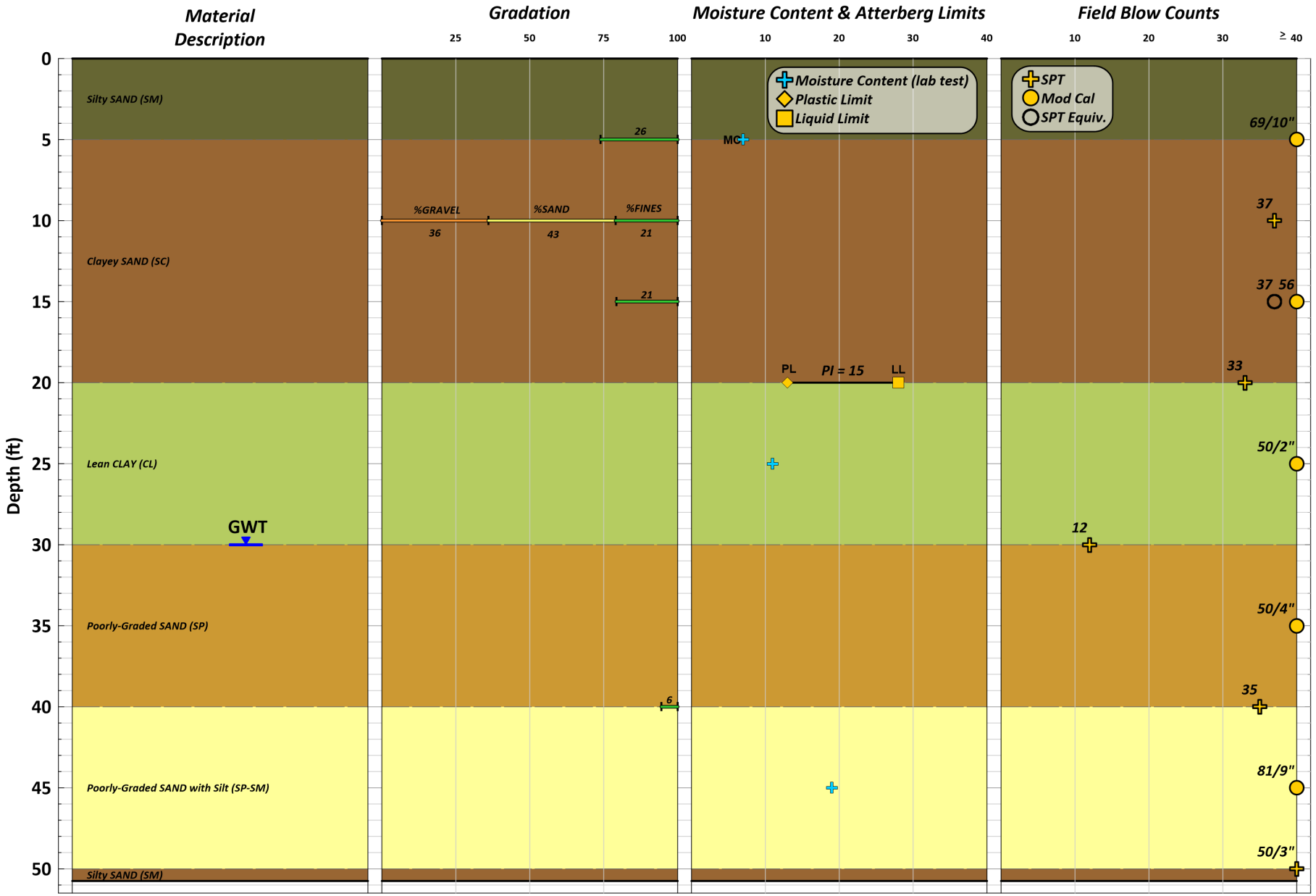
SLOPE STABILITY CROSS SECTIONS

Project: TOPANGA LAGOON BRIDGE

Project No.: 21013A | Date: APR 2022

Figure C-2

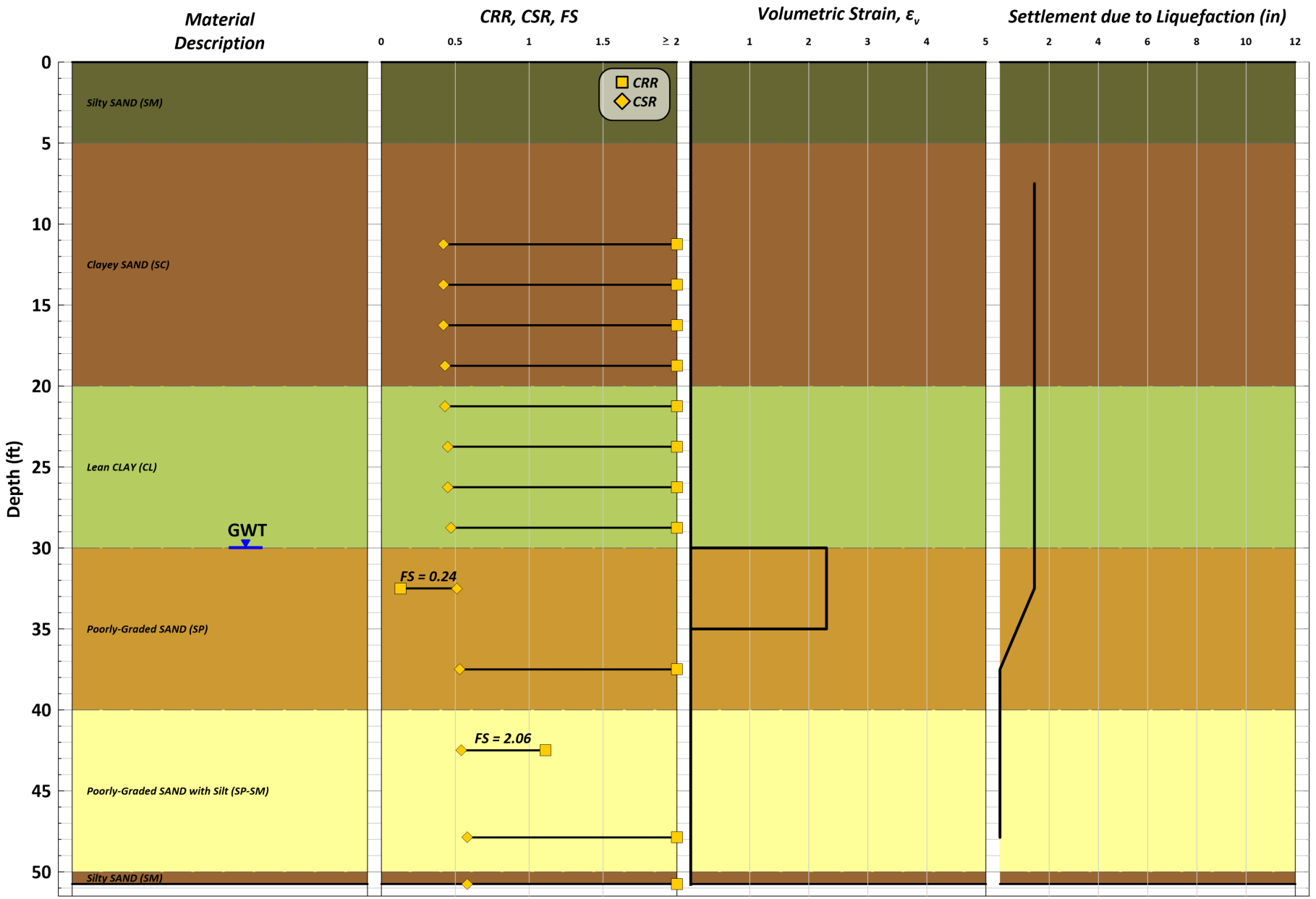
GeoPentech



BORING HSA-M1 INVESTIGATION DATA SUMMARY

Date: MAY 2022	Project No.: 21013A	Project: TOPANGA LAGOON RESTORATION	Figure: C-3a

GeoPentech

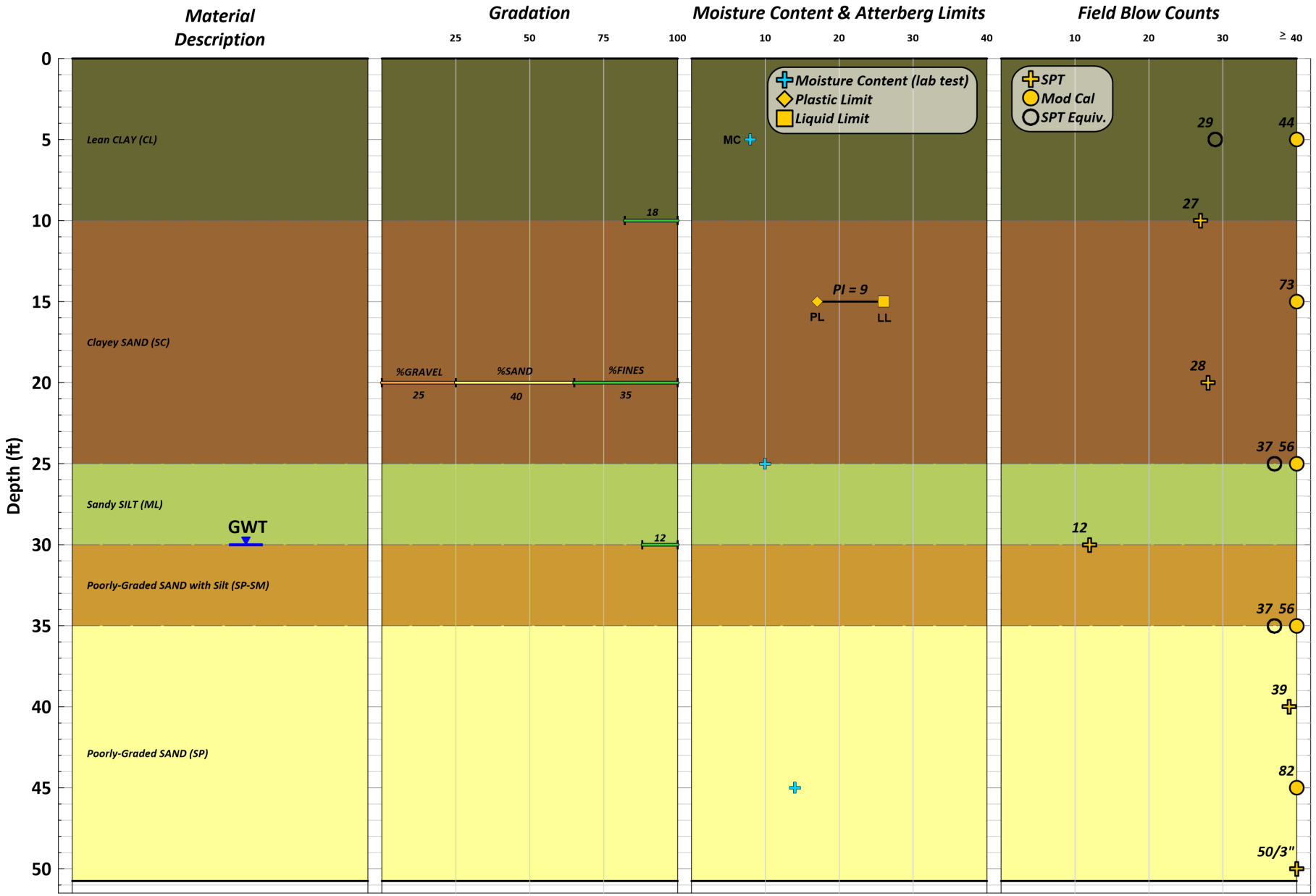


Note: Factors of safety not shown for very high values

HSA-M1 LIQUEFACTION & SETTLEMENT ANALYSIS

Date: MAY 2022	Project No.: 21013A	Project: TOPANGA LAGOON RESTORATION	Figure: C-3b

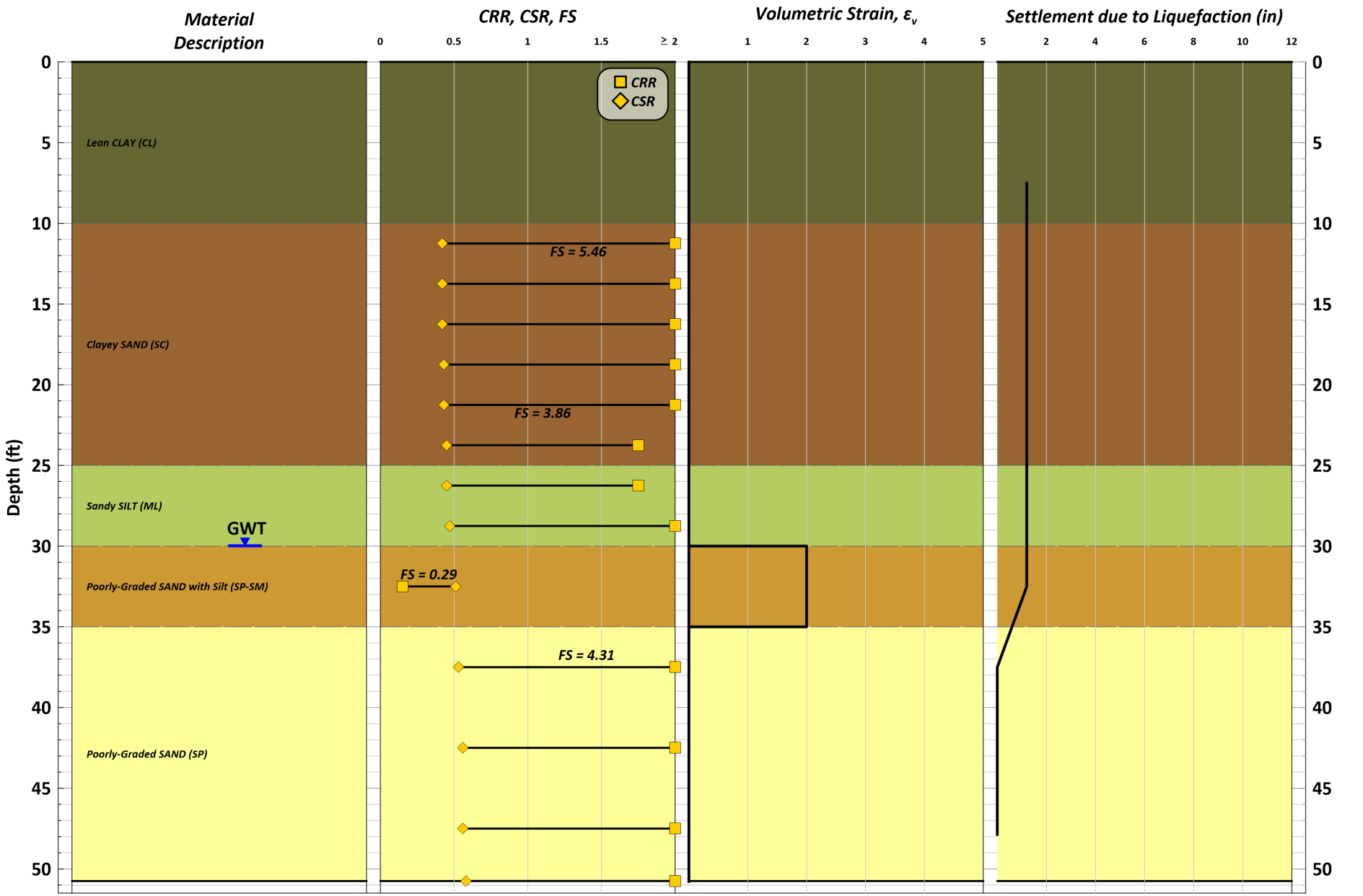
GeoPentech



BORING HSA-M2 INVESTIGATION DATA SUMMARY

Date: MAY 2022	Project No.: 21013A	Project: TOPANGA LAGOON RESTORATION	Figure: C-4a

GeoPentech



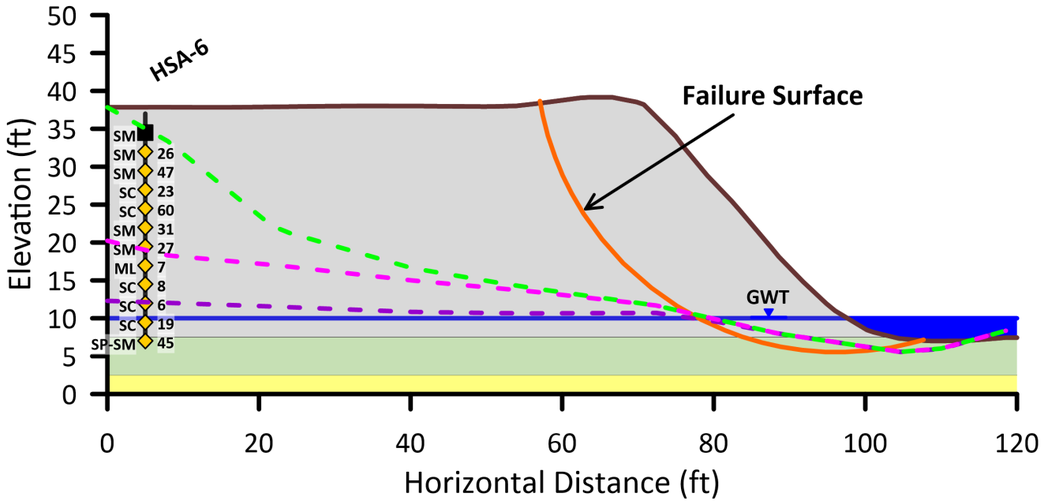
Note: Factors of safety not shown for very high values

HSA-M2 LIQUEFACTION & SETTLEMENT ANALYSIS

Date: MAY 2022	Project No.: 21013A	Project: TOPANGA LAGOON RESTORATION	Figure: C-4b

GeoPentech

Section 3 Cross Section



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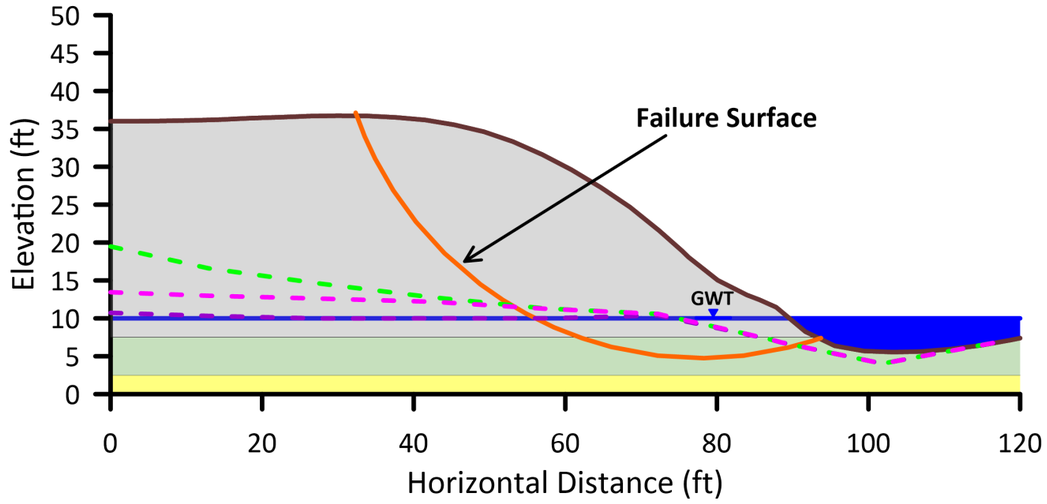
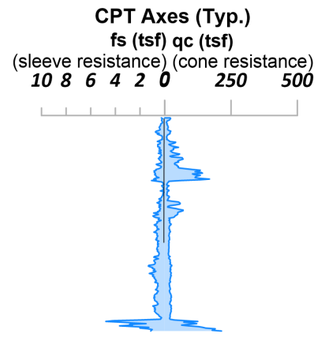


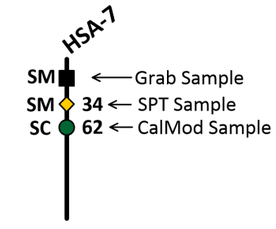
	Unit Weight (pcf)	Cohesion (psf)	Friction Angle (degrees)	Tau/Sigma Ratio
Fill	120	300	39	-
Beach Deposits	130	500	36	-
Liquefied Beach Deposits	130	-	-	0.11

Sections	Static	Pseudostatic				
	FS	K_y	K_{eq}		FS	
			5cm	15cm	5cm	15cm
3	1.27	0.07	0.436	0.427	0.37	0.38
4	1.35	0.09			0.32	0.34

Legend

- Alternative 2 Topo
- Alternative 3 Topo
- Alternative 4 Topo





Boring sample type, USCS, and Blowcount

LIQUEFIED SLOPE STABILITY CROSS SECTIONS

Project: TOPANGA LAGOON BRIDGE | Figure C-5

Project No.: 21013A | Date: APR 2022

GeoPentech

Appendix E

Topanga Lagoon Restoration Alternatives Analysis Report (Moffatt & Nichol June 2022) and Hydraulics, Sediment Transport and Sea Level Rise Analyses (Moffatt & Nichol 2022)

The Appendices herein contain supporting information. These Appendices contain highly detailed figures and other graphic information, which are difficult to translate for screen reading software; therefore, the Appendices have not been translated into an auditory format. If you have a disability and/or have difficulty accessing any material in this document, please contact us by mail, email, or telephone, and we will work with you to make all reasonable accommodations. Please indicate 1) the nature of the accessibility need; 2) your preferred format; 3) the material you are trying to access and its location within this document; and 4) how to reach you if questions arise while fulfilling your request. You can direct your requests to:

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Report
Produced for Resource Conservation District of the Santa Monica Mountains
November 18, 2022

moffatt & nichol

TOPANGA LAGOON RESTORATION

Alternatives Analysis Report

Document Verification

Client	Resource Conservation District of the Santa Monica Mountains (RCDSMM)
Project name	Topanga Lagoon Restoration
Document title	Alternatives Analysis Report
Document sub-title	–
Status	
Date	11/18/2022
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Revision	Description	Issued by	Date	Checked
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01	Final Report	Weixia Jin	6/15/2022	Chris Webb
02	Final Report, Revision 1	Weixia Jin	11/18/2022	

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Table of Contents

1 Project Description 1
1.1 Project Background 1
1.2 Project Objectives 2
1.2.1 Physical Objectives 2
1.2.2 Biological Objectives 2
1.2.3 Archaeological, Historic, and Cultural Objectives 3
1.2.4 Integration of Public Access, Emergency, and Visitor Services 3
1.2.5 Management and Maintenance Objectives 3
2 Alternatives 4
2.1 Alternative 1 – No Project/No Build – Managed Decline 5
2.2 Alternative 2 – Maximum Lagoon Habitat, Removal of Motel 5
2.3 Alternative 3 – Limited Lagoon Habitat Expansion, Retention of Motel 6
2.4 Alternative 4 – Maximum Managed Retreat, Partial Motel Retention 6
3 Alternatives Analyses 11
3.1 Alternative Concept 1 – No Project/No Build - Managed Decline 13
3.1.1 Hydraulics/Hydrology 13
3.1.2 Sediment Transport 14
3.1.3 Lagoon/Ocean Interface Dynamics 14
3.1.4 Surf Break 15
3.1.5 Water Quality 15
3.1.6 Vegetation 16
3.1.7 Biological Resources 18
3.1.8 Recreational Opportunities 18
3.1.9 Infrastructure Changes Required 18
3.1.10 Long-Term Management Issues 19
3.1.11 Sea Level Rise and Coastal Resilience 19
3.1.12 Relative Costs 19
3.2 Alternative 2 - Maximum Lagoon Habitat, Removal of Motel 20
3.2.1 Hydraulics/Hydrology 20
3.2.2 Sediment Transport 20
3.2.3 Lagoon/Ocean Interface Dynamics 21
3.2.4 Surf Break 21
3.2.5 Water Quality 21
3.2.6 Vegetation 22
3.2.7 Biological Resources 22
3.2.8 Recreational Opportunities 22
3.2.9 Infrastructure Changes Required 23
3.2.10 Long-Term Management Issues 23
3.2.11 Sea Level Rise and Coastal Resilience 23
3.2.12 Cost Estimates 24
3.3 Alternative 3 - Limited Lagoon Habitat Expansion, Retention of Motel 25
3.3.1 Hydraulics/Hydrology 25
3.3.2 Sediment Transport 25
3.3.3 Lagoon/Ocean Interface Dynamics 26
3.3.4 Surf Break 26
3.3.5 Water Quality 26
3.3.6 Vegetation 26
3.3.7 Biological Resources 27

3.3.8 Recreational Opportunities 27
3.3.9 Infrastructure Changes Required 28
3.3.10 Long-Term Management Issues 28
3.3.11 Sea Level Rise and Coastal Resilience 28
3.3.12 Cost Estimates 29
3.4 Alternative 4 – Maximum Managed Retreat, Partial Motel Retention 29
3.4.1 Hydraulics/Hydrology 29
3.4.2 Sediment Transport 30
3.4.3 Lagoon/Ocean Interface Dynamics 31
3.4.4 Surf Break 31
3.4.5 Water Quality 31
3.4.6 Vegetation 31
3.4.7 Biological Resources 32
3.4.8 Recreational Opportunities 32
3.4.9 Infrastructure Changes Required 32
3.4.10 Long-Term Management Issues 33
3.4.11 Sea Level Rise and Coastal Resilience 33
3.4.12 Cost Estimates 34
3.5 Summary of Alternatives Analyses 34
4 References 36
Appendix A: Habitat Maps

List of Figures

Figure 1-1: Project Vicinity Map 1
Figure 1-2: Project Location and Extent 2
Figure 1-3. Study Area Land Ownership 1
Figure 2.1: Alternative 1 – No Project/No Build – Managed Decline 7
Figure 2.2: Alternative 2 – Maximum Lagoon Habitat, Removal of Motel 8
Figure 2.3: Alternative 3 – Limited Lagoon Habitat Expansion, Retention of Motel 9
Figure 2.4: Alternative 4 – Maximum Managed Retreat, Partial Motel Retention 10

List of Tables

Table 3-1. Summary of Habitat Acreages for all Alternatives 17
Table 3-2: summary of Construction cost estimates (Million) 34
Table 3-3: General performance Ranking based on technical analyses 35

Disclaimer

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This study is qualified in its entirety by, and should be considered in light of, these limitations, conditions and considerations.

Glossary

cfs	Cubic feet per second
cms	Cubic meter per second
cy	Cubic yard
CO-OPS	Center for Operational Oceanographic Products and Services
CoSMoS	Coastal Storm Modeling System
DHI	Danish Hydraulic Institute
FIB	Fecal indicator bacteria
FM	Flexible Mesh
fps	Feet per second
ft	Feet
LACDPW	Los Angeles County Department of Public Works
LARIAC	Los Angeles Region Imagery Acquisition Consortium
MHHW	Mean Higher High Water
MLLW	Mean Lower Low Water
MM2	Mile Marker 2
M&N	Moffatt & Nichol
OPC	Ocean Protection Council
PCH	Pacific Coast Highway
RCDSMM	Resource Conservation District of the Santa Monica Mountains
SLR	Sea Level Rise
sq ft	Square foot
TAC	Technical Advisory Committee
TCB	Topanga Canyon Boulevard

1 Project Description

1.1 Project Background

Topanga Lagoon is a currently 0.56-acre lagoon in the Topanga Creek watershed in Los Angeles County, as shown in Figure 1-1 and Figure 1-2. Figure 1-2 shows the project boundary including a potential offshore disposal site. The historic lagoon at the mouth of Topanga Creek once covered almost 30 acres. In 1933, all but less than 1 acres were filled by Caltrans when Pacific Coast Highway (PCH) was re-aligned. This destroyed 93% of the lagoon wetland habitat area, completely changed existing biogeochemical processes, and severely impacted its function. This reduction in acreage resulted in devastating loss of habitat, nearly eliminating biodiversity of wetland flora, compromised water quality, and constrained flows that limit natural hydrologic and sedimentation processes from occurring. Existing downstream creek, lagoon, and PCH Bridge conditions severely limit flood conveyance to the sea, impede fish passage, prevent natural geomorphic processes from occurring, and generally limit the lagoon to function as a flood control conveyance feature rather than the genuinely sensitive and rare habitat area that it once was.

This project is intended to restore as much of the historic lagoon's wetland area, high quality, and effective function possessed as possible given current conditions. The process involves evaluating existing lagoon conditions and developing alternatives to that condition that replace lost habitat, processes, and functions; thus, restoring lost natural conditions. This report presents the existing condition and alternatives to that condition and provides an evaluation of each so that the superior alternative can be identified.

FIGURE 1-1: PROJECT VICINITY MAP

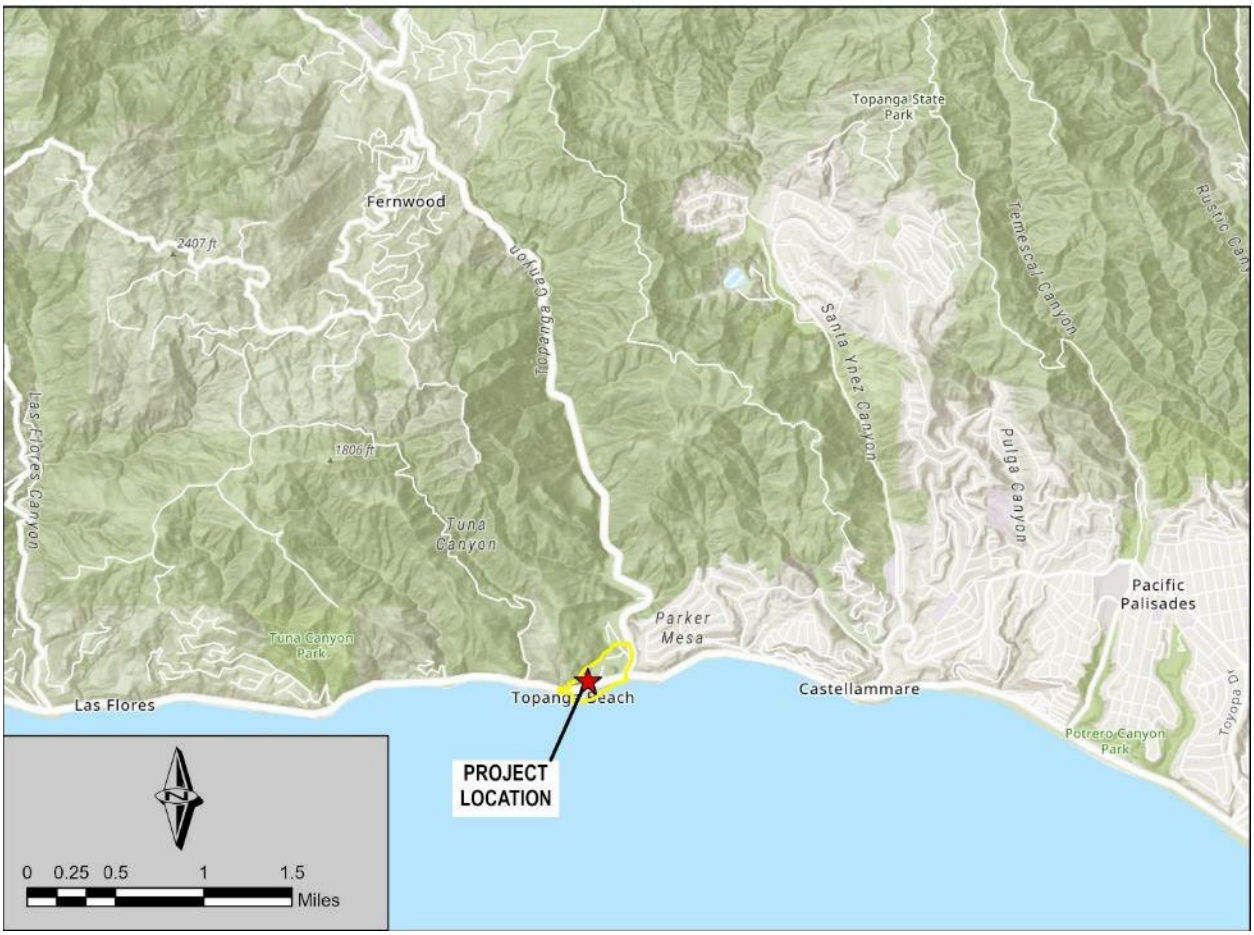
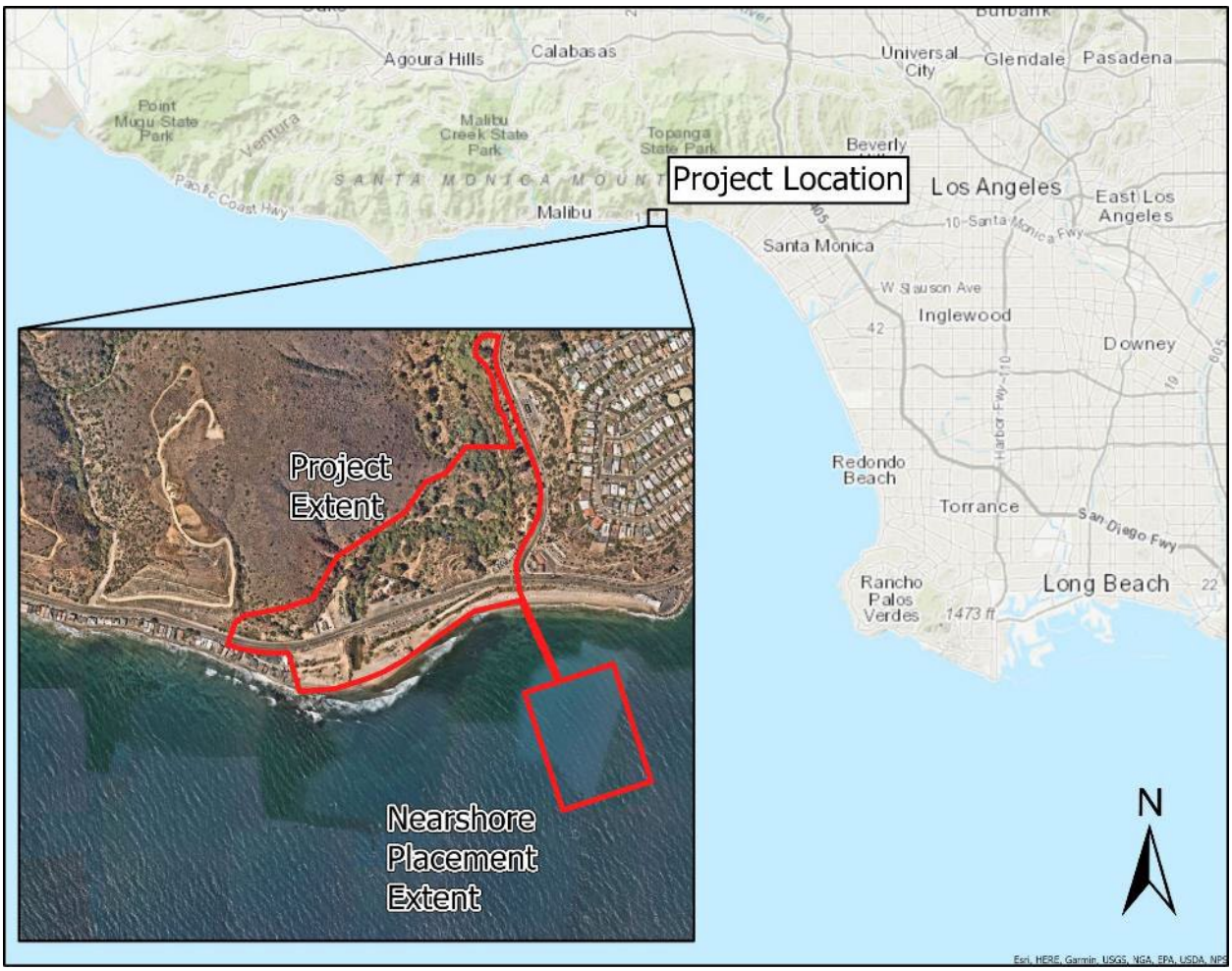


FIGURE 1-2: PROJECT LOCATION AND EXTENT



Despite its constrained condition, the lagoon supports the last remaining reproducing population of federally listed southern steelhead trout (*O. mykiss*) in the Santa Monica Bay and is considered a Core 1 high priority for restoration in the Southern California Steelhead Recovery Plan (NMFS 2012). There is also a population of federally endangered tidewater goby (*E. newberryi*) that re-colonized in 2000 that now represents one of the few reproducing and relatively stable populations in Southern California. Finally, Topanga Beach is a consistently important spawning site for California grunion (*L. tenuis*), which, although not a listed species, is both locally and regionally significant. Protecting and supporting the persistence of these important aquatic species has been identified as a priority goal in numerous planning documents.

In 2002, the final Topanga Creek Watershed and Lagoon Restoration Feasibility Report was completed for the Resource Conservation District of the Santa Monica Mountains (RCDSMM and M&N 2002). The study provided the basis for coordinated restoration and management of Topanga Lagoon and other features unique to the watershed. The 2002 report also analyzed ways to improve water quality at Topanga Beach, improve habitat for endangered fish and other aquatic species, reduce the flood hazard within the lower watershed, and improve recreational opportunities without changing the surf break. Four lagoon restoration alternatives (including the no build alternative) were evaluated based on meeting those objectives and their modeling performance.

In the years between 2002 and 2019, California State Parks acquired 1,625 acres of land in lower Topanga watershed, including a significant portion of the lagoon. The newly acquired land increased the extents of Topanga State Park from PCH to the hills of San Fernando Valley. While the General Plan and Environmental Impact Report (EIR) are being developed for the expanded park, an important alliance was

also developed between the RCDSMM and State Parks. The two agencies have worked closely together in coordinating lagoon restoration efforts. Figure 1-3 shows land ownership of the study area.

In 2019, RCDSMM began to build on previous studies and perform additional analyses including hydrologic/hydraulic modeling, sedimentation, fish passage/beach berm breaching, and sea level rise (SLR). These additional analyses are complete. A 30% plan set for the proposed alternative is developed.

Lagoon restoration alternatives that were developed in the 2002 Feasibility Report were further refined. All new alternatives propose expanding wetland, transitional, and upland habitat by grading radiating out from the edge of the existing wet limits. None of the proposed alternatives impact the archaeological resources and all are designed to protect existing lagoon habitat for tidewater gobies. Natural lagoon inlet breaching patterns based on rainfall is also preserved. The fill on the west side of the lagoon will be removed and provide an opportunity for implementing dune habitat and living shoreline protections. Except for the no build alternative, each lagoon restoration alternative includes replacing the existing bridge at PCH and Topanga Lagoon. Additionally, there are design elements that are included and evaluated in each alternative that could potentially be incorporated into other alternatives. These elements include: keeping the Caltrans bridge alignment at the current location or shifting to the north; full or partial retention of the Topanga Ranch Motel and some onsite business leases or concessions; inclusion of more than one wetted lagoon channel; expanding existing beach area through bridge realignment; alternative emergency access routes to the beach; and final placement of relocated beach facilities.

FIGURE 1-3. STUDY AREA LAND OWNERSHIP

1.2 Project Objectives

The overarching goal, or purpose, of the Topanga Lagoon Restoration Project is to protect and restore, then maintain via adaptive management, the Topanga Lagoon ecosystem and the adjacent uplands, integrating public access, recreation, and visitor serving needs while protecting important archaeological and cultural resources. Avoiding direct impacts to sensitive biological, archaeological/cultural and lagoon mouth/beach resources during the construction of the restoration has been an additional overarching guiding principle. These two goals can be further refined into five categories of objectives:

1. Physical restoration of lagoon and bar-built estuarine hydrologic functions
2. Biological restoration of habitat and species within the project area
3. Preservation of important archaeological, historic, and cultural resources
4. Integration of public access, emergency, and visitor services
5. Management and maintenance to ensure long-term viability of the restoration efforts

These objectives are further defined below.

1.2.1 Physical Objectives

A. Maintain the storm driven pattern of lagoon mouth breaching to enhance the health and ecological value of the bar-built lagoon.

B. Maintain the existing coastal littoral zone conditions along the beach face and important nearshore cobble shelf to avoid impacts to the surf break.

C. Improve water quality through restored wetland habitat, thereby reducing impacts due to high bacteria counts and the potential for mosquito-borne disease.

D. Reduce current flood problems by lengthening the bridge, removing constraining fill materials, and restoring a more natural lagoon, wetland, and transitional habitat.

E. Provide adequate area for wetland including emergent, transitional, and upland habitats that will support important life phases for endangered and sensitive species including, but not limited to: tidewater goby (*Eucyclogobius newberryi*), southern steelhead trout (*Oncorhynchus mykiss*), CA grunion (*Leuresthes tenuis*), and snowy plover (*Charadrius nivosus*).

F. Avoid, to the greatest extent possible, grading impacts to existing resources while providing the opportunity for expansion of these resources into the future by incorporating managed retreat of developed areas and resiliency for SLR.

1.2.2 Biological Objectives

A. Restore a natural gradient of habitats that considers climate change, anticipated SLR, potential upstream migration, potential for improving water quality, and heterogeneity of habitats based on analysis of historic conditions augmented by modeling of present and potential future conditions.

B. Maintain and enhance existing habitats for native species, such as the sandy lagoon preferred by the federally endangered Tidewater Goby (*E. newberryi*) and optimize fish passage opportunities during the rainy season, as well as expand potentially suitable smolt habitat within the lagoon for Southern Steelhead Trout (*O. mykiss*).

C. Protect and enhance suitable roosting and nesting habitat for the suite of birds currently using the site, as well as expand dune habitat to encourage suitable habitat for endangered snowy plovers.

D. Develop beach maintenance and grooming protocols that will protect breeding CA grunion (*Leuresthes tenuis*) and snowy plovers (*Charadrius nivosus)* if they colonize.

1.2.3 Archaeological, Historic, and Cultural Objectives

A. Avoid disturbance of archaeological or tribal cultural resources by using historical maps and information to define historical topography and lagoon/upland interface and then designing around those areas having the potential to contain cultural materials and/or human remains.

B. Site new bridge footings outside known areas of concern to the greatest extent feasible.

C. Identify options to rehabilitate and reconstruct historical resources for visitor-serving amenities.

D. Develop an interpretive plan to share site history with the public.

1.2.4 Integration of Public Access, Emergency, and Visitor Services

A. Maintain public access to the restored lagoon, beach, and transitional habitats that are consistent with resource protection needs and requirements.

B. Maintain sufficient parking and enhance public transportation access opportunities.

C. Maintain and improve pedestrian access from north of PCH to the beach.

D. Examine feasibility for overnight accommodations, including potential for adaptive reuse of the historic Topanga Ranch Motel.

E. Upgrade septic (or sewer) capacity for all visitor serving elements.

F. Maintain and improve emergency services (helipad, wildfire turnaround, lifeguard visibility, and access).

G. Promote educational opportunities consistent with resource protection needs and requirements.

H. Identify opportunities for other visitor serving concessions.

1.2.5 Management and Maintenance Objectives

A. Develop a cost-effective management and maintenance plan for supporting the proposed habitat enhancements, control of exotic species, and maintaining existing functional habitat for endangered fishes.

B. Design and implement a biological and hydrological monitoring program to assess the success of restoration efforts and to inform adaptive management decisions.

C. Identify potential sediment accretion areas and develop plans to avoid the need for future active sediment management.

2 Alternatives

Four alternatives were identified to restore the Topanga Lagoon. Three Build Alternatives (Alternatives 2 through 4) and one No Project/No Build- Managed Decline Alternative (Alternative 1). These alternatives allow consideration of the benefits and challenges of the different restoration approaches, and a final "preferred" alternative will be selected at the end of the environmental review process that best meets the Project's needs while minimizing adverse environmental impacts. The Proposed alternatives provide different road maps to restoring the lagoon area and adjacent seasonally wetted and riparian habitats, buffering its resources from future SLR, providing visitor-serving functions, and meeting the Project objectives.

Under all Project Build Alternatives, the seasonally wetted and riparian habitat areas would be expanded from the existing 0.56 acre to 7 to 10 acres, while the more upland/transition areas would increase from the existing 21.4 acres to between 23 and 24 acres, depending on which alternative is selected. This would require removing much of the historically imported fill on-site to create a more natural topography and expanded open space area. The existing wetted lagoon area and riparian habitats would be protected with grading starting at the outer edge of existing riparian trees, preserving the current lagoon banks and the majority of the existing riparian willows and native hardwoods. Most native trees would be retained throughout the Project area, and the natural breaching pattern of the lagoon would be protected by grading outside the footprint of the existing wetted lagoon and working landward of the beach berm at its mouth.

Under all Project Build Alternatives, the area of Topanga Beach for recreational users would increase with up to 50 ft of additional depth in Alternatives 2 and 3 on the east cove beach, and approximately 90 ft in Alternative 4. This adds between 1.2 to 1.8 acres of additional beach. The construction footprint includes the Topanga Beach lagoon/ocean interface on the landward side of the bar-built sand berm and extends approximately 350 feet upstream into Topanga Creek with removal of fill on both the west and east sides. Under all Project Build Alternatives, the fill material would either be trucked off site for disposal or beneficially reused in a near-shore placement location, subject to approval by USACE.

Under all Project Build Alternatives, the length of the existing 79-foot long Caltrans bridge would be expanded to accommodate a widened lagoon riparian area, which would lower flow velocities to improve adult steelhead migration opportunities and increase refugia areas for tidewater gobies and juvenile steelhead, as well as the quantity and quality of lagoon habitats. To provide for a wider lagoon and improve fish migration and refugia, the existing Caltrans bridge would be replaced with a longer bridge. The main span of the new bridge would increase to 200 feet, with secondary side spans of 130 feet on either side, increasing the total bridge span length to 460 feet. This expanded length provides space for the creek and lagoon to evolve in response to SLR and provides pedestrian access under the roadway on both sides of the lagoon, as only access on the east side is currently available. The existing alignment of the bridge and PCH roadway is maintained for two of the Project Build Alternatives but is relocated slightly to the north in the Alternative 4, as discussed below.

The new bridge would continue to accommodate two lanes in each direction with no expansion of roadway capacity. Traffic flows will also be protected during construction by way of a temporary roadway and bridge alignment. All utilities would be continued during construction, and eventually relocated underground or attached to the new bridge. All phases of construction and staging for the new bridge would be similar under each alternative.

Under all Project Build Alternatives, Native American cultural sites would be protected in place, retaining an appropriate cover over the pre-contact period surface of no less than 2 to 4 feet, and necessarily limiting the lowering of the riparian bottomland surface to actual historic elevations.

Coastal access would be maintained during construction and improved under all Project Build Alternatives. This includes the creation of a trail system through the Project area and provision of pedestrian access under PCH on the east and west sides of the lagoon. Improved parking would be provided along the PCH and TCB corridors. A dirt emergency route from PCH to the beach level would be constructed on the west

side of the lagoon to allow lifeguard access to both limit vehicle usage along the lagoon berm and provide access to the western beach even during times when the lagoon mouth is open. Parking at the beach level would be similar to existing conditions, and would only be accessible to staff, emergency vehicles, and disabled visitor parking spaces. The areas around the existing bus stops would be improved to be more welcoming to public transportation users.

Under all Project Build Alternatives, key DBH facilities on Topanga Beach would be relocated further from the ocean to protect structures from SLR. The existing lifeguard headquarters, beach restroom, and helipad would be demolished and rebuilt closer to the realigned access road, and at a higher elevation. The new buildings would be of similar size and materials to the existing building. A small two-car garage for staff would be added in the improvements. The new helipad site would re-located to the east side of the lagoon for improved access by the lifeguards and emergency responders. The size, setbacks and built elements of the new helipad would conform to all Federal Aviation Administration and Los Angeles County requirements. The permitted onsite wastewater treatment system (OWTS) that services the beach restroom would remain to support the new facility unless a sewer hookup becomes available. The existing parking lot would be modified depending on the alternative. ADA and staff parking and access at the beach level is retained in all alternatives.

A plan for determining the future configuration of the historic Topanga Ranch Motel is included in each of the Project Build Alternatives, as are potential locations for park facilities, concessions, and parking on CDPR property. Currently, the Proposed Project area accommodates authorized and unauthorized parking opportunities. All Project Build Alternatives would modify the existing parking opportunities. In general, additional coastal access parking spaces would be created, but their location and makeup would shift. Less free (and often non-conforming) parking along PCH would be available as parking is not permitted on the longer bridge deck, but would be partially shifted to the TCB corridor. More parking would be available in CDPR and DBH lots, which include new areas on the west side of Topanga Creek and along TCB. Concession parking would be reduced as fewer concessions remain in the project area.

2.1 Alternative 1 – No Project/No Build – Managed Decline

Under this alternative, existing conditions throughout the project area would remain “as-is” in terms of existing functions (or lack thereof) and conditions. Therefore, there would be no change to the lagoon footprint or habitat quality, and no new bridge would be constructed. Damage to the lifeguard headquarters due to coastal erosion would continue to occur and no relocation is included in this “No Project/No Build” alternative. The currently unusable majority of the Topanga Ranch Motel structures would continue to deteriorate without restoration, and existing non-conforming business leases and septic systems would remain in current operation but may be subject to future restriction or cessation of use in the future by enforcement of recent statewide wastewater policy changes. No improvements to habitat would occur. SLR would continue to reduce beach area available and threaten the integrity of PCH. Figure 2.1 shows the existing lagoon topography and the existing 78.6-foot-long PCH Bridge.

2.2 Alternative 2 – Maximum Lagoon Habitat, Removal of Motel

This alternative provides the maximum increase in lagoon, wetland, and riparian bank habitats. It includes restoration of more natural side channels connected to the western side of the existing lagoon based on historic topography and would allow the lagoon system to evolve to accommodate changing sea level and storm surge conditions. The Topanga Ranch Motel and onsite business leases would be removed from the project area and be replaced with riparian and transitional habitats. Partial or full relocation or replacement of public parking, business leases, and overnight accommodations from the current location on the north side of PCH to the west side of Topanga Canyon Boulevard (TCB) in the expanded project area will be developed in the next design phase. There is sufficient space along TCB in that location to replace all the parking that currently exists.

To provide for a wider lagoon and improve fish migration and refugia, the existing Caltrans bridge would be replaced with a longer one along the same road alignment. The span of the new bridge would total 460 feet

(200-foot primary span, with secondary/side spans of 130 feet each), plus an additional span to accommodate an emergency services underpass on the east side if that is included in the next phase of design development. This alternative includes ADA parking spaces on the beach level, with additional recreational parking at the PCH upper level on the south side of PCH only.

The lifeguard headquarters, beach restroom, and helipad would be demolished and rebuilt closer to the realigned access road and to each other on the same beach level. Figure 2.2 presents the proposed grading and bridge of Alternative 2.

2.3 Alternative 3 – Limited Lagoon Habitat Expansion, Retention of Motel

This alternative also provides expanded lagoon, wetland, riparian, and transitional habitat in the west part of the existing creek channel but allows for only the existing main channel within the lagoon area itself. The remaining Topanga Ranch Motel structures are restored in their historic configuration, including relocation of some of the structures from the west side, which is currently experiencing flood and bank erosion. One existing concession (restaurant lessee) would be remodeled and continue operation in place. No other business leases remain. If the emergency underpass is removed as the design evolves, this would provide additional parking on the north side of PCH. Partial or full relocation or replacement of public parking, business leases, and overnight accommodations from the current location on the north side of PCH to the west side of TCB in the expanded project area will be developed in the next design phase. There is sufficient space along TCB in that location to replace all the parking that currently exists.

All the changes to the new 460-foot Caltrans bridge (200-foot center span, with secondary/side spans of 130 feet each) are the same as for Alternative 2. However, the access road alignment is kept slightly to the east. This might change if no underpass is included. Figure 2.3 illustrates the proposed bridge and restored lagoon grading of Alternative 3.

2.4 Alternative 4 – Maximum Managed Retreat, Partial Motel Retention

The alignment of PCH moves north, expanding the maximum amount of beach area and managed retreat from SLR. The portion of the historic Topanga Ranch Motel east of the current motor court access lane is retained. Adjacent parking is adjusted, and a remodeled restaurant lessee would continue to operate, while providing expanded lagoon, wetland, riparian, and transitional habitats, primarily on the west side of the existing channel due to removal of all fill in that western area. No other business leases remain. Partial or full relocation or replacement of public parking, business leases, and overnight accommodation from the current location on the north side of PCH to the west side of TCB in the expanded project area will be developed in the next design phase. There is sufficient space along TCB in that location to replace all parking that currently exists.

Due to the curve of its alignment, the Caltrans bridge has the greatest length under this alternative, though the actual span lengths are similar to the other alternatives with a total of 460 feet consisting of a 200-foot-long center span and a 130-foot side span on each side. This PCH alignment eliminates shoulder parking on the bridge spans but has the greatest number of beach side parking spaces.

The helipad and lifeguard headquarters are arranged with staff, emergency, and ADA parking between these two functions and accommodate sight lines required for the expanded recreational beach area. This alternative maximizes managed retreat, recreational beach area (and/or living shoreline features such as dunes) and provides the most SLR resilience. The proposed bridge of Alternative 4 and the restored lagoon grading are presented in Figure 2.4.

FIGURE 2.1: ALTERNATIVE 1 – NO PROJECT/NO BUILD – MANAGED DECLINE

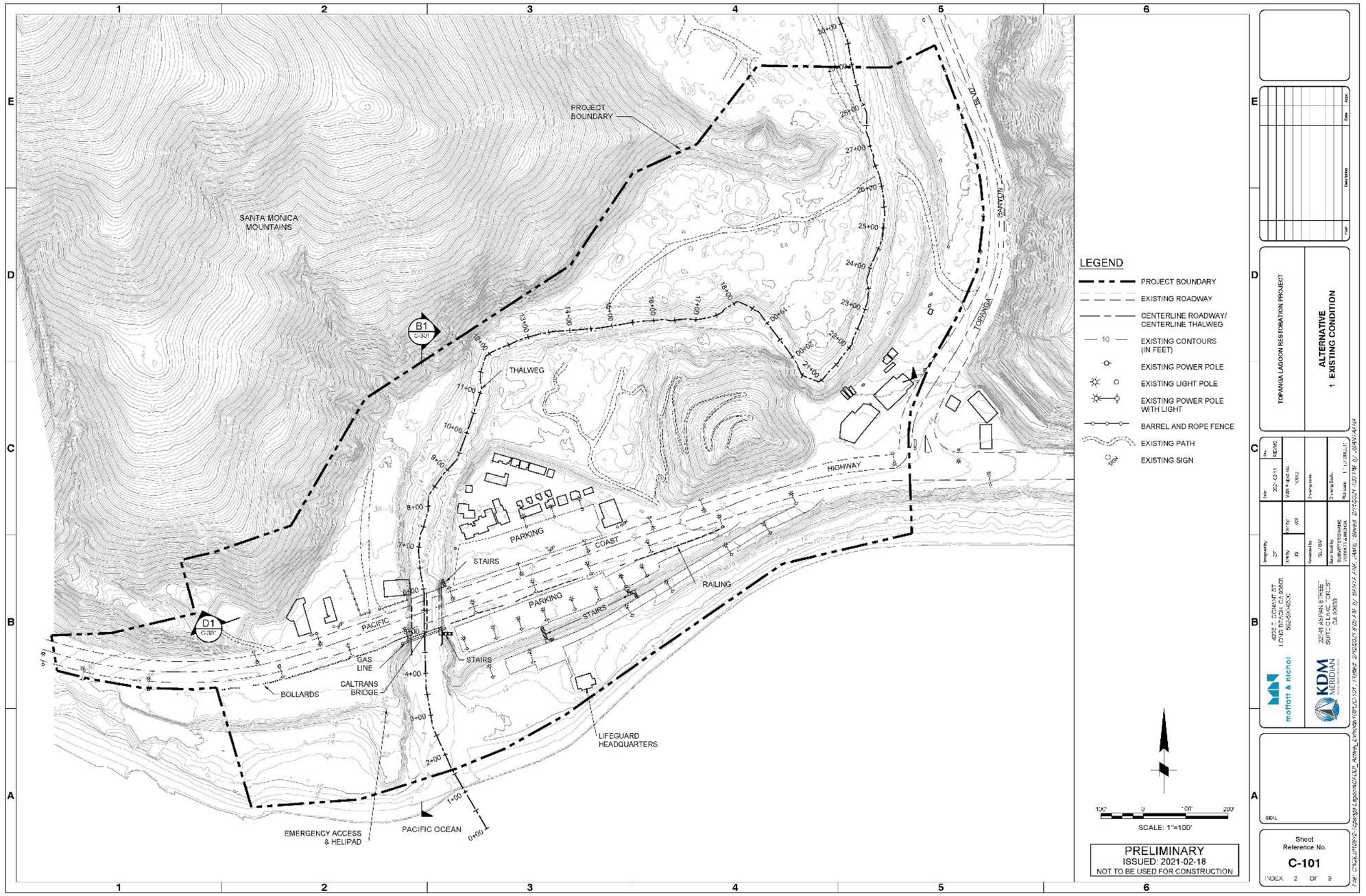


FIGURE 2.2: ALTERNATIVE 2 – MAXIMUM LAGOON HABITAT, REMOVAL OF MOTEL

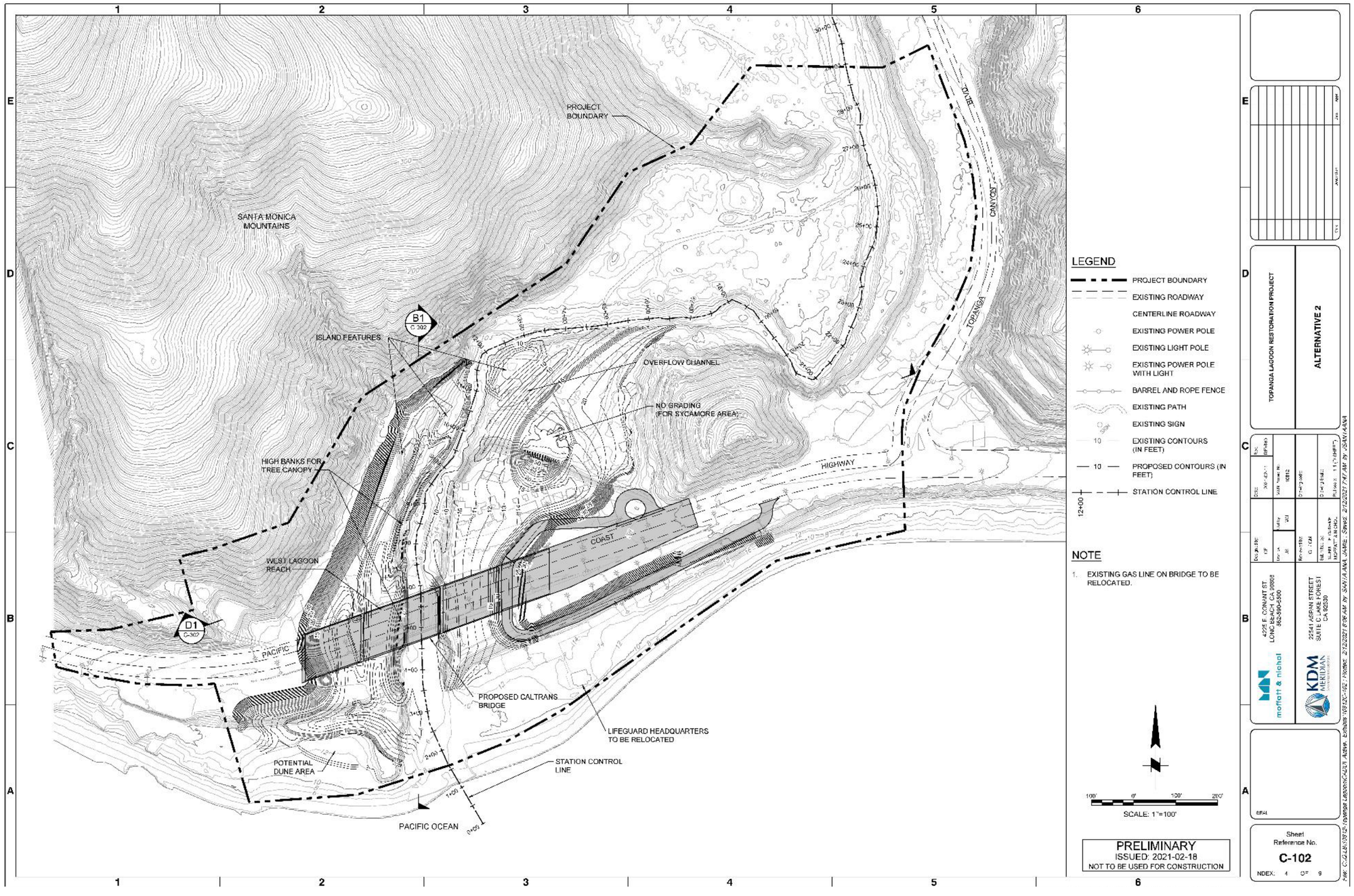


FIGURE 2.3: ALTERNATIVE 3 – LIMITED LAGOON HABITAT EXPANSION, RETENTION OF MOTEL

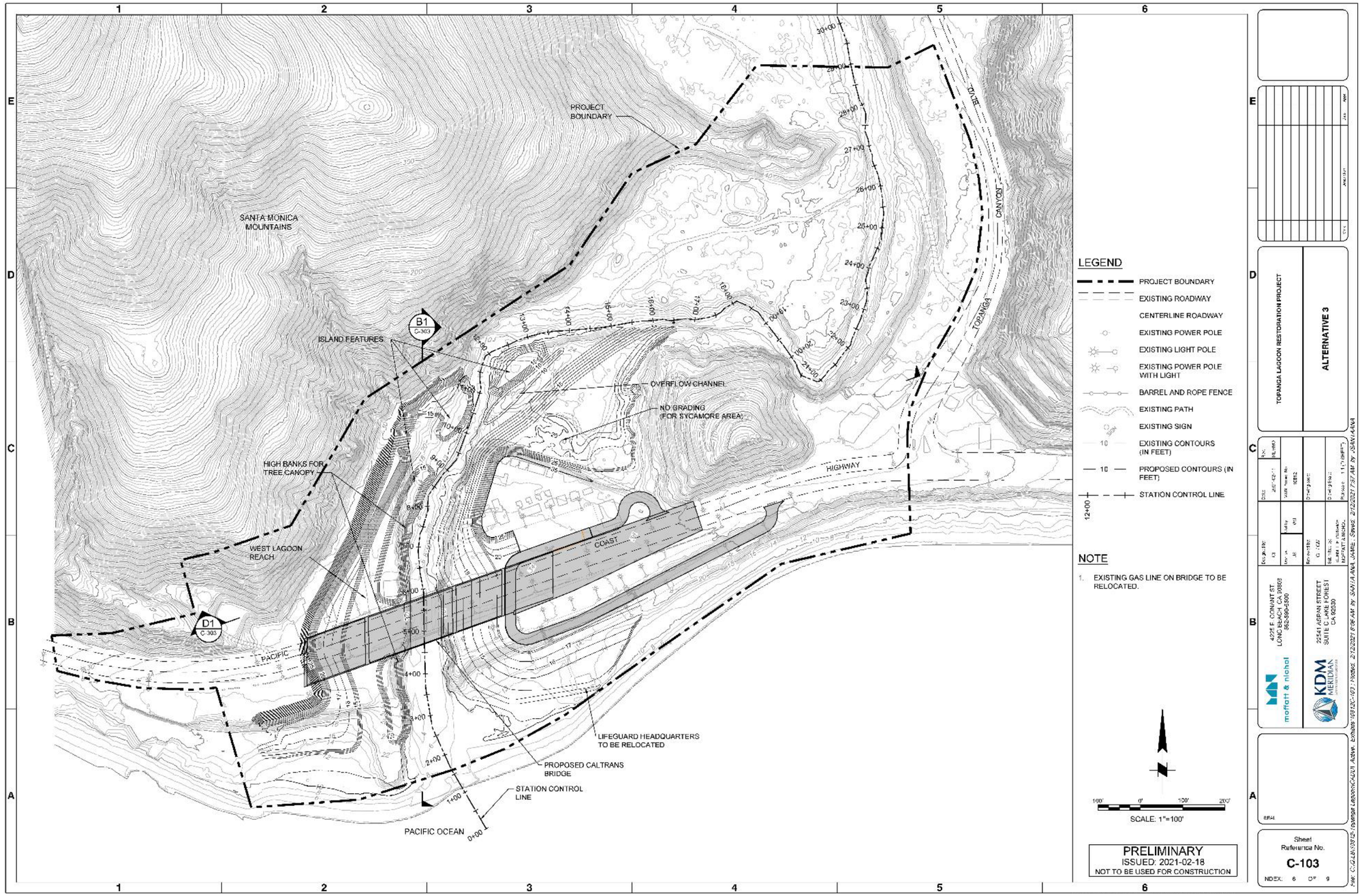
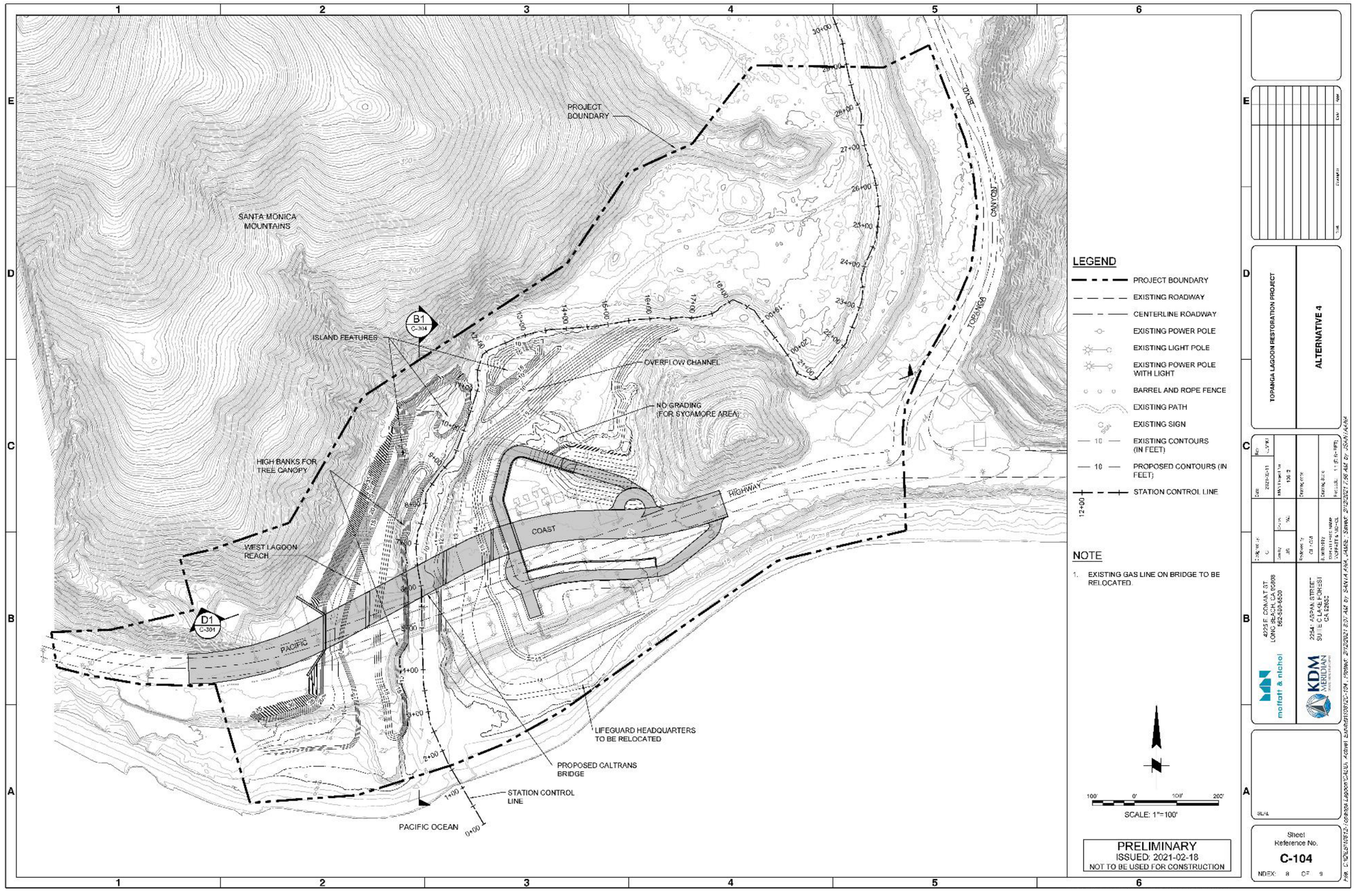


FIGURE 2.4: ALTERNATIVE 4 – MAXIMUM MANAGED RETREAT, PARTIAL MOTEL RETENTION



3 Alternatives Analyses

Prior to human impacts, the lagoon provided almost 30 acres of seasonally and tidally inundated wetlands, and the canyon mouth was unconstrained by roads or fill. The lagoon was substantial enough that the LA Athletic Club purchased the property in 1924 with the intention of creating a small yacht harbor. Changes to the lagoon as a result of installation of the PCH Bridge in 1924 and realignment of the highway in 1933 ultimately reduced the lagoon to its current size of less than 1 acre.

The cross-section under the existing bridge is approximately one-half the size of the cross-section of the bridge prior to the 1933 highway realignment. The current bridge has a cross-sectional area of 1,600 square feet compared to 3,600 square feet for the prior bridge.

The constraints of high fill banks and a narrow creek cross-section under PCH Bridge impede flood conveyance sufficiently to cause backwater of the flood, sedimentation within the creek channel upstream of the bridge, and high flood flow velocities and water elevations as the water is forced through the narrow cross-section. In addition, the channel cross-section can become blocked by large debris during floods.

The proposed alternatives analyzed in this report address the downstream bridge and fill constraints at the lagoon. The 1876 U.S. Coast Survey lagoon map, which illustrates the extent of the lagoon prior to human impacts, was used as the optimal reference for restoring the lagoon to the maximum extent possible. The larger the area available for a system to establish, the better the conditions and chances for it to succeed. Large, undeveloped watershed and lagoon systems evolve to be as efficient as possible under the physical laws of thermodynamics. Small, constrained systems are not able to optimize their processes to become maximally efficient and functional.

Increasing the size of the lagoon and associated habitat areas will enable the system to revert to a more natural condition and closer to the historical condition. More space provides a better opportunity for the entire system to establish functional processes of:

- Hydrology/Hydraulics – with channel meandering and establishment of a more natural gradient, profile, cross-sectional area, and shape;
- Sedimentation – formation of sand/cobble bars from upstream and ocean sources;
- Soil formation – soil structure, horizon development, and nutrient retention for plant roots;
- Vegetation colonization – native plant establishment and sustainability;
- Soil and water chemistry – improved sediment and water quality for native plants and animals;
- Food pyramid – re-establishment of natural trophic levels for higher level species; and
- Faunal colonization – by benthic, fish, crustaceans, birds, and mammals as part of the food pyramid.

These conditions will all lead to restored habitat areas, flood plain processes, and mouth breaching processes. The larger the lagoon, the more space is available for these processes to occur, the more constituents that are available for the building blocks of ecological foundations, and the better these processes can work. The more space that is provided maximizes the freedom they have to be dynamic and evolve. The historic lagoon was as functional as possible (highly functional), considering site constraints of its 30-acre footprint. The existing lagoon is so highly constrained by its 0.56-acre footprint that it is low-functioning and over-run by non-natives that can survive in the impaired conditions. Restoring the lagoon back toward the historic footprint will massively improve the conditions needed for re-establishment of functional natural processes and habitat.

Each of the alternatives was analyzed for their performance according to various criteria using numerical and analytical modelling tools. Criteria include hydraulics/hydrology, sediment transport, lagoon/ocean interface dynamics, surf break, water quality, vegetation, biological resources, recreational opportunities, infrastructure changes required, long-term management issues, SLR, and coastal resilience and relative costs.

Comprehensive technical analyses on hydrology and hydraulics, sediment transport, SLR impacts, beach morphology, and fish passage assessment were conducted for both existing and proposed alternatives. The one-dimensional (1-D) Mike11 model with integrated hydrology, hydraulic, and sediment transport modules is applied for simulating the creek and lagoon hydraulics and sedimentation. The simulation periods include an average flow period (October 1996 to March 2001) and a high flow period (November 1979 to March 1984). The results were used for assessing lagoon sedimentation, sediment transport to the ocean, flood water level, and velocity and resilience to SLR. A two-dimensional (2-D) Mike21-FM hydrodynamic model was created for the lagoon and nearshore ocean to generate flow velocity and depth data to be used by ESA for fish passage analyses. The simulated flows range from dry weather low flows to a 5-year storm flow. The ocean boundary conditions include both the mean lower low water (MLLW) and mean higher high water (MHHW) under no SLR, 1.6-feet SLR, and 6.8-feet SLR conditions. The 2-D modeling was done for all alternatives. Modeling methods, data, and results are described in the companion Technical Report for Hydraulics, Sediment Transport and Sea Level Analyses (M&N 2022).

A fish passage and refuge habitat suitability model using the results of (2-D) hydraulic modeling performed by Moffatt & Nichol (M&N 2022), as well as a lagoon mouth dynamic and water level model were developed by ESA. The modeling results were used to assess how the proposed Topanga Lagoon restoration alternatives would potentially affect adult steelhead passage as well as refugia for tidewater goby and juvenile steelhead. The ESA study also includes an assessment of habitat elevations for use in mapping habitat zones for the restoration alternatives. These habitat elevations developed by ESA were used by Moffatt & Nichol to map projected habitats for the restoration alternatives in the Moffatt & Nichol (2022) Technical Report. Modeling methods, data, and assessment results are documented in the companion Ecohydrology Report: Fish Passage, Fish Habitat Suitability, and Habitat Zone Elevations (ESA 2022).

The Resource Conservation District of the Santa Monica Mountains (RCDSMM) in collaboration with the Bay Foundation prepared a Water Quality Pre-Construction Baseline Report (RCDSMM and the Bay Foundation 2022). The report summarized 2004 and 2014 historic water quality studies. Both the 2004 and 2014 studies found that bacterial exceedances were associated with storm events only by the time the water was tested at the Bridge on TCB, which is located approximately halfway between the town and the ocean. Ocean exceedances were, therefore, coming from sources at the beach or lagoon and increased when there was a breach condition during storm events. The report also documented the recorded temperature, pH, Electrical Conductivity (EC), turbidity, dissolved oxygen, Oxygen Reduction Potential (ORP), and salinity from June to November 2021 by the Bay Foundation, as well as grab sample and nutrient monitoring, algae monitoring, and water temperature monitoring results in the lagoon.

To assess existing and projected vegetation, Moffatt & Nichol created maps of projected habitat zones for each of the four restoration alternatives under three different SLR conditions: no SLR, 1.6 feet of SLR, and 6.8 feet of SLR. Zones were mapped using estimated habitat elevations provided by ESA for the existing conditions and restoration alternatives for existing sea level and the two SLR scenarios. The habitat elevations represent an average of habitat elevations for low and moderate salinity lagoon wetland habitats and were based on ESA's modeling of the Topanga Lagoon inundation frequency distributions and habitat zone inundation frequency criteria for low salinity and moderate salinity habitats.

To create the habitat zones, contours representing the top and bottom elevations of each habitat type were extracted from the topography data for each individual alternative and used to create a habitat zone polygon for each habitat type within the project boundary in ESRI ArcGIS software. The roadways/developed/ landscaped layer was created using existing developed or landscaped and roadway areas for the existing condition, and existing roadway and proposed bridge footprints for the proposed alternatives.

Sand area was determined based on the current footprint of sand and the proposed design of the lagoon and bridge for each alternative. Data from the Coastal Storm Modeling System (CoSMoS) representing the "hold the line" shoreline position at Topanga Beach for both 1.6-feet and 6.6-feet SLR scenarios was used to define the extent of beach for each of the two SLR alternatives. Note CoSMoS 6.6-feet SLR scenario was used for the 6.8-feet SLR condition as the 6.8-feet SLR data are not available from the CoSMoS and the two elevations are close enough for planning analyses.

A Biological Assessment of the Project area was prepared by the RCDSMM in collaboration with the California Department of Parks and Recreation (CDPR) (RCDSMM and CDPR 2022). The assessment describes the biological resources known and anticipated to be present within the project footprint and adjacent areas of the Topanga Lagoon Restoration Project. Resource types documented include jurisdictional waters, natural plant communities exhibiting various degrees of disturbance, multiple disturbed and non-native plant communities and developed areas, protected and non-native tree species, plant and animal observations, and special status species including tidewater goby, southern steelhead trout and arroyo chub.

Opinion of restoration construction costs for proposed alternatives are also presented. Wetlands contribute to the local economy by producing resources, providing benefits such as wildlife habitat, improved water quality and pollution control, flood protection and fisheries support, and enabling recreational activities (U.S. EPA 2006). In 2011, 90.1 million U.S. residents 16 years and older participated in wildlife-related recreational activities, according to the U.S. Fish and Wildlife Service. Nationwide, these activities generate billions of dollars in revenue, creating an economic engine fueled partly by healthy wetlands (USDA NRCS 2021).

According to the 2012 Greater Los Angeles County Open Space for Habitat and Recreation Plan, wetland losses in Los Angeles County exceed 95%. Topanga Lagoon represents a valuable opportunity to restore a coastal wetland in heavily urbanized Southern California. Results of the 2002 Feasibility Study indicate that the present and future conditions within the Topanga Creek Watershed are suitable to support restoration and will benefit from the action. With the inclusion of the former LA Athletic Club property into Topanga State Park, the entire extent of the former lagoon is now in public ownership. This offers a unique chance to develop a more functional lagoon system providing improved water quality at Topanga Beach, improved habitat for endangered fishes and birds, and improved recreational opportunities while retaining the quality of the surf break at the point.

3.1 Alternative Concept 1 – No Project/No Build - Managed Decline

3.1.1 Hydraulics/Hydrology

Hydraulic and hydrology conditions are crucial to fish passage and habitat conditions. Hydraulic analyses also address flood protection and climate resilience. The detailed hydraulic modeling and analyses are included in the Technical Report for Hydraulics, Sediment Transport and SLR Analyses (M&N 2022).

Fish Passage: The fish migration from ocean to Topanga Lagoon and its upstream creek is only feasible when the lagoon is breached and connected to the ocean (i.e., steelhead trout). The fish passage is also controlled by whether the water depth is deep enough, and the flow velocity is sufficiently slow when the lagoon is breached. Within the lagoon area, the PCH Bridge is a controlling location with relatively high velocities. Based on the last ten years of fish passage observations, fish passages occurred during storms with a return period of less than 5 years. Hence, flows up to the 5-year storm were modeled to support fish passage analyses (M&N 2022).

Over the last 10-years, there were 13 passable storm events. The accumulative passable area at PCH Bridge from the hydraulic model is 1,249 square feet (sq ft) under MLLW tidal condition and 1,290 sq ft under MHHW condition. The peak velocities at the PCH Bridge under Alternative 1 vary from 13.3 feet per second (fps) to 13.9 fps during a 5-year storm, depending on the size of the lagoon mouth breach channel. The passable flow velocity is less than 6 fps for adult steelhead trout passage, 1.5 fps for juvenile steelhead refugia, and 1 fps for tidewater goby refugia.

Flood Protection: The limited capacity of the existing lagoon and the short existing PCH Bridge cause storm flow backup upstream of the PCH Bridge. High velocities up to 18 fps at the bridge during a 100-year flood event will cause damage to the bridge and adjacent structures. Meanwhile, debris from upstream could be flushed and dammed at the PCH Bridge. This would result in an even smaller cross-section and further increase flow velocities at the PCH Bridge. The high flow velocity could wash out the fish nurturing habitat in the lagoon.

Resilience: With projected 1.6-feet and 6.8-feet SLRs, the peak velocity during a 100-year storm decreases to 17.7 fps and 16.8 fps, respectively. The highest water level modeled during a 100-year storm at PCH is 15.3 ft NAVD88. With SLR, the peak water level remains the same under 1.6-feet SLR or increases by half a foot under 6.8-feet SLR. In summary, the high flow velocity and high flood water level don't change much with SLR for Alternative 1. SLR helps increase the passable area and slightly lower velocities in the lagoon basin and at the PCH Bridge.

Habitat: Habitat establishment depends on the hydrology conditions. The lagoon is closed most of the time. Under the closed condition, dry weather and groundwater inflows balance with evaporation and infiltration processes. The monitoring data indicate that the lagoon breaches when the water level reaches around 9.5 feet NAVD88. Under lagoon breached conditions, the low tide is truncated around 5 feet NAVD88 by the cobble berm at the mouth, and the high tide reaches the ocean high tide conditions.

3.1.2 Sediment Transport

This section compares sediment transport in the creek and to the ocean and sedimentation in the lagoon. The detailed sediment transport modeling and modeling results are included in the Technical Report for Hydraulics, Sediment Transport and SLR Analyses (M&N 2022).

Sedimentation in Upper and Lower Reach of Topanga Creek: The upper reach is under erosion mode during storms due to its relatively steep slope. The lower reach is a mixed region with erosion upstream to deposition downstream, as its slope changes from steep to mild. During storm events, sediments get eroded from the watershed and delivered into Topanga Creek. Part of the sediments settle in the lower reach, and the rest are transported to the lagoon and the ocean. The amount of the sediments transported through the system is almost tripled during the high flow period than the average flow period. According to the sediment transport model, SLR has no or minimal impact on the erosion or accretion in the upper and lower reach of Topanga Creek.

Sedimentation in Lagoon: The sediment transport model indicates the lagoon area is under deposition mode. The sedimentation volume in the lagoon is largely impacted by the storm intensity. The sediment transport model predicted that approximately 28.1% of the sediment settles in the lagoon during the average storm period and only 3.3% during the high flow period. During the average flow period, more sediments are deposited in the lagoon compared to the percentage that goes to the ocean. During the high flow period, it is reversed. Note that the total amount of sediments from the upstream creek is higher during the high flow period than in the average storm period. With SLR, the flow cross-section will increase, and the velocity will decrease under a similar storm. Hence, the sediment deposit volume in the lagoon will increase with SLR.

Sediment Transport to Ocean: More sediments from the watershed get transported to the ocean during the large storm period than the average storm period. The sediment transport model predicted that only 6.4% of the sediment goes to the ocean during the average storm period, and 26.4% of the total sediments get flushed to the ocean during the high flow period. More sediment passes through the lagoon to the ocean means more sediment to nourish the beach and littoral environment. SLR could gradually reduce sediment to the ocean. However, the model results indicate that the relative change is small.

Potential Erosion around PCH Bridge: As stated in the hydraulic and hydrology section, the modeled 100-year peak velocity at PCH Bridge is as high as 18 fps. This high velocity is very erosive and could cause erosion at the PCH Bridge and its adjacent structures.

Potential Impacts to Fish Habitat and Foraging/Nursing Area: The high velocity within the lagoon during storms would cause erosion, and also pose risks to fish habitat and its nurturing area.

3.1.3 Lagoon/Ocean Interface Dynamics

Breaching Frequency: Topanga inlet is an unstable inlet in that the lagoon mouth opens intermittently when streamflow is large enough to breach the beach berm. During dry season, the lagoon mouth is closed, and the site is essentially a pond. The monitoring data indicated that the lagoon breaches around 9.5 feet

NAVD88. In the wet season, the lagoon is breached to convey the streamflow to the ocean. As part of this project, ESA has studied the lagoon breach morphology of the existing condition (Alternative 1) based on historical aerial photos and surveys from 2005 to 2020. A baseline was established in terms of inlet breaching frequency, duration, and breach channel geometry. Other alternatives are evaluated in the following sections using Alternative 1 as a baseline. The detailed analyses are documented in Ecohydrology Report: Fish Passage, Fish Habitat Suitability, and Habitat Zone Elevations (ESA 2022).

Beach Berm: The existing cobble berm crest is around 4 feet NAVD88. The breach channel invert is generally around this elevation during the 2020 to 2021 monitoring period. However, it may be eroded down during extreme storm events. The beach berm is elevated due to wave actions after the breach channel is closed. The 2021 monitoring data indicated that the beach berm breached around elevation 9.5 feet NAVD88.

SLR Impacts: The beach berm is expected to be elevated with SLR. However, the breaching channel thalweg could remain at the current cobble berm crest elevation due to its resistance to erosion. If the cobble berm crest elevation remains at its current elevation, the tidal range will increase when the inlet is open due to higher high tide. Increased sea level will also inundate more higher land in the lagoon, leading to an increase in tidal prism when the lagoon is breached. With a larger lagoon body, it will require a larger storm to breach the inlet. ESA (2022) has predicted more inlet closures due to SLR for Alternative 1. However, it may require more wave action to close the lagoon due to the increased tidal prism. The latter is limited due to the small lagoon size for Alternative 1.

3.1.4 Surf Break

Surfing is mainly affected by either: 1) changes to bathymetry (ocean bottom contours), or 2) changes to the exposure of the shore to waves by either blocking waves from reaching the shoreline or varying their properties. Two other factors that also affect surfing are access to the surf sites and water quality, but both of these factors are maintained as similar for each alternative (public access is provided and water quality is preserved or enhanced) and there are no effects to surfing from them for this project.

Surfing will not change with the existing condition because no changes are proposed to the lagoon. Bathymetry of the surf site will remain as is, and no changes to wave exposure will occur.

3.1.5 Water Quality

The open water areas of the existing lagoon are significantly degraded due to impaired/limited habitat and water quality concerns; unmanaged human use syringes, human feces, and trash are commonly encountered. Two comprehensive sampling and monitoring studies have been done in the Topanga Creek watershed, the first in 2003-2004 (Dagit et al. 2004) and the second in 2013-2014 (Dagit et al. 2014). High levels of bacteria that exceed state criteria have been measured in the lagoon for total and fecal coliform. The lagoon bacterial exceedances have been chronic, and the 2014 study looked at the source of these bacteria and found that dogs and birds contribute the most, but that human feces can also be a factor (Dagit et al. 2014). In addition to examining fecal indicator bacteria (FIB) conditions, other variables such as nutrients (nitrates, nitrites, orthophosphates, ammonia), turbidity, and algal cover were also documented (RCDSMM and the Bay Foundation 2022).

Both the 2004 and 2014 studies found that bacterial exceedances were associated with storm events only by the time the water was tested at the bridge on TCB, which is located approximately halfway between the town and the ocean. Ocean exceedances were, therefore, coming from sources at the beach or lagoon and increased when there was a breach condition during storm events.

In addition to the 2004 and 2014 studies, LA City Environmental Monitoring Division also collects ocean water grab samples to test for FIB, Enterococcus, and E. coli in the surf zone in front of the lagoon mouth on Topanga Beach weekly as part of a permit requirement. These results are reported by Heal the Bay as a Beach Report Card grade. A summary of grades for the Topanga Lagoon is included in the Draft Water Quality Pre-Construction Baseline Report (RCDSMM and The Bay Foundation 2022).

Another concern in the lagoon is water temperature. The limited size of the open water area also exposes sensitive species to significant temperature changes with few retreat areas to use during drought, heat waves, and other extreme weather events. Water temperature has been monitored for many years (RCDSMM and the Bay Foundation 2022).

Alternative 1 will continue to generate relatively poor water quality at the beach and lagoon, assuming input concentrations to the lagoon remain the same over time. Contributions of nearby septic systems, non-point source pollution from stormwater runoff, and other possible inputs are not known at this time. The lagoon is relatively small, so dilution of contamination is minimal without influences of the tide or ocean. The only mechanism to reduce contaminant concentrations under existing conditions is to reduce input concentrations.

3.1.6 Vegetation

The existing lagoon contains a narrow band of emergent marsh and a pocket area of salt grass. Upstream of the lagoon, the site is riparian and upland dominant. The mapped locations of each habitat were compared to the project topography to estimate the elevation ranges for each habitat type. Under existing conditions downstream of the PCH Bridge, the upper end of the jurisdictional wetlands occurs around 9.6 feet NAVD, transitioning to upland habitat above this elevation. The salt grass (*Distichlis spicata*) on site occurs on the south side of the lagoon mouth, close to where the inlet begins, in the range of 6.2 to 8.7 feet NAVD according to the available topography. Bulrush (*Schoenoplectus californicus*) and cattails (*Typha* sp.) are found in the lagoon mouth on the south side of the lagoon mouth near the bridge. These emergent marsh species are found in the elevation range of 5.2 to 6.2 feet NAVD according to the available topography (ESA 2022).

The habitat ranges of each habitat type estimated by ESA were used to create maps of existing vegetation acreages under three SLR scenarios: no SLR, 1.6 feet of SLR, and 6.8 feet of SLR (see Appendix A). Developed areas and existing beach area were determined based on a jurisdictional delineation of Topanga Lagoon completed by WRA, Inc. Water levels for each of the two scenarios containing SLR were mapped based on the CoSMoS “hold the line” shoreline position for 1.6 feet and 6.6 feet of SLR respectively. Habitat acreages mapped for all alternatives under each SLR scenario are provided in Table 3-1 below.

TABLE 3-1. SUMMARY OF HABITAT ACREAGES FOR ALL ALTERNATIVES

Habitat Type	NO SLR Condition				1.6 ft SLR Condition				6.8 ft SLR Condition			
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 1	Alt 2	Alt 3	Alt 4	Alt 1	Alt 2	Alt 3	Alt 4
Open Water	0.06	0.04	0.08	0.07	1.21	1.19	1.23	1.22	5.07	5.78	5.22	5.14
Seasonal Shallow Open Water	0.42	0.69	0.44	0.38	0.42	0.69	0.44	0.38	0.08	0.32	0.12	0.08
Seasonally Unvegetated Flat	0.16	1.51	0.28	0.27	0.38	1.69	0.28	0.51	0.99	3.87	2.77	2.53
Emergent Marsh	0.47	1.12	0.5	0.5	0.39	1.87	0.5	0.82	0.24	0.94	0.59	0.8
Saltgrass	0.07	N/A	N/A	N/A	0.07	N/A	N/A	N/A	0.01	N/A	N/A	N/A
Riparian	2.46	6.09	6.42	6.36	2.32	5.16	6.42	5.79	1.62	2.59	3.11	3.13
Wetted Area Below Riparian/Upland Transition	3.6	9.5	7.7	7.6	4.8	10.6	8.9	8.7	8.0	13.5	11.8	11.7
Riparian/Upland Transition	6.06	6.14	6.34	6.23	6.06	6.14	6.34	6.23	6.06	6.14	6.34	6.22
Coastal Sage Scrub	3.66	2.98	2.98	2.98	3.66	2.98	2.98	2.98	3.65	2.98	2.98	2.98
Upland	11.16	13.84	14.37	14.49	11.15	13.84	14.37	14.49	11.16	13.84	14.35	14.49
Disturbed Upland/Trails	0.49	N/A	N/A	N/A	0.49	N/A	N/A	N/A	0.49	N/A	N/A	N/A
Roadways/Developed/Landscaped	12.43	4.84	5.78	5.78	12.43	4.84	5.78	5.78	11.99	4.84	5.78	5.78
Above Riparian/Upland Transition	33.8	27.8	29.5	29.5	33.8	27.8	29.5	29.5	33.4	27.8	29.5	29.5
Sand (Beach)	4.2	4.4	4.4	4.6	3.1	3.2	3.3	3.4	0.3	0.3	0.4	0.5
TOTAL PROJECT AREA	41.6	41.6	41.6	41.6	41.6	41.6	41.6	41.6	41.6	41.6	41.6	41.6

3.1.7 Biological Resources

A biological assessment of the Project site was completed in 2022 by RCDSMM and CDPR. Vegetation documented included ten natural plant communities and multiple disturbed and non-native plant communities. Natural plant communities identified included California Sycamore Woodland/Red and Arroyo Willow and Mulefat Understory, Arroyo Willow thickets. Individual native trees, several coastal sage scrub communities, riparian habitat, giant wildrye grassland, and salt grass flats. Non-native communities identified included non-native tree stands, Arundo stands, and non-native annual grasslands. A total of 154 species of plants were recorded during project surveys.

According to the Biological Assessment, ninety-eight animal species were observed during project surveys, including 14 special status species. Documented special status fish species include steelhead trout, tidewater goby, California grunion and arroyo chub. More common species including topsmelt, mullet and California killifish, and nonnative Mississippi silverside and goldfish were also encountered. Reptiles and amphibians surveyed included California and Pacific tree frogs, western fence lizards, common side-blotched lizard, and the San Bernardino ring-necked snake. Several special-status species of birds were found, including Cooper's hawk, olive sided flycatcher, and snowy egret, along with several species suited to the disturbed nature of the site such as American crow, black phoebe and rock pigeon, among others. Terrestrial mammal species observed included several mouse species, two woodrat species, two species of rabbit, coyote, gray fox, bobcat, mountain lion, racoon, Virginia opossum, and mule deer. Seven species of bats were also documented within the project area.

ESA (2022) modeled passage suitability for adult steelhead during 4-month passage window from January to April in 2011 to 2020 based on M&N's hydraulic inputs. For the existing condition without SLR, the breach channel is modeled passable for adult steelhead during high tides most of time, and only several days over the 10-year period is passable also on low tides. The lagoon provides suitable refugia for tidewater goby and juvenile steelhead during low flows when lagoon is open. Under storm flows, the velocities throughout the lagoon exceed the refugia threshold and cause refuge problems for tide goby and juvenile steelhead.

Alternative 1 would keep in place the existing configuration and degraded nature of the habitat. No temporary disturbance of vegetation would occur beyond ongoing limited management of non-native species, the habitat integrity and ecosystem health are anticipated to continue to decline. Alternative 1 would result in further deterioration of grunion habitat as beach areas continue to shrink due to storm damage. The diversity and abundance of reptiles and amphibians is expected to continue to decline under Alternative 1.

3.1.8 Recreational Opportunities

Recreational activities are concentrated at the mouth of the creek on Topanga Beach. There are currently no recreational facilities along the mainstem of Topanga Creek. The recreational opportunities presented by the various Topanga Lagoon restoration alternatives are significant.

Alternative 1 presents the existing recreational opportunities such as walking, hiking, bicycling, surfing, beach use, and bird watching. Existing opportunities are limited by the layout of parking, pedestrian walkways, and natural amenities. Pedestrian walkways include an underpass at PCH connecting the parking lot of the Ranch Motel with the County Beach parking lot, and a stair from the County Beach parking lot to the beach. All other access is ad hoc and uses the existing beach access road for lifeguard and emergency vehicle from PCH to the County Lifeguard Headquarters building. Also, an open vacant lot northwest of the lagoon mouth provides an overlook for views and hikers. Biking is limited to the road shoulder along both PCH and TCB. Beach use is available at the County Beach, and surfing occurs just off of that beach. Parking is available at the four corners of the lagoon and along PCH.

3.1.9 Infrastructure Changes Required

Infrastructure at the lagoon includes PCH and the bridge with existing utilities (natural gas, water, telephone, and three storm drains), the County Beach Lifeguard Headquarters building and utilities, the public parking lot, public access walkways and trails to the beach (east of the lagoon), and an informal helipad and

emergency beach access ramp west of the lagoon. No changes to these facilities will occur from Alternative 1.

3.1.10 Long-Term Management Issues

Continued long-term maintenance is recommended for Alternative 1, including potential removal of exotic vegetation and debris from the lagoon and periodic repair of the PCH Bridge and roadway. No change in long-term maintenance will be required for Alternative 1; however, PCH Bridge and roadway maintenance activities may increase over time as these facilities age. As the existing lagoon is not self-sustaining and is gradually degrading in quality, area, and function, there will be increased maintenance needs for habitat and existing natural processes over time to meet biological resource demands.

3.1.11 Sea Level Rise and Coastal Resilience

Flood protection: the peak velocity during the 100-year storm decreases with the projected SLR, but the peak water level in the lagoon remains similar under the 1.6-feet SLR scenario and increases slightly under the 6.8-feet SLR scenario.

Sediment Transport: sediment deposition volume in the lagoon increases with SLR, and sediment delivery to the ocean decreases with SLR for all alternatives. Since the overall sediment delivery from the Topanga watershed to the ocean is minimal, the overall impact to the littoral cell is negligible.

Beach/Ocean Interface: the beach berm is expected to be elevated with SLR. However, the breaching channel thalweg will likely remain at the current cobble berm crest elevation. Increased sea level will also inundate more higher land in the lagoon, leading to increase in tidal prism when the lagoon is breached. With a larger lagoon body, it will require a larger storm to breach the inlet. ESA (2022) has predicted more inlet closures due to SLR for Alternative 1. However, the opening duration may become longer, as it may require more wave action to close the lagoon due to the increased tidal prism. The latter is limited due to the small lagoon size for Alternative 1.

Surf Break: the beach profile is expected to shift landward and upward with SLR for all alternatives if there is sufficient sand available in the littoral cell. The surfing condition is likely to remain similar to the current conditions in the near-term. The long-term condition will depend on the sand supply in the littoral cell.

Water Quality: the dry weather lagoon closed water quality conditions will likely remain the same as the existing conditions, or slightly improve due to slightly larger lagoon surface. During the lagoon inlet open conditions, the water quality may improve with SLR due to potentially larger tidal range with increasing sea level.

Beach Area: beach area will gradually decrease with SLR. It is expected to be reduced from the current 4.2 acres to 3.1 acres with 1.6 feet of SLR and 0.3 acres with 6.8 feet of SLR.

Vegetation: the wetted vegetation area (below riparian/upland transition) will increase with SLR, mainly due to the loss of beach area. The area above riparian/upland transition will slightly increase with SLR.

Fish Passage: SLR helps increase the passable area and lower velocities in the lagoon basin and at the PCH Bridge. In the near-term with 1.6 feet of SLR, the number of passable events will remain the same, but the accumulated passable area will increase. In the long-term with 6.8 feet of SLR, the number of passable events will be less, but the accumulated passable area will increase.

Infrastructure: with SLR, the lifeguard tower and restroom building will be subject to further coastal erosion and will eventually be damaged.

3.1.12 Relative Costs

Alternative 1 requires no new construction; hence, the relative cost is zero. The ongoing maintenance is necessary but is not included in the cost estimate.

3.2 Alternative 2 - Maximum Lagoon Habitat, Removal of Motel

3.2.1 Hydraulics/Hydrology

Fish Passage: Hydraulic modeling up to 5-year storm of Alternative 2 provides flow conditions for the fish passage analysis. The peak velocity at the PCH Bridge under Alternative 2 has a 30% to 40% reduction from the peak velocities under the existing condition (Alternative 1) due to its enlarged lagoon footprint and lengthened PCH Bridge. Storms that fish are not passable under the existing condition may become passable under this proposed Alternative 2 due to reduced velocity, especially on floodplains where velocity is lower than the main creek.

According to ESA's lagoon mouth morphology analysis (ESA 2022), the lagoon mouth during the 13 historical passable storm events would remain open and passable to adult steelhead with the proposed Alternative 2 restoration under the existing condition. Compared to Alternative 1, the accumulative passable area at PCH Bridge increases from 1,249 sq ft to 1,422 sq ft under MLLW, and from 1,290 sq ft to 1,459 sq ft under MHHW condition. It is an approximately 13% increase in passable area for Alternative 2 under both tidal conditions. Alternatives 3 and 4 have similar passable areas to Alternative 1, and the change in accumulative passable areas is less than 5%. Alternative 2 has the largest accumulative passable area among all the alternatives. Hence, Alternative 2 improves fish passage conditions by increasing passable area.

Flood Protection: With the enlarged lagoon retention capacity and the lengthening of the PCH Bridge, the flow backup issue upstream of the PCH Bridge will be improved under Alternative 2. Peak velocity at the bridge reduces to 10.9 fps (40% reduction compared to Alternative 1) during a 100-year flood event. The peak water level would also be lowered in the lagoon compared to Alternative 1. The reduced flow velocity and water level help to achieve the restoration goal of improving flood protection. Lower flow velocity in the lagoon could also reduce impact to the fish nurturing habitat. Hence, Alternative 2 improves flood protection and reduces the erosive velocity compared to Alternative 1. It will also perform better than Alternatives 3 and 4.

Resilience: With projected 1.6-feet and 6.8-feet SLRs, the peak velocity during the 100-year storm decreases to 10.2 fps and 8.2 fps, respectively. The highest water level modeled during the 100-year storm at PCH decreases from 15.3 ft NAVD88 to 12.8 ft NAVD, compared to Alternative 1. With SLR, the peak water level remains the same under 1.6-feet SLR or increases by a foot under 6.8-feet SLR. The trend of flow velocity and water levels in the lagoon with SLR under Alternative 2 is similar to Alternative 1. However, with both reduced velocity and water level, Alternative 2 would be more resilient to SLR than the existing condition, as well as better than Alternatives 3 and 4.

Habitat: Same as Alternative 1, the low tide is truncated near the berm height and high tide will inundate the habitat during the high tide condition. The beach berm is expected to breach at a similar elevation as it will be limited by the existing cobble bed elevation. The tidal prism of the restored Alternative 2 when the lagoon is connected is much larger than the existing Alternative 1 due to a larger lagoon area. Alternative 2 provides the largest habitat expansion compared to other alternatives (as discussed in Section 3.1.6).

3.2.2 Sediment Transport

Sedimentation in Upper and Lower Reach of Topanga Creek: As the sediment transport model indicated, the erosion/deposition mode does not change in the upper and lower reach of Topanga Creek under Alternative 2. Furthermore, the modeled sediment erosion and deposition volumes in the upper and lower reach among the alternatives are almost identical. Therefore, the restoration of the downstream lagoon does not pose any negative impact to the upstream reaches in terms of erosion. Similar to Alternative 1, SLR has no or minimal impact on the erosion or accretion in the upper and lower reach of Topanga Creek.

Sedimentation in Lagoon: The sediment transport model predicts deposition in the lagoon area with Alternative 2, same as Alternative 1. There are approximately 32.2% of the total eroded sediments from

upstream that will settle in the lagoon during the average storm period and 8.5% during the high flow period. Compared to Alternative 1, Alternative 2 has increased sediment deposition volume in the lagoon under both flow periods. This is due to the larger lagoon area of Alternative 2 since the sediment deposition depth is similar to Alternative 1. With SLR, the sediment deposit volume in the lagoon will increase similar to Alternative 1.

Sediment Transport to Ocean: The percentage of sediments predicted to be flushed to the ocean is similar to Alternative 1 for both average and high flow periods. SLR could gradually reduce sediment to the ocean, but the amount of sediment reduction is small.

Potential Erosion around PCH Bridge: The modeled 100-year peak velocity at PCH Bridge of Alternative 2 is reduced to 60% of the existing peak velocity (Alternative 1), as low as 10.9 fps. The lowered velocity in the lagoon and under the PCH Bridge will reduce erosion potential at the roadway embankments and its adjacent structures. Also, the new bridge will be designed to the anticipated scour.

Potential Impacts to Fish Habitat and Foraging/Nursing Area: The high velocity within the lagoon during storms will be lowered under Alternative 2 due to a longer PCH Bridge. The proposed PCH Bridge has a longer main span than Alternative 1, specially designed for fish passage. The lowered velocity would also reduce impacts to the foraging and nursing fish habitat.

3.2.3 Lagoon/Ocean Interface Dynamics

Breaching Frequency: According to ESA's lagoon mouth dynamics analysis (ESA 2022), Alternative 2 has increased wetted lagoon volume perched above tides. The increased lagoon volume required larger storms to fill the lagoon and breach naturally. The predicted lagoon close time is 5% to 25% more in Alternative 2 than in Alternative 1. Although there is more chance of a closed inlet in Alternative 2, the passable events of Alternative 2 remain at 13, the same as other alternatives under the current sea level condition. With 1.6-feet SLR, the passable events in Alternative 2 are predicted to be reduced from 13 to 10 events due to less breaching, and it is the lowest among all alternatives. The passable storm events of Alternative 2 are further reduced to 7 events under 6.8-feet SLR, more than Alternative 4 but less than Alternatives 1 and 3.

Beach Berm: The proposed Alternative 2 does not change cobble berm crest elevation and lagoon breach elevation. The lagoon breaching condition will be similar to the existing condition.

SLR Impacts: SLR will build the beach berm higher, which is equivalent to adding lagoon volume in terms of lagoon breaching. The beach berm moves up with SLR. The proposed lagoon of Alternative 2 is predicted to have more inlet closure with increased sea levels. This trend is consistent for all alternatives. The larger tidal prism due to SLR will require larger wave action to close the lagoon, but potentially keep the inlet open longer.

3.2.4 Surf Break

This alternative proposes significant changes to the lagoon, but all are landward of the highest elevation of the beach berm. Therefore, no direct changes are proposed to the bathymetry of the surf site, nor to the beach adjacent to the surf site. In addition, there will be no changes to wave exposure and waves will continue to reach the surf site without modification. Therefore, no effects should occur to surfing from Alternative 2 as compared to existing conditions.

3.2.5 Water Quality

The lagoon design proposed for Alternative 2 provides the largest lagoon footprint and, therefore, could provide the most wetland, emergent and riparian vegetation to assist in shading the water to moderate temperatures, and providing nutrient cycling. It also provides a larger dry weather wet lagoon body, which could reduce potential contaminant concentration due to dilution. Reducing contaminant inputs from septic systems and non-point source road runoff will be another project benefit to improved water quality.

3.2.6 Vegetation

This alternative provides the optimal opportunity for establishment of the most diverse wetland community possible. After contouring of the new lagoon area is completed, a suite of wetland species would be introduced based on soil sampling, gradient, and expected tidal and seasonal inundation levels. The habitat elevation ranges estimated by ESA were used to project proposed vegetation and create maps of habitat vegetation acreages under the no SLR, 1.6-feet SLR, and 6.8-feet SLR scenarios (see Appendix A). Developed area acreages were determined based on the proposed bridge design footprint for the alternative and existing roadways. Water levels for 1.6-feet SLR and 6.8-feet SLR conditions were mapped based on the CoSMoS "hold the line" shoreline positions for 1.6 feet and 6.6 feet of SLR respectively. Habitat acreages mapped for Alternative 2 under each SLR condition are provided in Table 3-1.

Compared to Alternative 1, Alternative 2 has increased areas of several habitat types, including seasonal shallow open water, seasonally unvegetated flat, emergent marsh, riparian, riparian/upland transition, and upland habitats. This alternative also reduces the footprint of roadways/developed/landscaped areas and increases beach area by 0.21 acre under the no SLR scenario condition. Open water is reduced slightly in Alternative 2 compared to Alternative 1 due to increased area of emergent marsh.

Under the 1.6-feet SLR condition, total beach area in Alternative 2 is reduced by 1.15 acres. Beach area under 6.8 feet of SLR is 0.34 acre, a reduction of 4.05 acres compared to the no SLR condition.

Based on mapping of projected habitat zones, Alternative 2 has the largest proposed areas of seasonal shallow open water, seasonally unvegetated flat and emergent marsh, and the smallest proposed roadways/developed/landscaped area compared to the other alternatives.

3.2.7 Biological Resources

This alternative provides the greatest potential for restoring the biological functions of Topanga Lagoon. Due to the greater area of lagoon and wetland areas, the creek will be able to develop natural meanders, side channels, and depositional bars that will significantly increase the habitat diversity available.

Under Alternative 2, significant vegetation removal would occur in existing wetted areas. Willow trees lining the wetted banks of the creek would be protected during grading, but most other vegetation outside of the wetted areas would be removed. Due to the larger area of lagoon and wetland areas created, Alternative 2 would have the most extensive vegetation removed outside the wetted area among Alternatives 2-4. This alternative would also remove the existing historically imported fill to create a more natural topography and expanded open space areas. Seasonally wetted, riparian, and riparian-upland transition areas would be expanded compared to the existing condition. This alternative would also result in the greatest extent of restored native habitats compared to the other alternatives.

Alternative 2 would have the most ground disturbance during construction. Standard animal protection practices would be implemented to minimize impacts to animals. Over the long term, Alternative 2 would provide substantial benefits to animals compared to Alternative 1 because the project would increase the quantity and variety of habitats and improve the quality of habitats through removal of invasive species. Additional retreat and refuge areas are available under Alternative 2 to better buffer animals from adverse effects of climate change and SLR. For aquatic amphibians, Alternatives 2-4 allow for the potential reestablishment of aquatic species like the California and Pacific tree frogs with the expansion and improvement of lagoon, wetland, riparian and transitional habitats. Resident and migrating fish would also benefit from additional refugia areas and better protected migration corridors found under this alternative. Alternative 2 also provides improved conditions for grunion, tidewater gobies and steelhead, and improved aquatic and terrestrial habitats.

3.2.8 Recreational Opportunities

Alternative 2 also presents the same recreational opportunities as existing conditions (walking, hiking, bicycling, surfing, beach use, and bird watching), but a formal walking trail will be added around the future lagoon as a northern perimeter route. Pedestrian walkways will include an underpass at PCH connecting

the area north of PCH with the County Beach parking lot, and a beach access stair will be provided from the County Beach parking lot to the beach. Access can still be somewhat ad hoc and use the existing beach access road for lifeguard and emergency vehicle from PCH to the expanded beach area. A new County Lifeguard Headquarters building will be located on the bluff. Biking will remain limited to bike lanes along both PCH and TCB. Beach use will continue to be available at the County Beach with a larger beach area available, and surfing can still occur just off of that beach. Parking will be available along PCH south of the lagoon and along Topanga Canyon Road. Alternative 2 will increase recreation over Alternative 1 due to the larger beach area and formal perimeter lagoon walking trail.

3.2.9 Infrastructure Changes Required

Infrastructure at the lagoon consists of a new PCH roadway and bridge over the lagoon, reconfigured parking, removal of the Ranch Motel, relocation of the County Lifeguard Headquarters building and helipad, and a new pedestrian underpass under the bridge along the east bank. The proposed PCH Bridge will be a much longer bridge, while the roadway alignment will remain the same. Utility lines on the bridge will also have to be moved, although it should be possible to retain the water main in its existing location, and power may need to be moved from overhead to on the bridge. Installation of state-of-the-art stormwater runoff and non-point source pollution devices are planned for the bridge, the new roadway, and parking areas. The Lifeguard Headquarters building will be relocated to the back of the beach and along the new beach access road. The final design will also need to include access for emergency vehicles to the upstream area and safe access to the beach.

3.2.10 Long-Term Management Issues

All new items will require some measure of maintenance but will not need it as frequently as the existing (Alternative 1) roadway, bridge, and utility lines. The new infrastructure will be longer-lasting and more resilient than existing infrastructure due to improved construction material quality and up-to-date design and construction methods. As the lagoon will be in a more natural condition regarding biogeochemical processes, there should be less management needed of vegetation, sediment, debris, water quality, etc. The lagoon is designed to be self-sustaining and that should reduce management needs. The same type of human-related management such as trespass and homelessness will exist for any alternative. Access and trespass may be more readily controllable with new infrastructure as compared to existing infrastructure. New trails, overlooks, and any fences will require maintenance. Also, storm drains and culverts may need inspection and periodic maintenance.

3.2.11 Sea Level Rise and Coastal Resilience

Flood protection: the peak velocity during the 100-year storm decreases with the projected SLR, but the peak water level in the lagoon remains similar under the 1.6-feet SLR scenario and increases slightly under the 6.8-feet SLR scenario. Both water level and velocity are much lower compared to Alternative 1; hence, Alternative 2 is more flood resilient than Alternative 1 and is also more resilient than Alternatives 3 and 4.

Sediment Transport: sediment deposition volume in the lagoon increases with SLR, and sediment delivery to the ocean decreases with increased SLR for all alternatives. Since the overall sediment delivery from the Topanga watershed to the ocean is minimal, the overall impact to the littoral cell is negligible.

Beach/Ocean Interface: the condition and trend will be similar to the existing condition. The beach berm is expected to be elevated with SLR. However, the breaching channel thalweg could remain at the current cobble berm crest elevation. Increased sea level will also inundate more higher land in the lagoon, leading to an increase in tidal prism. With a larger lagoon body, it will require a larger storm to breach the inlet. However, the opening duration may become longer as it will require more wave action to close the lagoon due to the increased tidal prism. All alternatives will have similar trend.

Surf Break: the beach profile is expected to shift landward and upward with SLR for all alternatives if there is sufficient sand in the littoral cell. The surfing condition is likely to remain similar to the current conditions

in the near-term. The long-term condition will depend on the sand supply in the littoral cell. The proposed lagoon grading will not change the surfing conditions.

Water Quality: the dry weather lagoon closed water quality conditions will likely remain the same as the existing conditions, or slightly improve due to slightly larger lagoon surface. During the lagoon inlet open conditions, the water quality may improve with SLR due to potentially larger tidal range with increasing sea level. Alternative 2 has the largest lagoon body and vegetation acreage for cleaning the system, so it will perform better than other alternatives.

Beach Area: similar to Alternative 1, beach area will gradually decrease with SLR. It is expected to be reduced from the current 4.4 acres to 3.2 acres with 1.6 feet of SLR and 0.3 acres with 6.8 feet of SLR. All alternatives will experience similar trend. Alternative 4 will retain 0.2 acre more beach area than Alternatives 1 and 2. Alternative 3 will retain 0.1 acre more beach area than Alternatives 1 and 2.

Vegetation: the wetted vegetation area (below riparian/upland transition) will increase with SLR, mainly due to the loss of beach area. The area above riparian/upland transition will slightly increase with SLR. Alternative 2 will retain more wetted vegetation area than other alternatives due to lagoon restoration.

Fish Passage: SLR helps increase the passable area and lower velocities in the lagoon basin and at the PCH Bridge. In the near-term with 1.6 feet of SLR, the number of passable events will be reduced from 13 to 10 over the 10-year simulation period compared to Alternative 1. In the long-term with 6.8 feet of SLR, the number of passable events will be reduced from 10 to 7, but the accumulated passable area will be almost doubled. Also, larger storms currently not passible may become passible in Alternative 2 due to lowered velocity. In general, the resilience may be similar for alternatives in the short time, and Alternatives 1, 2, and 3 will be better than Alternative 4 in the long-term.

Infrastructure: the Lifeguard Headquarters, beach restroom, and helipad would be demolished and rebuilt closer to the realigned access road and to each other on the same beach level. They will be more resilient than Alternative 1.

3.2.12 Cost Estimates

The opinion of the construction cost includes the lagoon grading and building a new PCH Bridge over the lagoon. The ongoing maintenance is necessary but is not included in the cost estimate.

For the lagoon grading, the estimated construction cost is $8.6 million based on the items considered, including mobilization of equipment, earthwork and stockpiling, irrigation and planning, demobilization of equipment, construction support, and material disposal.

The following items are assumed in the cost estimate of the lagoon grading for Alternatives 2, 3, and 4:

- This cost estimate represents year 2021 costs.
- This cost estimate is an opinion of construction cost made by the Consultant. In providing opinions of construction cost, it is recognized that neither the Client nor the Consultant has control over the costs of labor, equipment, materials, or over the Contractors' methods of determining prices and bids. This opinion of construction cost is based on the Consultant's reasonable professional judgment and experience. This estimate does not constitute a warranty, expressed or implied, that the Contractors' bids or negotiated prices of work will correspond with the Owner's budget or the opinion of construction cost prepared by the Consultant.
- Cost of earthwork increases with distance; i.e., less if loading and hauling within 2 miles ($15/cy), and more if within 5 miles ($24/cy), and even more if within 10 miles ($35/cy).
- The tipping cost for hazardous material decreases to $56/ton if a special handling facility is not required.
- It is assumed that 5,000 cubic yards of the disposal material are hazardous, requiring hazard material tipping fee.

For the new PCH Bridge and roadway, the estimated construction cost is $42.1 million, which was escalated to year 2021 from year 2004 when the 2004 PSR-PDS was prepared.

3.3 Alternative 3 - Limited Lagoon Habitat Expansion, Retention of Motel

3.3.1 Hydraulics/Hydrology

Fish Passage: Hydraulic modeling of Alternative 3 provided flow conditions for the fish passage analysis. The peak velocity at the PCH Bridge under Alternative 3 will be 16% to 18% lower than that of Alternative 1 due to lengthening of the PCH Bridge, but the reduction is less than that of Alternative 2.

According to ESA's lagoon mouth morphology analysis, the lagoon mouth during the 13 historical passable storm events would remain open and passable to adult steelhead with the proposed Alternative 3 restoration without SLR. Compared to Alternative 1, the accumulative passable area at PCH Bridge under Alternative 3 is slightly increased, from 1,249 sq ft to 1,290 sq ft under MLLW and from 1,290 sq ft to 1,326 sq ft under MHHW condition. Such increase (approximately 3%) in the passable area is considered insignificant. Hence, the fish passage condition of Alternative 3 is considered to be similar to Alternatives 1 and 4, but not as good as Alternative 2.

Flood Protection: With the enlarged lagoon retention capacity and lengthening of the PCH Bridge, the flow backup issue upstream of the PCH Bridge will be improved under Alternative 3. Peak velocity at the bridge reduces to 11.7 fps (35% reduction compared to Alternative 1) during a 100-year flood event. The peak water level in the lagoon during a 100-year storm is predicted to be similar to Alternative 1. The reason is that the lagoon expansion of Alternative 3 is mostly located at elevations above 9.5 ft NAVD88, above most of lagoon water levels; therefore, no significant change in lagoon volume compared to Alternative 1. However, the reduced flow velocity would still help to achieve the restoration goal by reducing erosion and improving flood protection. The reduced flow velocity in the lagoon could also reduce impact to the fish nurturing habitat. Hence, Alternative 3 improves flood protection and reduces the erosive velocity compared to Alternatives 1 and 4, but it is not as good as Alternative 2. Alternative 2 lowers both flow velocity and water level during extreme storms.

Resilience: With projected 1.6-feet and 6.8-feet SLRs, the peak velocity during the 100-year storm decreases to 11.6 fps and 8.8 fps, respectively. The highest water level during the 100-year storm at PCH Bridge remains similar to Alternative 1 for both SLR scenarios. The differences in peak water level between Alternative 1 and Alternative 3 is less than 0.2 feet. With reduced velocity, Alternative 3 would be more resilient to SLR than Alternatives 1 and 4, but not as good as Alternative 2.

Habitat: Same as Alternative 1, the low tide is truncated near the berm height and high tide will inundate the habitat during the high tide condition. The beach berm is expected to breach at a similar elevation as it will be limited by the existing cobble bed elevation. The expanded lagoon area provides opportunities for habitat growth. Alternative 3 provides larger habitat expansion compared to Alternative 1, mostly at higher elevations for riparian and upland habitat. When compared to other proposed Alternatives, Alternative 3 is similar to Alternative 4 but worse than Alternative 2 (as discussed in Section 3.2.1).

3.3.2 Sediment Transport

Sedimentation in Upper and Lower Reach of Topanga Creek: The sediment transport model indicated that the erosion/deposition mode does not change in the upper and lower reach of Topanga Creek under Alternative 3. The modeled sediment erosion and deposition volumes in the upper and lower reach among the alternatives are almost identical. Therefore, the restoration of the downstream lagoon does not pose any negative impact to the upstream reaches. Similar to Alternative 1, SLR has no or minimal impact on the erosion or accretion in the upper and lower reach of Topanga Creek.

Sedimentation in Lagoon: The sediment transport model predicts deposition in the lagoon area for Alternative 3 similar to Alternative 1. There are approximately 31.7% of the total eroded sediments from upstream that will settle in the lagoon during the average storm period and 3.1% during the high flow period. Compared to Alternative 1, Alternative 3 has slightly increased sediment deposition volume in the lagoon under average flow period, and similar accretion volume during high flow period. During the high flow period,

most sediment that would deposit in the lagoon during the average flow will be flushed to the ocean. With SLR, the sediment deposit volume in the lagoon will slightly increase, similar to Alternative 1.

Sediment Transport to Ocean: The percentage of sediments predicted to be flushed to the ocean is similar for all alternatives under both the average and high flow periods. SLR could gradually reduce sediment to the ocean, but the amount of sediment reduction is negligible since sediment transport to the ocean from Topanga watershed is minimal (USACE 2009).

Potential Erosion around PCH Bridge: The modeled 100-year peak velocity at PCH Bridge of Alternative 3 is reduced by 35% of the existing peak velocity (Alternative 1), as low as 11.7 fps. Although the velocity reduction of Alternative 3 is not as high as Alternative 2, the lowered velocity at the lagoon and under the PCH Bridge in Alternative 3 will reduce erosion potential at the roadway embankments and its adjacent structures. Also, the new bridge will be designed to the anticipated scour.

Potential Impacts to Fish Habitat and Foraging/Nursing Area: The high velocity within the lagoon during storms will be lowered under Alternative 3 due to a longer PCH Bridge. The proposed PCH Bridge has a longer main span than Alternative 1, specially designed for fish passage. The lowered velocity would also reduce storm impacts to the foraging and nursing fish habitat.

3.3.3 Lagoon/Ocean Interface Dynamics

Breaching Frequency: As indicated in ESA's lagoon mouth dynamics analysis (ESA 2022), Alternative 3 has increased the wetted lagoon volume perched above tides, although not as large as Alternative 2. Compared to Alternative 1, the predicted lagoon close time change in Alternative 3 is generally less than 5%. The fish passable events of Alternative 3 remain at 13, the same as Alternative 1 under no SLR and 1.6-feet SLR. With 6.8-feet SLR, the passable storm events of Alternative 3 are reduced to 8 due to enlarged lagoon volume, which is more than Alternatives 2 and 4, but less than Alternative 1.

Beach Berm: The proposed Alternative 3 does not change cobble berm crest elevation and lagoon breach elevation. The lagoon breaching condition will be similar to the existing condition.

SLR Impacts: SLR will build the beach berm higher, which is equivalent to adding lagoon volume in terms of lagoon breaching. The beach berm moves up with SLR. The proposed lagoon of Alternative 3 is predicted to have more inlet closure with increased sea levels. This trend is consistent for all alternatives.

3.3.4 Surf Break

This alternative also proposes significant changes to the lagoon, but all proposed changes are to occur above and landward of the highest elevation of the beach berm. Therefore, no direct changes are proposed to the bathymetry of the surf site, nor to the beach adjacent to the surf site. In addition, there will be no changes to wave exposure and waves will continue to reach the surf site without being changed in any way. Therefore, no effects should occur to surfing from Alternative 3 compared to existing conditions.

3.3.5 Water Quality

The lagoon design proposed for Alternative 3 will not expand the dry weather wet areas in the lagoon and is not expected to provide as much potential water quality benefit compared to Alternative 2. Reducing contaminant inputs from septic systems and non-point source road runoff will be another benefit from the project which will improve water quality.

3.3.6 Vegetation

Although not as extensive as Alternative 2, this alternative provides a significant opportunity for establishment of a diverse wetland community. After contouring of the new lagoon area is completed, a suite of wetland species would be introduced based on soil sampling, gradient, and expected tidal and seasonal inundation levels. The habitat elevation ranges estimated by ESA were used to project proposed vegetation and create maps of habitat vegetation acreages under the no SLR, 1.6-feet SLR, and 6.8-feet SLR scenarios (see Appendix A). Developed area acreages were determined based on the proposed bridge

design footprint for the alternative and existing roadways. Water levels for 1.6-feet SLR and 6.8-feet SLR conditions were mapped based on the CoSMoS "hold the line" shoreline positions for 1.6 feet and 6.6 feet of SLR respectively. Habitat acreages mapped for Alternative 3 under each SLR condition are provided in Table 3-1.

Compared to the existing conditions, Alternative 3 has increased areas of open water, seasonal shallow open water, seasonally unvegetated flat, emergent marsh, riparian, riparian/upland transition, and upland habitats. This alternative also reduces the footprint of roadways/developed/landscaped areas and increases beach area by 0.24 acre under the no SLR scenario condition.

Under the 1.6-feet SLR and 6.8-feet SLR conditions, total beach area in Alternative 3 is reduced by 1.14 and 4.07 acres respectively compared to the no SLR condition.

Based on mapping of projected habitat zones, Alternative 3 would have the largest areas of riparian and riparian/upland transition habitats compared to the other alternatives.

3.3.7 Biological Resources

The amount and quality of habitat will increase substantially with Alternative 3. Significant vegetation removal would occur in existing wetted areas. Willow trees lining the wetted banks of the creek would be protected during grading, but most other vegetation outside of the wetted areas would be removed. This alternative would also remove the existing historically imported fill to create a more natural topography and expanded open space areas. Seasonally wetted, riparian, and riparian-upland transition areas would be expanded compared to the existing condition.

Alternative 3 would have some ground disturbance during construction. Standard animal protection practices would be implemented to minimize impacts to animals. Over the long term, Alternative 3 would provide substantial benefits to animals compared to Alternative 1 because the project would increase the quantity and variety of habitats and improve the quality of habitats through removal of invasive species. Additional retreat and refuge areas are available under Alternative 3 to better buffer animals from adverse effects of climate change and SLR. For aquatic amphibians, Alternative 3 allows for the potential reestablishment of aquatic species like the California and Pacific tree frogs with the expansion and improvement of lagoon, wetland, riparian and transitional habitats. Resident and migrating fish would also benefit from additional refugia areas and better protected migration corridors found under this alternative. Alternative 3 also provides improved conditions for grunion, and improved aquatic and terrestrial habitats.

3.3.8 Recreational Opportunities

Alternative 3 presents the same recreational opportunities as existing conditions and Alternative 2 (walking, hiking, bicycling, surfing, beach use, and bird watching), but will add more beach area than either previous scenario, a formal walking trail around the future lagoon as a northern perimeter route, and a portion of the Ranch Motel will be improved and available for some visitor services that could include overnight accommodations depending on the potential for improving wastewater services. Pedestrian walkways will include an underpass at PCH connecting the Ranch Motel and an area north of PCH with the County Beach parking lot, and a beach access stair will be provided from the County Beach parking lot to the beach. Access can still be ad hoc and use the existing beach access road for lifeguard and emergency vehicle from PCH to the expanded beach area. A new County Lifeguard Headquarters building will be relocated to be up on the bluff. Biking will remain limited to bike lanes along both PCH and TCB. Beach use will continue to be available at the County Beach with a slightly expanded beach area compared to Alternatives 1 and 2 under SLR conditions, and surfing can still occur just off of that beach. Parking will be is available along PCH south of the lagoon and at the Ranch Motel but provides the least amount of parking compared to other alternatives. Alternative 3 will increase recreation over Alternatives 1 and 2 due to the future larger beach area, formal perimeter lagoon walking trail, and remodeled Ranch Motel.

3.3.9 Infrastructure Changes Required

Infrastructure at the lagoon for Alternative 3 is similar to that of Alternative 2, except the Ranch Motel remains in place but is slightly reduced in area. Also proposed are a new PCH roadway and bridge over the lagoon, reconfigured parking, relocation of the County Lifeguard Headquarters building and helipad closer to PCH, and a new pedestrian underpass under the bridge along both east and west banks. The proposed PCH Bridge (460 feet) will be much longer than the existing bridge (78.6 feet) while the roadway alignment will remain the same. Utility lines on the bridge will also have to be moved, although it should be possible to retain the water main in its existing location, and power may need to be moved from overhead to on the bridge. Installation of state-of-the-art stormwater runoff and non-point source pollution devices are planned for the bridge, the new roadway, and parking areas. The Lifeguard Headquarters building will be set back farther from the ocean and slightly farther east (relocated to the back of the beach and along the new beach access road). The final design will also need to include access for emergency vehicles to the upstream area and safe access to the beach.

3.3.10 Long-Term Management Issues

Similar to Alternative 2, Alternative 3 will require maintenance but will not need it as frequently as the existing (Alternative 1) roadway, bridge, and utility lines. The new infrastructure will be longer-lasting and more resilient than existing infrastructure due to improved construction material quality and up-to-date design and construction methods. As the lagoon will be in a more natural condition regarding biogeochemical processes, there should be less management needed of vegetation, sediment, debris, water quality, etc. The lagoon is designed to be self-sustaining and that should reduce management needs. The same type of human-related management such as trespass and homelessness will existing for any alternative. Access and trespass may be more readily controllable with new infrastructure as compared to existing infrastructure. New trails, overlooks, and any fences will require maintenance. Also, storm drains and culverts may need inspection and periodic maintenance. Finally, retaining walls may also require maintenance over time.

3.3.11 Sea Level Rise and Coastal Resilience

Flood protection: the peak velocity during the 100-year storm decreases with the projected SLR, but the peak water level in the lagoon remains similar under the 1.6-feet SLR scenario and increases slightly under the 6.8-feet SLR scenario. Both water level and velocity are much lower compared to Alternative 1, but higher than Alternative 2. Hence, Alternative 2 is more flood resilient, followed by Alternative 3, Alternative 4, and Alternative 1.

Sediment Transport: sediment deposition volume in the lagoon increases with SLR, and sediment delivery to the ocean decreases with increased SLR for all alternatives. Since the overall sediment delivery from the Topanga watershed to the ocean is minimal, the overall impact to the littoral cell is negligible.

Beach/Ocean Interface: the condition and trend will be similar to the existing condition. The beach berm is expected to be elevated with SLR. However, the breaching channel thalweg could remain at the current cobble berm crest elevation. Increased sea level will also inundate more higher land in the lagoon, leading to increase in tidal prism. With a larger lagoon body, it will require a larger storm to breach the inlet. However, the opening duration may become longer as it will require more wave action to close the lagoon due to the increased tidal prism. All alternatives will have similar trend.

Surf Break: the beach profile is expected to shift landward and upward with SLR for all alternatives if there is sufficient sand in the littoral cell. The surfing condition is likely to remain similar to the current conditions in the near-term. The long-term condition will depend on the sand supply in the littoral cell. The proposed lagoon grading will not change the surfing conditions.

Water Quality: the dry weather lagoon closed water quality conditions will likely remain the same as the Alternative 1, or slightly improve due to larger lagoon surface. During the lagoon inlet open conditions, the water quality may improve with SLR due to potentially larger tidal range with increasing sea level.

Alternative 2 has the largest lagoon body and vegetation acreage for cleaning the system, so it will perform better than other alternatives. Alternatives 3 and 4 will perform similarly, but better than Alternative 1.

Beach Area: similar to Alternative 1, beach area will gradually decrease with SLR. It is expected to be reduced from the current 4.4 acres to 3.2 acres with 1.6 feet of SLR and 0.3 acres with 6.8 feet of SLR. All alternatives will experience similar trend. Alternative 4 will retain 0.2 acre more beach area than Alternatives 1 and 2. Alternative 3 will retain 0.1 acre more beach area than Alternatives 1 and 2.

Vegetation: the wetted vegetation area (below riparian/upland transition) will increase with SLR, mainly due to the loss of beach area. The area above riparian/upland transition will slightly increase with SLR. Alternative 2 will retain more wetted vegetation area than other alternatives due to lagoon restoration, followed by Alternatives 3 and 4.

Fish Passage: SLR helps increase the passable area and lower velocities in the lagoon basin and at the PCH Bridge. In the near-term with 1.6 feet of SLR, the number of passable events will remain the same as Alternative 1 and the accumulative passable area will slightly increase compared to Alternative 1. In the long-term with 6.8 feet of SLR, the number of passable events will be reduced from 10 to 8, but the accumulated passable area will be similar to Alternative 1. Also, larger storms currently not passible may become passible in Alternative 3 due to lowered velocity. In general, the resilience may be similar for alternatives in the short-time, and Alternatives 1, 2, and 3 will be better than Alternative 4 in the long-term.

Infrastructure: the Lifeguard Headquarters and restroom building will be moved to higher and further away from the beach for Alternatives 2, 3, and 4, and they will be more resilient than Alternative 1. The helipad would be located at PCH with a gated separation from the west end of the parking lot on the same level and be more resilient than the existing conditions.

3.3.12 Cost Estimates

The opinion of the construction cost includes the lagoon grading and building a new PCH Bridge over the lagoon. The ongoing maintenance is necessary but is not included in the cost estimate.

For the lagoon grading, the estimated construction cost is $6.9 million based on the items considered including mobilization of equipment, earthwork and stockpiling, irrigation and planning, demobilization of equipment, construction support, and material disposal as well as hazard material tipping fee. Assumptions included in Alternative 2 also apply to this Alternative.

For the new PCH Bridge and roadway, the estimated construction cost is $42.1 million, which was escalated to year 2021 from year 2004 when the 2004 PSR-PDS was prepared.

3.4 Alternative 4 – Maximum Managed Retreat, Partial Motel Retention

3.4.1 Hydraulics/Hydrology

Fish Passage: Hydraulic modeling of Alternative 4 provides flow conditions for the fish passage analysis. The peak velocity at the PCH Bridge under Alternative 4 is similar to that under Alternative 1, but it is higher than that of Alternatives 2 and 3.

Per ESA's lagoon mouth morphology analysis (ESA 2022), the lagoon mouth during the 13 historical passable storm events would remain open and passable to adult steelhead with the proposed Alternative 4 without SLR. Compared to Alternative 1, the accumulative passable area at PCH Bridge under Alternative 4 is slightly decreased, from 1,249 sq ft to 1,193 sq ft under MLLW and from 1,290 sq ft to 1,227 sq ft under MHHW condition. Such changes (approximately 5%) in the passable area of Alternative 4 are considered insignificant. Hence, the fish passage condition of Alternative 4 is not as good as Alternative 2, but similar to Alternatives 1 and 3.

Flood Protection: With the enlarged lagoon retention capacity and the lengthening of the PCH Bridge, the flow backup issue upstream of the PCH Bridge will be improved under Alternative 3. Peak velocity at the

bridge reduces to 13.6 fps (25% reduction compared to Alternative 1) during a 100-year flood event. The peak water level in the lagoon during 100-year storm is predicted to be similar to Alternative 1. Similar to Alternative 3, the grading of Alternative 4 is mostly at elevations above 9.5 ft NAVD88. The expanded lagoon capacity is located above the water levels most of the time; therefore, no significant change in lagoon volume compared to Alternative 1. However, the reduced flow velocity would still help to achieve the restoration goal by reducing erosion and improving flood protection. The reduced flow velocity in the lagoon could also reduce storm impact to the fish nurturing habitat. Hence, Alternative 4 improves flood protection and reduces the erosive velocity compared to Alternatives 1, but it is not as good as Alternatives 2 and 3. Alternative 2 is the best in terms of flood protection, as it will reduce both flow velocity and water level during extreme storms.

Resilience: With projected 1.6-feet and 6.8-feet SLRs, the peak velocity during a 100-year storm decreases to 13.6 fps and 10.2 fps, respectively. The highest water level during the 100-year storm at PCH Bridge remains similar to Alternative 1 for both SLR scenarios. The differences in peak water level between Alternative 1 and Alternative 4 is less than 0.1 feet. With reduced velocity, Alternative 4 would be more resilient to SLR than Alternative 1, but less resilient than Alternatives 2 and 3.

Habitat: Same as other alternatives, the low tide is truncated near the berm height and high tide will reach the ocean high tide condition. The beach berm is expected to breach at a similar elevation, as it will be limited by the existing cobble bed elevation. Similar to Alternative 3, Alternative 4 provides habitat expansion compared to Alternative 1, mostly at higher elevations for riparian and upland habitat. But Alternative 2 provides more habitat increases than any of the other alternatives (as discussed in Section 3.3.6).

3.4.2 Sediment Transport

Sedimentation in Upper and Lower Reach of Topanga Creek: The sediment transport model shows that the erosion/deposition mode does not change in the upper and lower reach of Topanga Creek under Alternative 4. The modeled sediment erosion and deposition volumes in the upper and lower reach among the alternatives are almost identical. Therefore, the restoration of the downstream lagoon does not pose any negative impact to the upstream reaches. Similar to Alternative 1, SLR has no or minimal impact on the erosion or accretion in the upper and lower reach of Topanga Creek.

Sedimentation in Lagoon: The sediment transport model predicts deposition in the lagoon area with Alternative 4, same as Alternative 1. There are approximately 28.7% of the total eroded sediments from upstream that will settle in the lagoon during the average storm period and 1% during the high flow period. Compared to Alternative 1, Alternative 4 has similar accretion volume in the lagoon under average flow period, and less accretion volume during the high flow period. Considering the percentage of accretion during the high flow period is low (less than 5%), such a decrease in deposition volume is considered negligible. During the high flow period, most sediment that would deposit in the lagoon during the average flow will directly be flushed to the ocean. Same as other alternatives, the sediment deposit volume in the lagoon will increase with SLR.

Sediment Transport to Ocean: The percentage of sediments predicted to be flushed to the ocean is similar for all alternatives under both the average and high flow periods. SLR could gradually reduce sediment transport to the ocean, but the amount of sediment reduction is minimal.

Potential Erosion around PCH Bridge: The modeled 100-year peak velocity at PCH Bridge of Alternative 4 is reduced by 25% compared to Alternative 1, as low as 13.6 fps. Although the velocity reduction from the existing condition in Alternative 4 is not as much as Alternatives 2 and 3, the lowered velocity at the lagoon and PCH Bridge in Alternative 4 will reduce erosion potential at the roadway embankments and its adjacent structures. Also, the new bridge will be designed to the anticipated scour.

Potential Impacts to Fish Habitat and Foraging/Nursing Area: The high velocity within the lagoon during storms will be lowered under Alternative 4 due to a longer PCH Bridge. The proposed PCH Bridge has a longer main span than Alternative 1, specially designed for fish passage. The lowered velocity would also reduce impacts to the foraging and nursing fish habitat.

3.4.3 Lagoon/Ocean Interface Dynamics

Breaching Frequency: As presented in ESA's lagoon mouth dynamics analysis (ESA 2022), Alternative 4 has increased the wetted lagoon volume perched above tides, although not as large as Alternative 2. Compared to Alternative 1, the predicted lagoon close time change in Alternative 4 is generally less than 5%. The passable events of Alternative 4 remain at 13, same as Alternative 1 under no SLR and 1.6-feet SLR. With 6.8-feet SLR, the passable storm events of Alternative 4 are reduced to 3 events, which is the lowest among all four alternatives.

Beach Berm: The proposed Alternative 4 does not change cobble berm crest elevation and lagoon breach elevation. The lagoon breaching condition will be similar to the existing condition.

SLR Impacts: SLR will build the beach berm higher, which is equivalent to adding lagoon volume in terms of lagoon breaching. The beach berm moves up with SLR. The proposed lagoon of Alternative 4 is predicted to have more inlet closure with increased sea levels. This trend is consistent for all alternatives.

3.4.4 Surf Break

This alternative also proposes the same change to the lagoon as Alternative 3. All proposed changes are to occur above and landward of the highest elevation of the beach berm. Therefore, no direct changes are proposed to the bathymetry of the surf site, nor to the beach adjacent to the surf site. In addition, there will be no changes to wave exposure and waves will continue to reach the surf site without being changed in any way. Therefore, no effects should occur to surfing from Alternative 4 compared to existing conditions.

3.4.5 Water Quality

The lagoon design proposed for Alternative 4 will not expand the dry weather wet areas in the lagoon and is not expected to provide as much potential water quality benefit compared to Alternative 2. Reducing contaminant inputs from septic systems and non-point source road runoff will be another benefit from the project which will improve water quality.

3.4.6 Vegetation

This alternative provides a significant opportunity for establishment of a diverse wetland community and increases the area of the back beach, which could potentially present an opportunity for dunes and dune vegetation. After contouring of the new lagoon area is completed, a suite of wetland species would be introduced based on soil sampling, gradient, and expected tidal and seasonal inundation levels. The habitat elevation ranges estimated by ESA were used to project proposed vegetation and create maps of habitat vegetation acreages under the no SLR, 1.6-feet SLR, and 6.8-feet SLR scenarios (see Appendix A). Developed area acreages were determined based on the proposed bridge design footprint for the alternative and existing roadways. Water levels for 1.6-feet SLR and 6.8-feet SLR conditions were mapped based on the CoSMoS "hold the line" shoreline positions for 1.6 feet and 6.6 feet of SLR respectively. Habitat acreages mapped for Alternative 4 under each SLR condition are provided in Table 3-1

Compared to the existing conditions, Alternative 4 has increased areas of open water, seasonally unvegetated flat, emergent marsh, riparian, riparian/upland transition, and upland habitats This alternative also reduces the footprint of roadways/developed/landscaped areas and increases beach area by 0.38 acre under the no SLR scenario condition.

Under the 1.6-feet SLR and 6.8-feet SLR conditions, total beach area in Alternative 4 is reduced by 1.15 and 4.08 acres respectively compared to the no SLR condition.

Based on mapping of projected habitat zones, Alternative 4 would have the largest area of beach compared to the other alternatives.

3.4.7 Biological Resources

Under this alternative, the amount of beach area is largest and the amount and quality of lagoon habitat will be about the same as Alternative 3.

Under Alternative 4, significant vegetation removal would occur in existing wetted areas. Willow trees lining the wetted banks of the creek would be protected during grading, but most other vegetation outside of the wetted areas would be removed. This alternative would also remove the existing historically imported fill to create a more natural topography and expanded open space areas. Seasonally wetted, riparian, and riparian-upland transition areas would be expanded compared to the existing condition.

Alternative 4 would have some ground disturbance during construction. Standard animal protection practices would be implemented to minimize impacts to animals. Over the long term, Alternative 4 would provide substantial benefits to animals compared to Alternative 1 because the project would increase the quantity and variety of habitats and improve the quality of habitats through removal of invasive species. Additional retreat and refuge areas are available under Alternative 4 to better buffer animals from adverse effects of climate change and SLR. For aquatic amphibians, Alternative 4 allows for the potential reestablishment of aquatic species like the California and Pacific tree frogs with the expansion and improvement of lagoon, wetland, riparian and transitional habitats. Resident and migrating fish would also benefit from additional refugia areas and better protected migration corridors found under this alternative. Alternative 4 has the most benefit potential for grunion because it maximizes the increase in beach habitat, which in turn increases spawning opportunities for California grunion. This alternative also provides improved aquatic and terrestrial habitats.

3.4.8 Recreational Opportunities

Alternative 4 presents the same recreational opportunities as existing conditions and Alternatives 2 and 3 (walking, hiking, bicycling, surfing, beach use, and bird watching), but will add more beach area than Alternatives 1, 2, and 3, a formal walking trail around the future lagoon as a northern perimeter route, a portion of the Ranch Motel will be available for accommodations, and PCH is moved inland to expand the beach area. Pedestrian walkways will include an underpass at PCH connecting the Ranch Motel and area north of PCH with the County Beach parking lot, and a beach access stair will be provided from the County Beach parking lot to the beach. Access can still be ad hoc and can still use the existing beach access road for lifeguard and emergency vehicles from PCH to the expanded beach area. A new County Lifeguard Headquarters building will be relocated to be up on the bluff. Biking will remain limited to bike lanes along both PCH and TCB. Beach use will continue to be available at the County Beach with the largest beach area available, and surfing can still occur just off of that beach. Parking will be is available along PCH south of the lagoon and along Topanga Canyon Road. Alternative 4 will increase recreation over Alternatives 1, 2, and 3 due to the largest beach area, formal perimeter lagoon walking trail, and remodeled Ranch Motel.

3.4.9 Infrastructure Changes Required

The PCH roadway and bridge are moved north under Alternative 4 as compared to previous alternatives, and the configuration of the Ranch Motel is modified as well as parking and Lifeguard Headquarters building and helipad south of PCH. However, the same infrastructure is proposed as with the previous two alternatives. A new PCH roadway and bridge are proposed over the lagoon, with reconfigured parking, relocation of the County Lifeguard Headquarters building and helipad farther north, and a new pedestrian underpass under the bridge along both east and west banks. The proposed PCH Bridge (460 feet) will be much longer than the existing bridge and the roadway alignment is moved north. Utility lines on the bridge will also have to be moved, and power may need to be moved from overhead to on the bridge. Installation of state-of-the-art stormwater runoff and non-point source pollution devices are planned for the bridge, the new roadway, and parking areas. The Lifeguard Headquarters building will be set back farthest from the ocean and farthest east. The final design will also need to include access for emergency vehicles to the upstream area and safe access to the beach.

3.4.10 Long-Term Management Issues

Similar to Alternatives 2 and 3, Alternative 4 will require maintenance but will not need it as frequently as the existing (Alternative 1) roadway, bridge, and utility lines. The new infrastructure will be longer-lasting and more resilient than existing infrastructure due to improved construction material quality and up-to-date design and construction methods. As the lagoon will be in a more natural condition regarding biogeochemical processes, there should be less management needed of vegetation, sediment, debris, water quality, etc. The lagoon is designed to be self-sustaining and that should reduce management needs. The same type of human-related management such as trespass and homelessness will existing for any alternative. Access and trespass may be more readily controllable with new infrastructure as compared to existing infrastructure. New trails, overlooks and any fences will require maintenance. Also, storm drains and culverts may need inspection and periodic maintenance. Finally, retaining walls may also require maintenance over time.

3.4.11 Sea Level Rise and Coastal Resilience

Flood protection: the peak velocity during the 100-year storm decreases with the projected SLR, but the peak water level in the lagoon remains similar under the 1.6-feet SLR scenario and increases slightly under the 6.8-feet SLR scenario. Both water level and velocity are much lower compared to Alternative 1, but higher than Alternative 2. Hence, Alternative 2 is more flood resilient, followed by Alternative 3, Alternative 4, and Alternative 1.

Sediment Transport: sediment deposition volume in the lagoon increases with SLR, and sediment delivery to the ocean decreases with increased SLR for all alternatives. Since the overall sediment delivery from the Topanga watershed to the ocean is minimal, the overall impact to the littoral cell is negligible.

Beach/Ocean Interface: the condition and trend will be similar to the existing condition. The beach berm is expected to be elevated with SLR. However, the breaching channel thalweg could remain at the current cobble berm crest elevation. Increased sea level will also inundate more higher land in the lagoon, leading to increase in tidal prism. With a larger lagoon body, it will require a larger storm to breach the inlet. However, the opening duration may become longer as it will require more wave action to close the lagoon due to the increased tidal prism. All alternatives will have a similar trend.

Surf Break: the beach profile is expected to shift landward and upward with SLR for all alternatives if there is sufficient sand in the littoral cell. The surfing conditions are likely to remain similar to the current conditions in the near term. The long-term condition will depend on the sand supply in the littoral cell. The proposed lagoon grading will not change the surfing conditions.

Water Quality: the dry weather lagoon closed water quality conditions will likely remain the same as the existing conditions, or slightly improve due to slightly larger lagoon surface. During the lagoon inlet open conditions, the water quality may improve with SLR due to potentially larger tidal range with increasing sea level. Alternative 2 has the largest lagoon body and vegetation acreage for cleaning the system, so it will perform better than other alternatives. Alternatives 3 and 4 will perform similarly, but better than Alternative 1.

Beach Area: similar to Alternative 1, beach area will gradually decrease with SLR. It is expected to be reduced from the current 4.4 acres to 3.2 acres with 1.6 feet of SLR and 0.3 acres with 6.8 feet of SLR. All alternatives will experience similar trend. Alternative 4 will retain 0.2 acre more beach area than Alternatives 1 and 2. Alternative 3 will retain 0.1 acre more beach area than Alternatives 1 and 2.

Vegetation: the wetted vegetation area (below riparian/upland transition) will increase with SLR, mainly due to the loss of beach area. The area above riparian/upland transition will slightly increase with SLR. Alternative 2 will retain more wet vegetation area than other alternatives due to lagoon restoration, followed by Alternatives 3 and 4.

Fish Passage: SLR helps increase the passable area and lower velocities in the lagoon basin and at the PCH Bridge. In the near term with 1.6 feet of SLR, the number of passable events and the accumulative

passable area will remain the same as Alternative 1. In the long-term with 6.8 feet of SLR, the number of passable events will be reduced from 10 to 3 and the accumulated passable area will be also reduced compared to Alternative 1. In general, the resilience may be similar for alternatives in the short time, and Alternatives 1, 2 and 3 will be better than Alternative 4 in the long term.

Infrastructure: The helipad and Lifeguard Headquarters are arranged with staff, emergency, and ADA parking between these two functions and accommodates sight lines required for the expanded recreational beach area. This alternative maximizes managed retreat, recreational beach area (and/or living shoreline features such as dunes) and so provides the most SLR resilience.

3.4.12 Cost Estimates

The opinion of the construction cost includes the lagoon grading and building a new PCH Bridge over the lagoon. The ongoing maintenance is necessary but is not included in the cost estimate.

For the lagoon grading, the estimated construction cost is $7.6 million based on the items considered including mobilization of equipment, earthwork and stockpiling, irrigation and planning, demobilization of equipment, construction support, and material disposal as well as hazard material tipping fee. Assumptions included in Alternative 2 also apply to this Alternative.

For the new PCH Bridge and roadway of the northern alignment, the estimated construction cost is $42.6 million, which was based on Caltrans price index for the first quarter ending March 2021. The utility relocation and the right-of-way portion of the cost estimate was escalated to year 2021 from year 2004 when the 2004 PSR-PDS was prepared. Table 3-2 compares estimates of the new construction cost, not including any maintenance cost.

TABLE 3-2: SUMMARY OF CONSTRUCTION COST ESTIMATES (MILLION)

Alternative	Lagoon Grading	PCH Bridge	Subtotal
Alt1	0	0	0
Alt2	$8.6	$42.1	$50.7
Alt3	$6.9	$42.1	$49.0
Alt4	$7.6	$42.6	$50.2

3.5 Summary of Alternatives Analyses

As previously stated, each of the alternatives was analyzed for their performance according to various criteria using numerical and analytical modelling tools. Criteria include hydraulics/hydrology, sediment transport, lagoon/ocean interface dynamics, surf break, water quality, vegetation, biological resources, recreational opportunities, infrastructure changes required, long-term management issues, SLR and coastal resilience, and relative costs. Table 3-3 summarizes the general order of performance ranking. For example, the performance of hydraulics and hydrology, Alternative 2 (Alt2) will perform better than Alt3, Alt3 will perform better than Alt4, and Alt4 will perform better than Alt1; hence the performance order is Alt2, Alt3, Alt4, Alt1. An "=" sign indicates a similar performance between the two alternatives. For example, the performance of sediment transport, "Alt1 = Alt2 = Alt3 = Alt4" indicates all alternatives have a similar performance in terms of. Excluding items (Items No. 2, 3 and 4) that have the same ranking, there are 9 remaining items. Alternative 2 ranked first 4 times and tied 2 times with Alternatives 3 and 4. There are 3 times that Alternative 3 is better than Alternative 4 and 2 times that Alternative 4 is better than Alternative 3. The cost of Alternative 3 is less than Alternative 4.

In summary, the ranking based on the technical analyses is Alt2, Alt3, Alt4, and Alt1.

TABLE 3-3: GENERAL PERFORMANCE RANKING BASED ON TECHNICAL ANALYSES

Item No.	Technical Aspects	The Order of Ranking
1	Hydraulics/Hydrology	Alt2 > Alt3 > Alt4 > Alt1
2	Sediment Transport	Alt1 = Alt3 = Alt4 = Alt2
3	Lagoon/Ocean Interface	Alt1 = Alt3 = Alt4 = Alt2
4	Surf Conditions	Alt1 = Alt3 = Alt4 = Alt2
5	Water Quality	Alt2 > Alt3 = Alt4 > Alt1
6	Vegetation	Alt2 > Alt3 > Alt4 > Alt1
7	Biological Resources	Alt2 > Alt3 > Alt4 > Alt1
8	Recreational Opportunities	Alt4 > Alt3 > Alt2 > Alt1
9	Infrastructure Changes	Alt2 = Alt3 = Alt4 > Alt1
10	Long-term Management Cost (less to more)	Alt2 = Alt3 = Alt4 < Alt1
11	SLR/Coastal Resilience	Alt4 > Alt2 = Alt3 > Alt1
12	Construction Cost (less to More)	Lagoon grading: Alt1 < Alt3 < Alt4 < Alt2 PCH bridge: Alt1 < Alt2 = Alt3 < Alt4
	Summary	**Alt2 > Alt3 > Alt4 > Alt1**

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Topanga Lagoon Habitat

Alternative 1, No Sea Level Rise

moffatt & nichol

1 INCH = 200 FEET

0 100 200 400 600 FT

N W E S

Project Boundary

Habitat

- Open water (1.21)
- Seasonally shallow open water (0.42)
- Seasonally unvegetated flat (0.38)
- Emergent marsh (0.39)
- Saltgrass (0.07)
- Riparian (2.32)
- Sand (3.05)
- Riparian/upland transition (6.06)
- Coastal sage scrub (3.66)
- Upland (11.15)
- Disturbed upland/trails (0.49)
- Roadways/developed/landscaped (12.43)

RCD Resource Conservation District of the Santa Monica Mountains

July 14, 2021

PRELIMINARY

Topanga Lagoon Habitat

Alternative 1, 1.6 ft Sea Level Rise

moffatt & nichol

1 INCH = 200 FEET

0 100 200 400 600 FT

N W E S

Project Boundary

Habitat Type (Acres)

- Open water (5.07)
- Seasonally shallow open water (0.08)
- Seasonally unvegetated flat (0.99)
- Emergent marsh (0.24)
- Coastal sage scrub (3.65)
- Saltgrass (0.01)
- Riparian (1.62)
- Sand (0.27)
- Riparian/upland transition (6.06)
- Upland (11.16)
- Disturbed upland/trails (0.49)
- Roadways/developed/landscaped (11.99)

RCD Resource Conservation District of the Santa Monica Mountains

July 14, 2021

PRELIMINARY

Topanga Lagoon Habitat

Alternative 1, 6.8 ft Sea Level Rise

moffatt & nichol

1 INCH = 200 FEET

0 100 200 400 600 FT

N W E S

Topanga Lagoon Habitat

Alternative 2, No Sea Level Rise

moffatt & nichol

1 INCH = 200 FEET

0 100 200 400 600 FT

N W E S

Topanga Lagoon Habitat

Alternative 2, 1.6 ft Sea Level Rise

moffatt & nichol

1 INCH = 200 FEET

0 100 200 400 600 FT

N W E S

Topanga Lagoon Habitat

Alternative 2, 6.8 ft Sea Level Rise

moffatt & nichol

1 INCH = 200 FEET

0 100 200 400 600 FT

N W E S

Project Boundary
Proposed Bridge

Habitat Type (Acres)

- Open water (0.08)
- Seasonally shallow open water (0.44)
- Seasonally unvegetated flat (0.28)
- Emergent marsh (0.5)
- Riparian (6.42)
- Sand (4.42)
- Riparian/upland transition (6.34)
- Coastal sage scrub (2.98)
- Upland (14.37)
- Roadways/developed/landscaped (5.78)

RCD Resource Conservation District of the Santa Monica Mountains

July 7, 2021

PRELIMINARY

Topanga Lagoon Habitat

Alternative 3, No Sea Level Rise

moffatt & nichol

1 INCH = 200 FEET

0 100 200 400 600 FT

N W E S

Topanga Lagoon Habitat

Alternative 3, 1.6 ft Sea Level Rise

moffatt & nichol

1 INCH = 200 FEET

0 100 200 400 600 FT

N W E S

Topanga Lagoon Habitat

Alternative 3, 6.8 ft Sea Level Rise

moffatt & nichol

1 INCH = 200 FEET

0 100 200 400 600 FT

N W E S

Topanga Lagoon Habitat

Alternative 4, No Sea Level Rise

moffatt & nichol

1 INCH = 200 FEET

0 100 200 400 600 FT

N W E S

Topanga Lagoon Habitat

Alternative 4, 1.6 ft Sea Level Rise

moffatt & nichol

1 INCH = 200 FEET

0 100 200 400 600 FT

N W E S

Topanga Lagoon Habitat

Alternative 4, 6.8 ft Sea Level Rise

moffatt & nichol

1 INCH = 200 FEET

0 100 200 400 600 FT

N W E S

REPORT
Produced for Resource Conservation District of the Santa Monica Mountains
November 18, 2022

moffatt & nichol

TOPANGA LAGOON RESTORATION

Technical Report for
Hydraulics, Sediment Transport and Sea Level Rise Analyses

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Table of Contents

1 Introduction 1
2 Scope of Work 3
3 Data Collection and Review 4
3.1 Summary of Existing Data Review 4
3.2 New Data Collection 4
3.2.1 Lagoon Topography and Bathymetry 4
3.2.2 Water Levels 5
3.2.3 Cross-section 6
3.2.4 Stream Flows 7
4 Alternatives 10
4.1 Alternative 1 – No Project/Managed Decline 11
4.2 Alternative 2 – Maximum Lagoon Habitat, Removal of Motel 11
4.3 Alternative 3 – Limited Lagoon Habitat Expansion, Retention of Motel 12
4.4 Alternative 4 – Maximum Managed Retreat, Partial Motel Retention 12
4.5 Alternatives Comparison 17
4.6 Habitat Mapping 17
5 Beach Morphology and Breach Analyses 19
6 One-dimensional Sedimentation Modeling 21
6.1 Model Description 21
6.2 Model Area and Cross Sections 21
6.3 Model Boundary and Modeling Periods 24
6.3.1 Rating Curve Development 24
6.3.2 Modeling Periods 24
6.3.3 SLR Scenarios 25
6.3.4 Model Boundary Conditions 25
6.4 1D Sedimentation Model Results 28
6.4.1 No SLR Condition 28
6.4.2 SLR Condition 33
6.5 Summary of Findings 35
7 Two-dimensional Hydraulic Modeling 37
7.1 Model Description 37
7.2 Model Approach and Scenarios 37
7.2.1 Channel Breach Scenarios for Existing Condition (No SLR) 37
7.2.2 Channel Breach Scenarios for SLR Condition 38
7.3 Model Domain and Bathymetry 39
7.4 Model Calibration 46
7.4.1 Water Levels During Calibration Period and Lagoon Mouth Photos 46
7.4.2 Boundary Conditions 47
7.4.3 Calibration Results 48
7.5 2D Hydraulic Model Results 49
7.5.1 No SLR Condition 49
7.5.2 SLR Condition 54
7.6 Fish Passable Area Analysis 59
7.7 Summary of Findings 63
8 References 64

List of Figures

Figure 1.1: Topanga Lagoon Restoration Location and Extent 1
Figure 2.1: Topanga State Park General Plan in 2012 3
Figure 3.1: Water Level Monitoring location in Topanga Lagoon 5
Figure 3.2: Water Level Monitoring location near Topanga Creek MM2 6
Figure 3.3: Monitored Water Levels at Gage 1 and Gage 2 6
Figure 3.4: Surveyed Cross-section at Gage 2 7
Figure 3.5: Hourly Stream Flow Data at Station F54C-R Topanga Creek above Mouth of Canyon 8
Figure 4.1: Alternative 1 – No Project/No Build, Managed Decline 13
Figure 4.2: Alternative 2 – Maximum Lagoon Habitat, Removal of Motel 14
Figure 4.3: Alternative 3 – Limited Lagoon Habitat Expansion, Retention of Motel 15
Figure 4.4: Alternative 4 – Maximum Managed Retreat, Partial Motel Retention 16
Figure 5.1: Observed Breach Channel Centerlines from 2005 – 2020 19
Figure 6.1: Model Area of 1D Sedimentation Model 22
Figure 6.2: Updated Cross-section Locations in 1D Model Network 23
Figure 6.3: Rating Curve Developed at MM2/M&N Gage using Mike11 HD Model 24
Figure 6.4: Comparison of Modeled and Measured Flow Rate at MM2/F54C-R Gage 27
Figure 6.5: Water Level Time Series Applied at Downstream Ocean Boundary 27
Figure 6.6: Flow Rate Time Series Applied at Upstream Boundary (The Confluence) 28
Figure 6.7: Sediment Analysis Reaches of the 1D Model network 31
Figure 6.8: SLR Impacts to Lagoon Sedimentation For 1996-2001 Average Flow Period 33
Figure 6.9: SLR Impacts to Sediment Transport TO Ocean For 1996-2001 Average Flow Period 34
Figure 6.10: SLR Impacts to Lagoon Sedimentation For 1979-1984 High Flow Period 34
Figure 6.11: SLR Impacts to Sediment Transport TO Ocean For 1979-1984 High Flow Period 35
Figure 7.1: Model Domain and Flexible Mesh of 2D Hydrodynamic Model 40
Figure 7.2: Model Domain and Flexible Mesh of Zoomed in Lagoon Area 40
Figure 7.3: Model Bathymetry for Alternatives 42
Figure 7.4: Zoomed in Views of Breach Inlet Bathymetry for Straight Channel Alignment 43
Figure 7.5: Zoomed in Views of Breach Inlet Bathymetry for Migrated Channel Alignment 44
Figure 7.6: Zoomed in Views of Breach Inlet Bathymetry for Extra-long Migrated Channel Alignment 45
Figure 7.7: Water Level Measurements at Gage 1 Overlaid with Ocean Tides and Freshwater Discharge 46
Figure 7.8: Lagoon Mouth Photos Captured during The Calibration Period 47
Figure 7.9: Comparison of Stream Flow at MM2 48
Figure 7.10: Comparison of Measured and Modeled Water Levels at Gage 1 in the Lagoon 49
Figure 7.11: Representative Cross-sections Plotted on Model Bathymetry 50
Figure 7.12: Representative Cross-sections Plotted on Modeled Maximum Water Depth 51
Figure 7.13: Modeled Velocities at Upstream Cross-sections (Numbered 1 to 4 from Upstream to Downstream) 52
Figure 7.14: Modeled Velocities at Lagoon and Breach Channel Cross-sections (Numbered 1 to 2 from Upstream to Downstream) 53
Figure 7.15: Velocity vs. Discharge Rating Curves at Lagoon and Breach Channel With 1.6-ft SLR, Condition A 55
Figure 7.16: Velocity vs. Discharge Rating Curves at Lagoon and Breach Channel With 6.8-ft SLR, Condition A 56
Figure 7.17: Water Depth vs. Discharge Rating Curves at Lagoon and Breach Channel With 1.6-ft SLR, Condition A 57
Figure 7.18: Water Depth vs. Discharge Rating Curves at Lagoon and Breach Channel With 6.8-ft SLR, Condition A 58

List of Tables

Table 3-1: Data Gaps Identified after Reviewing Existing Data 4
Table 3-2: Percentage of Flow Exceedance at Station F54C-R (1996 – 2019) 8
Table 3-3: Extreme Peak Flow at Station F54C-R by Return Period 8
Table 3-4: Top 30 Annual Peak Flows from 1930 to 2018 at F54C-R Gage 9
Table 4-2: Summary Of Habitat Acreage 17
Table 4-1: Comparisons of Alternatives (RCDSMM, 11/29/2021) 18
Table 5-1: Breach Inlet Dimension Ranges and Typical Sizes Provided by ESA 20
Table 5-2: Recommended Breach Channel Profiles by ESA 20
Table 6-1: Creek Cross-Sections 22
Table 6-2: Projected Sea Level Rises at Topanga Lagoon (California OPC 2018) 25
Table 6-3: Total Sediment Accretion and Erosion Volumes[1,2] from 1996-2001 Simulation (Cubic Yard) 31
Table 6-4: Total Sediment Accretion and Erosion Volumes[1,2] from 1979-1984 Simulation (Cubic Yard) 32
Table 6-5: Estimated Peak Current and Water Levels Under The PCH Bridge During The 1980 Storm 33
Table 6-6: Estimated Peak Velocity and Water Levels Under the PCH Bridge During 1980 Storm With SLR 35
Table 6-7: 1-D Model Result Comparisons Among Alternatives and SLR Impacts 36
Table 7-1: Modeled Channel Breach Scenarios for Each Project ALternative 38
Table 7-2: Breach Scenarios Modeled with 2D hydrodynamic Model with SLR – COndition A 39
Table 7-3: Breach Scenarios Modeled with 2D hydrodynamic Model with SLR – COndition B 39
Table 7-4: Bathymetry Data Source Inventory and Mesh Resolution 39
Table 7-5: Summary of Calibrated Roughness Coefficients 48
Table 7-6: 5-year Storm Peak Velocities (fps) Under the PCH Bridge [1,2] 53
Table 7-7: Comparison OF Velocities in fps for Wide Straight Channel 54
Table 7-8: Channel Breach Scenario Codes for Historical Breach Events – No SLR (Provided by ESA) 59
Table 7-9: Channel Breach Scenario Codes by Breach Events – 1.6-ft SLR (Provided by ESA) 59
Table 7-10: Channel Breach Scenario codes by Breach Events – 6.8-ft SLR (Provided by ESA) 60
Table 7-11: Estimated Passable Area in Sq. FT Under PCH Bridge By Breach Events – No SLR, MHHW 61
Table 7-12: Estimated Passable Area in Sq. FT Under PCH Bridge By Breach Events – No SLR, MLLW 61
Table 7-13: Estimated Passable Area in Sq. FT Under PCH Bridge By Breach Events – 1.6ft SLR, MHHW 61
Table 7-14: Estimated Passable Area in Sq. FT Under PCH Bridge By Breach Events – 1.6ft SLR, MLLW 61
Table 7-15: Estimated Passable Area in Sq. FT Under PCH Bridge By Breach Events – 6.8ft SLR, MHHW 62
Table 7-16: Estimated Passable Area in Sq. FT Under PCH Bridge By Breach Events – 6.8ft SLR, MLLW 62

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This study is qualified in its entirety by, and should be considered in light of, these limitations, conditions and considerations.

Glossary

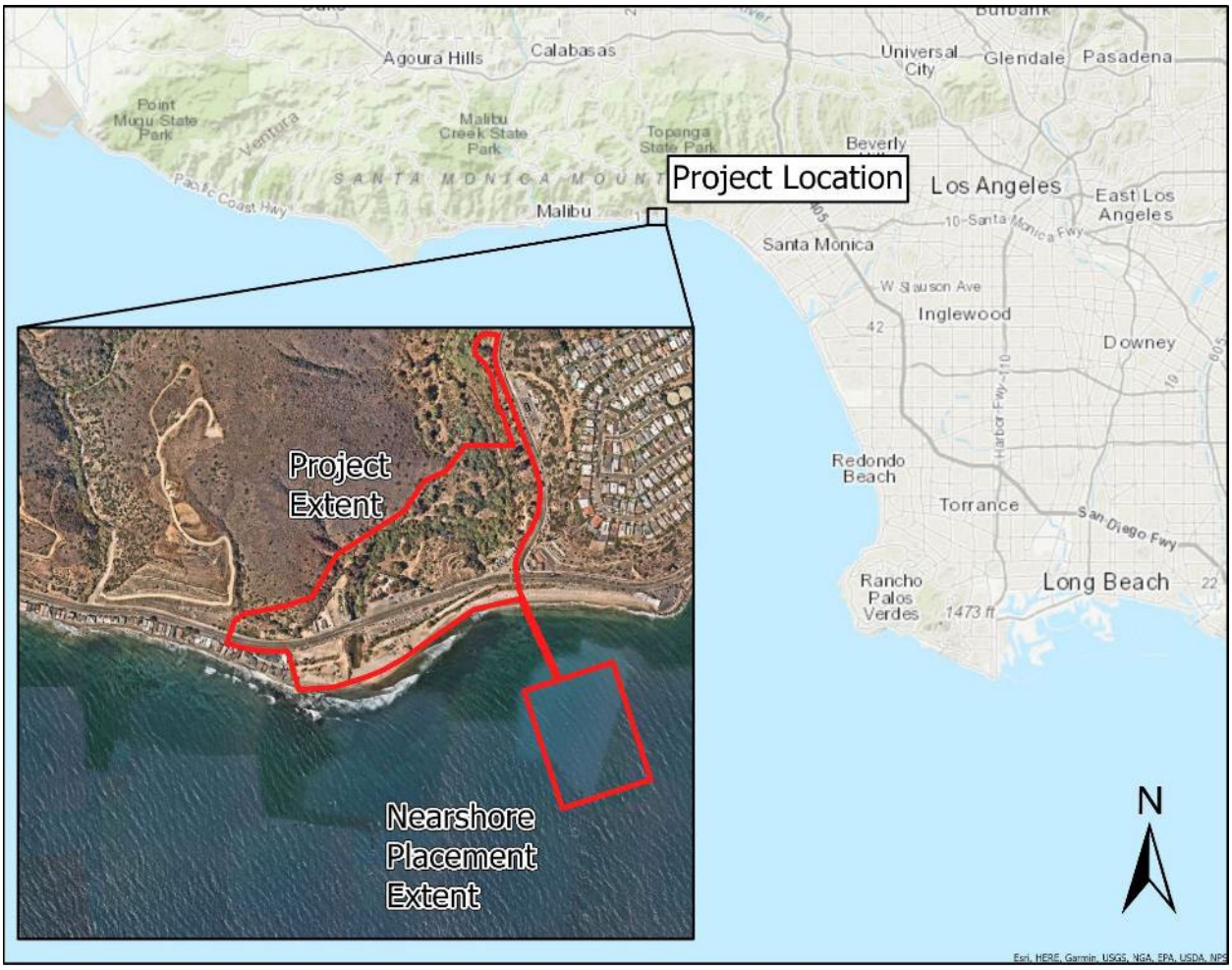
1D	One-dimensional
2D	Two-dimensional
cfs	Cubic feet per second
cms	Cubic meter per second
CO-OPS	Center for Operational Oceanographic Products and Services
cy	Cubic yards
DHI	Danish Hydraulic Institute
FM	Flexible Mesh
fps	Feet per second
ft	Feet
LACDPW	Los Angeles County Department of Public Works
LARIAC	Los Angeles Region Imagery Acquisition Consortium
LIDAR	Light Detection and Ranging
MHHW	Mean Higher High Water
MLLW	Mean Lower Low Water
MM2	Mile Marker 2
MSL	Mean Sea Level
M&N	Moffatt & Nichol
OPC	Ocean Protection Council
PCH	Pacific Coast Highway
RCDSMM	Resource Conservation District of the Santa Monica Mountains
SLR	Sea Level Rise
TAC	Technical Advisory Committee
TCB	Topanga Canyon Boulevard

1 Introduction

Moffatt & Nichol (M&N) is contracted with Resource Conservation District of the Santa Monica Mountains (RCDSMM) to provide professional services to restore estuarine lagoon habitat at Topanga Lagoon. Topanga Lagoon is the lagoon of lower Topanga Creek where it empties into the Pacific Ocean in Los Angeles County, California. The focused area of this project is the lagoon and riparian areas between Topanga State Beach and approximately 2,300 feet (ft) upstream of Pacific Coast Highway (PCH) Bridge. Figure 1.1 illustrates the lagoon restoration planning area. The entire planning area is approximately 41.6-acres.

The tributary to Topanga Lagoon, Topanga Creek drains an 18-square-mile watershed in the Santa Monica Mountains to the Pacific Ocean. It conveys flood flows to the lagoon during rain events and low flows during non-rain events. A beach berm, which typically develops during summer wave conditions, restricts direct flow into the Pacific Ocean. The beach berm is breached during fluvial storms with sufficient flow volumes and velocities, and during combined large coastal storm wave and king tide events. This allows seawater to inflow into the lagoon, thus creating a connection, and provides fish passage opportunities. The restoration priority for endangered tidewater gobies and southern steelhead trout in Topanga Lagoon and its tributary was identified by the Santa Monica Mountains Steelhead Habitat Assessment (CalTrout 2006) and the Santa Monica Mountains National Recreation Area General Management Plan (National Park Service 2002).

FIGURE 1.1: TOPANGA LAGOON RESTORATION LOCATION AND EXTENT



The restoration of Topanga Lagoon would significantly benefit the local community by:

- Restoring Topanga Lagoon composed of wetland, transitional, and upland habitat to the greatest extent possible;
- Restoring natural biogeochemical processes by removing constraining fill materials, expanding the lagoon footprint, and restoring a more natural creek and lagoon system;
- Improving the quality, value, and function of wetland and transitional habitat areas;
- Improving ecological function of the lagoon by maintaining/improving the endangered tidewater gobies and improving fish passage for southern steelhead trout;
- Improving water quality as a result of a larger lagoon area while accommodating for the projected increase in water levels due to sea level rise (SLR);
- Alleviating current problems of flooding, problematic sedimentation, and invasion of non-native plant species;
- Planning for coastal resilience to climate change and SLR; and
- Enhancing visitors' experience.

The larger the area available for a system to establish, the better the conditions and chances for it to succeed. Large, undeveloped watershed and lagoon systems evolve to be as efficient as possible under the physical laws of thermodynamics. Small, constrained systems are not able to optimize their processes to become maximally efficient and functional.

Increasing the size of the lagoon and associated habitat areas will enable the system to revert to a more natural condition, and closer to the historical condition. More space provides a better opportunity for the entire system to establish functional processes of:

- Hydrology/Hydraulics – with channel meandering and establishment of a more natural gradient, profile, cross-sectional area, and shape;
- Sedimentation – formation of sand/cobble bars from upstream and ocean sources;
- Soil formation - soil structure, horizon development, and nutrient retention for plant roots;
- Vegetation colonization – native plant establishment and sustainability;
- Soil and water chemistry - improved sediment and water quality for native plants and animals;
- Food pyramid – re-establishment of natural trophic levels for higher level species; and
- Faunal colonization – by benthic, fish, crustaceans, birds, mammals as part of the food pyramid.

These conditions will all lead to restored habitat areas, flood plain processes, and mouth breaching processes. The larger the lagoon, the more space is available for these processes to occur, the more constituents that are available for the building blocks of ecological foundations, and the better these processes can work. The more space that is provided maximizes the freedom they have to be dynamic and evolve. The historic lagoon was as functional as possible (highly functional), considering site constraints of its 30-acre footprint. The existing lagoon is so highly constrained by its 2-acre footprint that it is low-functioning and over-run by non-natives that can survive in the impaired conditions. Restoring the lagoon back toward the historic footprint will massively improve the conditions needed for re-establishment of functional natural processes and habitat.

Comprehensive technical analyses on hydrology and hydraulics, sediment transport, SLR impacts, beach morphology, and fish passage assessment were conducted for both existing and proposed alternatives. These analyses are discussed in detail in the following sections.

2 Scope of Work

The engineering scope of work is composed of the following tasks:

- Task 1 - Stakeholder Meetings and Technical Advisory Committee (TAC) Meetings
- Task 2 - Data Collection and Data Gap Analysis
- Task 3 - Provide 30% Design Plans for Three Project Alternatives

This report mainly focuses on the analyses and findings of Task 2 and Task 3. Task 2 consists of reviewing existing data and conducting technical studies to assist the design of Topanga Lagoon and beach restoration with the goal of developing a self-sustaining lagoon based on current conditions. In Task 3, three project alternatives were developed to restore ecological function, increase resiliency to SLR and climate change, and enhance visitors' experience. The restored lagoon will also improve fish passage for the endangered southern steelhead trout and tidewater gobies, among other native species. The three alternatives were developed based on the Topanga State Park General Plan approved by the State Park and Recreation Commission in 2012, shown in Figure 2.1, and feedbacks from the public and project's TAC during 2019-2021.

FIGURE 2.1: TOPANGA STATE PARK GENERAL PLAN IN 2012

Source: California State Parks 2020

3 Data Collection and Review

3.1 Summary of Existing Data Review

All available previous technical studies and data have been reviewed in Task 2 of the project. After the existing data review, data gaps have been identified and are listed in Table 3-1. The status of filling each data gap is also included in the table. The one presently remaining gap is the existing utilities map.

TABLE 3-1: DATA GAPS IDENTIFIED AFTER REVIEWING EXISTING DATA

No.	Data Gap:	Description	Status	Action Required by	Completion Date
1	Utilities	Utilities within project boundary	Pending	RCDSMM	N/A
2	Survey benchmark	Project survey benchmark	Established	KDM Meridian Inc.	January 2020
3	Buildings	Building outlines	Digitized from LARIAC4 aerial imagery	M&N	January 2020
4	Manmade features	Fences, signs, AC pavement, stairs, etc.	Digitized from LARIAC4 aerial imagery	M&N	January 2020
5	Caltrans ROW	Caltrans right-of-way	Acquired from Caltrans	M&N	November 2021
6	Bathymetry	Lagoon bathymetry	Field surveyed	KDM Meridian Inc.	January 2021
7	Water levels	Water levels at lagoon and MM2	MM2 complete Lagoon, ongoing	M&N	MM2, July 2020 Lagoon: ongoing
		gage height	Field surveyed	KDM Meridian Inc.	July 2020
8	Spot elevations	Topographic spot elevations	Field surveyed	KDM Meridian Inc.	January 2020
9	Stream flow	Stream flow data at F54C-R Topanga Creek above Mouth of Canyon (1996-2019)	Received from LACDPW	M&N	November 2019
10	Cross-section	Cross-section at Topanga Creek, 400 ft southerly of Topanga Canyon Blvd. 2-mile bridge	Field surveyed	Daniel P. MacNeil Inc.	February 2020

LARIAC: Los Angeles Region Imagery Acquisition Consortium
LACDPW: Los Angeles County Department of Public Works
MM2: Mile Marker 2

3.2 New Data Collection

As identified in Table 3-1, new data such as bathymetry, water levels, and cross-sections were collected by multiple agencies and consultants to fill the data gaps. This section mainly discusses the data that were used in the hydraulic and beach morphologic modelling analyses:

- Lagoon topography and bathymetry;
- Water levels at Topanga Creek and Topanga Lagoon;
- Cross-section at Topanga Creek (where the water levels have been monitored); and
- Stream flows at Topanga Creek Gage F54C-R.

3.2.1 Lagoon Topography and Bathymetry

The project team developed a new lagoon topographic and bathymetry base map using the latest Light Detection and Ranging (LIDAR) data and verified with limited supplemental survey points in the lagoon. The new topographic and bathymetric data acquired are listed below.

- 2015-2016 LARIAC4 LIDAR for Los Angeles County is used for Topanga Lagoon restoration area and its tributary Topanga Creek. This LIDAR dataset is limited to dry areas when the areas were mapped and has been verified with spot elevations surveyed in January 2020 (KDM Meridian Inc. 2020). The differences between the LIDAR and spot elevations are all less than 1 ft.
- 2009 USACE NCMP LIDAR for southern California (USACE 2009) is used for the offshore area .
- Supplemental Point Survey: Spot elevations in the lagoon wet areas not covered in the LIDAR, and creek with dense vegetations were surveyed by KDM Meridian Inc. in January 2020. These point data are used to supplement the LIDAR data.

3.2.2 Water Levels

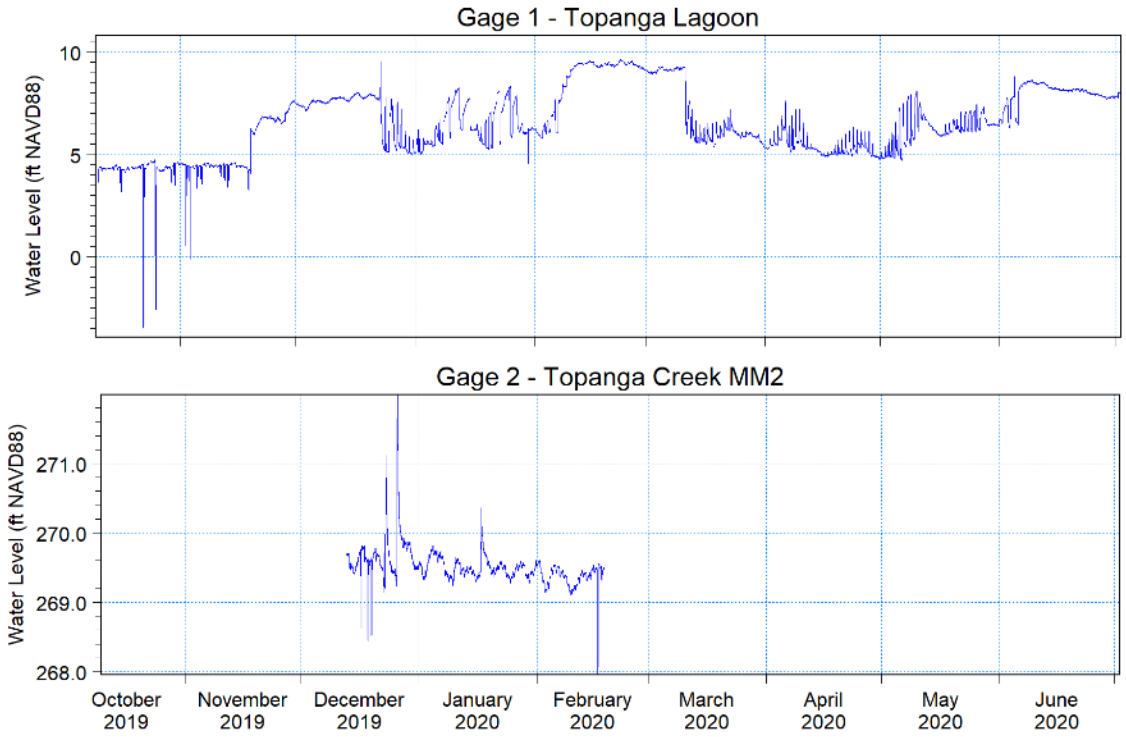
Pressure gages were deployed in two locations to record water levels: Gage 1 is presently located in the Topanga Lagoon, approximately 100 ft downstream of the PCH Bridge; and Gage 2 (34°3'49" N 118°35'15" W) was deployed at Topanga Creek MM2, about 400 ft south of the Topanga Canyon Blvd (Route 27) Bridge. The locations of the two gages are illustrated in Figure 3.1 and Figure 3.2, respectively.

Water levels collected from Gage 1 cover approximately 9 months from October 10, 2019 to July 2, 2020. A new gage was deployed again at Gage 1 location in October 2021 before the rain season. Gage 2 was deployed for a shorter period from December 12, 2019 to February 18, 2020. Figure 3.3 plots the monitored water levels at both locations in feet, relative to NAVD88. Gage 1 water level data helped identify the lagoon breach conditions and were used for calibrating the hydraulic model discussed in Section 7. Gage 2 is located about 2 miles upstream, in a relatively heavily vegetated area. The water depth at Gage 2 is less than 1 ft during dry conditions (no rainfall). During its deployment, three storm events were captured. Compared with dry conditions, the water level increases quickly and significantly during a storm.

FIGURE 3.1: WATER LEVEL MONITORING LOCATION IN TOPANGA LAGOON

FIGURE 3.2: WATER LEVEL MONITORING LOCATION NEAR TOPANGA CREEK MM2

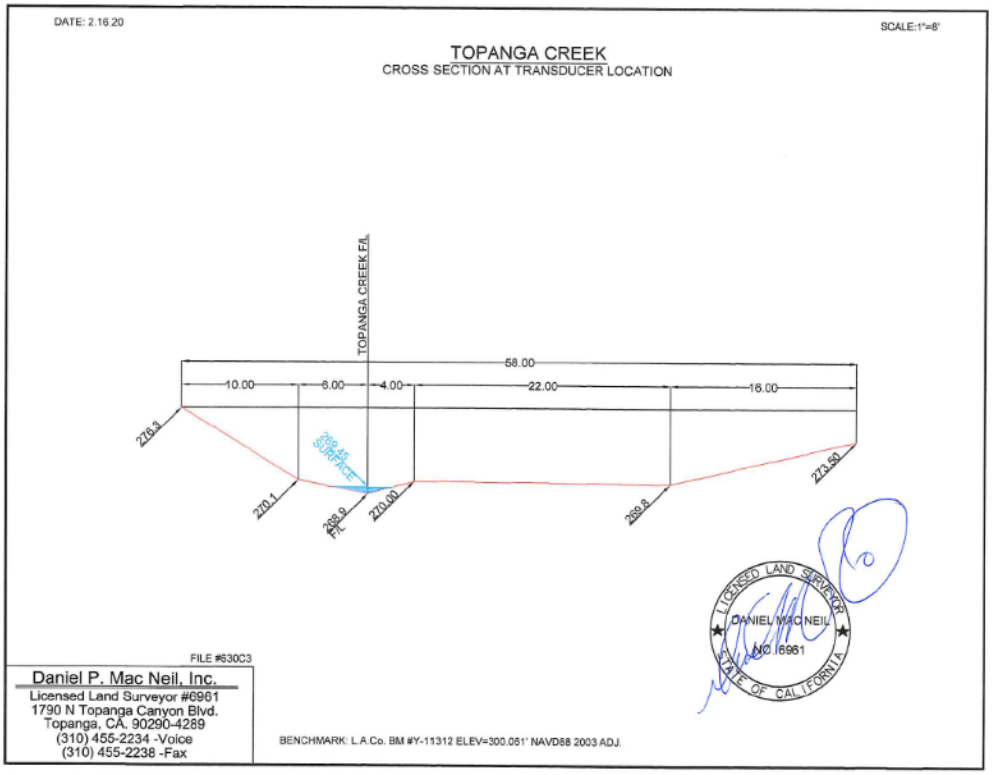
FIGURE 3.3: MONITORED WATER LEVELS AT GAGE 1 AND GAGE 2



3.2.3 Cross-section

The cross-section at Gage 2 was surveyed by Daniel P. MacNeil Inc. in February 2020. The survey document indicated the cross-section location as "*the pressure transducer location approx. 400' southerly of the Topanga Canyon Blvd. 2-mile bridge over Topanga Creek*" (MacNeil 2020). Figure 3.4 is the cross-section sketch with elevations marked in feet relative to NAVD88. The thalweg of the channel is at an elevation of 268.9 ft NAVD88. The water surface was at 269.45 ft NAVD88 when the measurements were initially taken and varied afterward depending on runoff conditions. The floodplain on both sides of the creek was also included in the survey. The cross-section survey expands up to 276.3 ft NAVD88 on the west bank and 273.5 ft NAVD88 on its east bank.

FIGURE 3.4: SURVEYED CROSS-SECTION AT GAGE 2

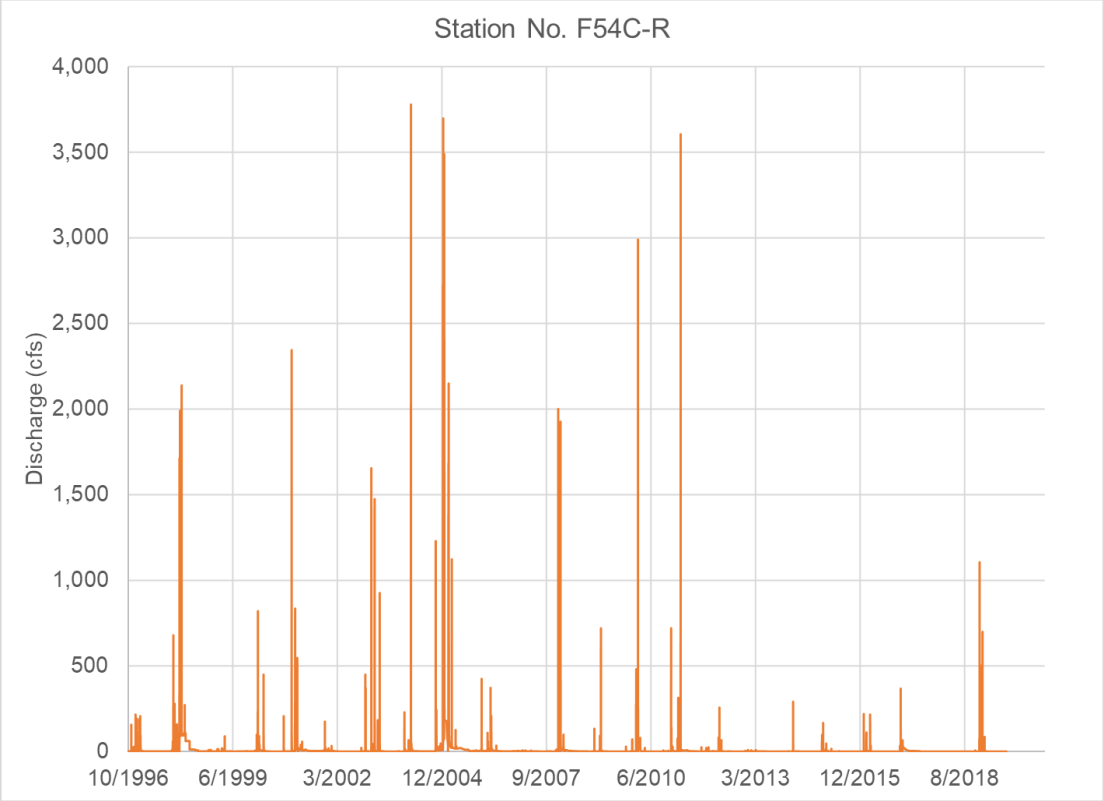


3.2.4 Stream Flows

Hourly corrected depth and instantaneous flow data for gage station F54C-R (Topanga Creek above Mouth of Canyon) from October 1996 through September 2019 were provided by the LACDPW in November 2019. The gage station F54C-R is close to Gage 2, shown in Figure 3.2, approximately 2 miles north of Topanga Beach. Figure 3.5 presents the 23-year continuous hourly flow data received from the LACDPW, and the highest flow in the record is 3,800 cubic feet per second (cfs), that occurred on February 26, 2004. The discharges during storms generally spike from very small base flows to a storm peak in a relatively short period (usually less than 24 hours), and the magnitude of the peak flow varies largely by storm. As shown in Table 3-2, only 1% of the entire 23-year period hourly flow exceeds 103 cfs, and 90% of the time the hourly flow is below 7 cfs.

Additionally, annual peak flows from 1930 to 2018 at the same station are available from the LACDPW's hydrological report (LACDPW 2019). The 90-year long-term annual peak flow data, neglecting any flows that are less than 400 cfs, was used to develop the extreme flow conditions. The resulting extreme flows at Station F54C-R are listed in Table 3-3. The 5-year and 100-year extreme flows are 4,700 cfs and 20,020 cfs, respectively. Table 3-4 ranks the top thirty peak flows and the corresponding water years. The highest storm event occurred in February 1980 with a peak flow of 20,200 cfs, slightly higher than a 100-year event. The third highest event that occurred in January 1983 is close to a 25-year event.

FIGURE 3.5: HOURLY STREAM FLOW DATA AT STATION F54C-R TOPANGA CREEK ABOVE MOUTH OF CANYON



Source: LACDPW 2019

TABLE 3-2: PERCENTAGE OF FLOW EXCEEDANCE AT STATION F54C-R (1996 – 2019)

Percentage of Exceedance	Corresponding Hourly Discharge (cfs)
0.1%	622.3
1%	103.0
5%	14.7
10%	6.9
25%	2.3
50%	0.7
100%	0.0

TABLE 3-3: EXTREME PEAK FLOW AT STATION F54C-R BY RETURN PERIOD

Return Period (year)	Peak Flow (cfs)
1	251
2	1,946
5	4,709
10	7,279
25	11,465
50	15,360
100	20,019

TABLE 3-4: TOP 30 ANNUAL PEAK FLOWS FROM 1930 TO 2018 AT F54C-R GAGE

Rank	Water Year	Peak Flow Date	Peak Flow (cfs)
1	1979-80	Feb 16	20,200
2	1968-69	Jan 25	12,200
3	1982-83	Jan 27	10,200
4	1977-78	Mar 4	10,127
5	1937-38	Mar 2	9,300
6	2007-08	Jan 5	8,813
7	1940-41	Feb 20	8,700
8	2010-11	Mar 20	6,240
9	1951-52	Jan 15	6,050
10	1985-86	Feb 14	5,135
11	1943-44	Feb 22	5,070
12	1933-34	Dec 31	4,510
13	2004-05	Dec 28	3,980
14	1957-58	Apr 3	3,950
15	1972-73	Feb 11	3,840
16	2003-04	Feb 26	3,780
17	1965-66	Dec 29	3,500
18	2009-10	Feb 6	3,370
19	1970-71	Jan 29	3,020
20	2000-01	Jan 11	2,820
21	1961-62	Feb 10	2,790
22	1983-84	Dec 25	2,612
23	1978-79	Mar 27	2,490
24	1997-98	Feb 23	2,470
25	1966-67	Jan 24	2,280
26	1942-43	Jan 22	2,200
27	1953-54	Feb 13	2,090
28	1973-74	Jan 7	2,060
29	1974-75	Mar 6	1,670
30	2002-03	Feb 12	1,660

4 Alternatives

Four alternatives were identified to restore the Topanga Lagoon. Three Build Alternatives (Alternatives 2 through 4) and one No Project/No Build- Managed Decline Alternative (Alternative 1). These alternatives allow consideration of the benefits and challenges of the different restoration approaches, and a final "preferred" alternative will be selected at the end of the environmental review process that best meets the Project's needs while minimizing adverse environmental impacts. The Proposed alternatives provide different road maps to restoring the lagoon area and adjacent seasonally wetted and riparian habitats, buffering its resources from future SLR, providing visitor-serving functions, and meeting the Project objectives.

Under all Project Build Alternatives, the seasonally wetted and riparian habitat areas would be expanded from the existing 0.56 acre, to 7 to10 acres, while the more upland/transition areas would increase from the existing 21.4 acres to between 23 and 24 acres, depending on which alternative is selected. This would require removing much of the historically imported fill on-site to create a more natural topography and expanded open space area. The existing wetted lagoon area and riparian habitats would be protected with grading starting at the outer edge of existing riparian trees, preserving the current lagoon banks and the majority of the existing riparian willows and native hardwoods. Most native trees would be retained throughout the Project area, and the natural breaching pattern of the lagoon would be protected by grading outside the footprint of the existing wetted lagoon and working landward of the beach berm at its mouth.

Under all Project Build Alternatives, the area of Topanga Beach for recreational users would increase with up to 50 ft of additional depth in Alternatives 2 and 3 on the east cove beach, and approximately 90 ft in Alternative 4. This adds between 1.2 to 1.8 acres of additional beach. The construction footprint includes the Topanga Beach lagoon/ocean interface on the landward side of the bar-built sand berm and extends approximately 350 feet upstream into Topanga Creek with removal of fill on both the west and east sides. Under all Project Build Alternatives, the fill material would either be trucked off site for disposal or beneficially reused in a near-shore placement location, subject to approval by USACE.

Under all Project Build Alternatives, the length of the existing 79-foot long Caltrans bridge would be expanded to accommodate a widened lagoon riparian area, which would lower flow velocities to improve adult steelhead migration opportunities and increase refugia areas for tidewater gobies and juvenile steelhead, as well as the quantity and quality of lagoon habitats. To provide for a wider lagoon and improve fish migration and refugia, the existing Caltrans bridge would be replaced with a longer bridge. The main span of the new bridge would increase to 200 feet, with secondary side spans of 130 feet on either side, increasing the total bridge span length to 460 feet. This expanded length provides space for the creek and lagoon to evolve in response to SLR and provides pedestrian access under the roadway on both sides of the lagoon, as only access on the east side is currently available. The existing alignment of the bridge and PCH roadway is maintained for two of the Project Build Alternatives but is relocated slightly to the north in the Alternative 4, as discussed below.

The new bridge would continue to accommodate two lanes in each direction with no expansion of roadway capacity. Traffic flows will also be protected during construction by way of a temporary roadway and bridge alignment. All utilities would be continued during construction, and eventually relocated underground or attached to the new bridge. All phases of construction and staging for the new bridge would be similar under each alternative.

Under all Project Build Alternatives, Native American cultural sites would be protected in place, retaining an appropriate cover over the pre-contact period surface of no less than 2 to 4 feet, and necessarily limiting the lowering of the riparian bottomland surface to actual historic elevations.

Coastal access would be maintained during construction and improved under all Project Build Alternatives. This includes the creation of a trail system through the Project area and provision of pedestrian access under PCH on the east and west sides of the lagoon. Improved parking would be provided along the PCH and TCB corridors. A dirt emergency route from PCH to the beach level would be constructed on the west

side of the lagoon to allow lifeguard access to both limit vehicle usage along the lagoon berm and provide access to the western beach even during times when the lagoon mouth is open. Parking at the beach level would be similar to existing conditions, and would only be accessible to staff, emergency vehicles, and disabled visitor parking spaces. The areas around the existing bus stops would be improved to be more welcoming to public transportation users.

Under all Project Build Alternatives, key DBH facilities on Topanga Beach would be relocated further from the ocean to protect structures from SLR. The existing lifeguard headquarters, beach restroom, and helipad would be demolished and rebuilt closer to the realigned access road, and at a higher elevation. The new buildings would be of similar size and materials to the existing building. A small two-car garage for staff would be added in the improvements. The new helipad site would re-located to the east side of the lagoon for improved access by the lifeguards and emergency responders. The size, setbacks and built elements of the new helipad would conform to all Federal Aviation Administration and Los Angeles County requirements. The permitted onsite wastewater treatment system (OWTS) that services the beach restroom would remain to support the new facility unless a sewer hookup becomes available. The existing parking lot would be modified depending on the alternative. ADA and staff parking and access at the beach level is retained in all alternatives.

A plan for determining the future configuration of the historic Topanga Ranch Motel is included in each of the Project Build Alternatives, as are potential locations for park facilities, concessions, and parking on CDPR property. Currently the Proposed Project area accommodates authorized and unauthorized parking opportunities. All Project Build Alternatives would modify the existing parking opportunities. In general, additional coastal access parking spaces would be created, but their location and makeup would shift. Less free (and often non-conforming) parking along PCH would be available as parking is not permitted on the longer bridge deck, but would be partially shifted to the TCB corridor. More parking would be available in CDPR and DBH lots, which include new areas on the west side of Topanga Creek and along TCB. Concession parking would be reduced as fewer concessions remain in the project area.

4.1 Alternative 1 – No Project/No-Build, Managed Decline

Under this alternative, existing conditions throughout the project area would remain “as-is” in terms of existing functions (or lack thereof) and conditions. Therefore, there would be no change to the lagoon footprint or habitat quality, and no new bridge would be constructed. Damage to the lifeguard headquarters due to coastal erosion would continue to occur and no relocation is included in this “No Project/No Build” alternative. The currently unusable majority of the Topanga Ranch Motel structures would continue to deteriorate without restoration, and existing non-conforming business leases and septic systems would remain in current operation but may be subject to future restriction or cessation of use in the future by enforcement of recent statewide wastewater policy changes. No improvements to habitat would occur. Sea level rise would continue to reduce beach area available and threaten the integrity of the Pacific Coast Highway. Figure 4.1 shows the existing lagoon topography and the existing 78.6-ft-long PCH Bridge.

4.2 Alternative 2 – Maximum Lagoon Habitat, Removal of Motel

This alternative provides the maximum increase in lagoon, wetland, and riparian bank habitats. It includes restoration of more natural side channels connected to the western side of the existing lagoon based on historic topography and would allow the lagoon system to evolve to accommodate changing sea level and storm surge conditions. The Topanga Ranch Motel and onsite business leases would be removed from the project area and be replaced with riparian and transitional habitats. Partial or full relocation or replacement of public parking, business leases and overnight accommodations from the current location on the north side of PCH to the west side of Topanga Canyon Boulevard (TCB) in the expanded project area will be developed in the next design phase. There is sufficient space along TCB in that location to replace all of the parking that currently exists.

To provide for a wider lagoon and improve fish migration and refugia, the existing Caltrans bridge would be replaced with a longer one along the same road alignment. The span of the new bridge would total 460 ft

(200-foot primary span, with secondary/side spans of 130 ft each), plus an additional span to accommodate an emergency services underpass on the east side if that is included in the next phase of design development. This alternative includes ADA disabled parking spaces on the beach level, with additional recreational parking at the PCH upper level on the south side of PCH only.

The lifeguard headquarters, beach restroom and helipad would be demolished and rebuilt closer to the realigned access road and to each other on the same beach level. Figure 4.2 presents the proposed grading and bridge of Alternative 2.

4.3 Alternative 3 – Limited Lagoon Habitat Expansion, Retention of Motel

This alternative also provides expanded lagoon, wetland, riparian and transitional habitat in the west part of the existing creek channel, but allows for only the existing main channel within the lagoon area itself. The remaining Topanga Ranch Motel structures are restored in its historic configuration, including relocation of some of the structures from the west side that is currently experiencing flood and bank erosion. One existing concession (restaurant lessee) would be remodeled and continue operation in place. No other business leases remain. If the emergency underpass is removed as the design evolves, this would provide additional parking on the North side of PCH. Partial or full relocation or replacement of public parking, business leases and overnight accommodations from the current location on the north side of PCH to the west side of Topanga Canyon Boulevard (TCB) in the expanded project area will be developed in the next design phase. There is sufficient space along TCB in that location to replace all of the parking that currently exists.

All of the changes to the new 460 ft Caltrans bridge (200-foot center span, with secondary/side spans of 130 ft each) are the same as for Alternative 2. However, the access road alignment is kept slightly to the east. This might change if no underpass is included. Figure 4.3 illustrates the proposed bridge and restored lagoon grading of Alternative 3.

4.4 Alternative 4 – Maximum Managed Retreat, Partial Motel Retention

The alignment of PCH moves north expanding the maximum amount of beach area and managed retreat from SLR. The portion of the historic Topanga Ranch Motel east of the current motor court access lane is retained. Adjacent parking is adjusted, and a remodeled restaurant lessee would continue to operate, while providing expanded lagoon, wetland, riparian and transitional habitats, primarily on the west side of the existing channel due to removal of all fill in that western area. No other business leases remain. Partial or full relocation or replacement of public parking, business leases and overnight accommodations from the current location on the north side of PCH to the west side of Topanga Canyon Boulevard (TCB) in the expanded project area will be developed in the next design phase. There is sufficient space along TCB in that location to replace all of the parking that currently exists.

Due to the curve of its alignment, the Caltrans bridge has the greatest length under this alternative, though the actual span lengths are similar to the other alternatives with a total of 460 ft consisting of a 200-foot long center span and a 130 ft side span on each side. This PCH alignment eliminates shoulder parking on the bridge spans, but has the greatest number of beach side parking spaces.

The helipad and lifeguard headquarters are arranged with staff, emergency and ADA disabled parking between these two functions and accommodate sight lines required for the expanded recreational beach area. This alternative maximizes managed retreat, recreational beach area (and/or living shoreline features such as dunes) and provides the most SLR resilience. The proposed bridge of Alternative 4 and the restored lagoon grading are presented in Figure 4.4.

FIGURE 4.1: ALTERNATIVE 1 – NO PROJECT/NO BUILD, MANAGED DECLINE

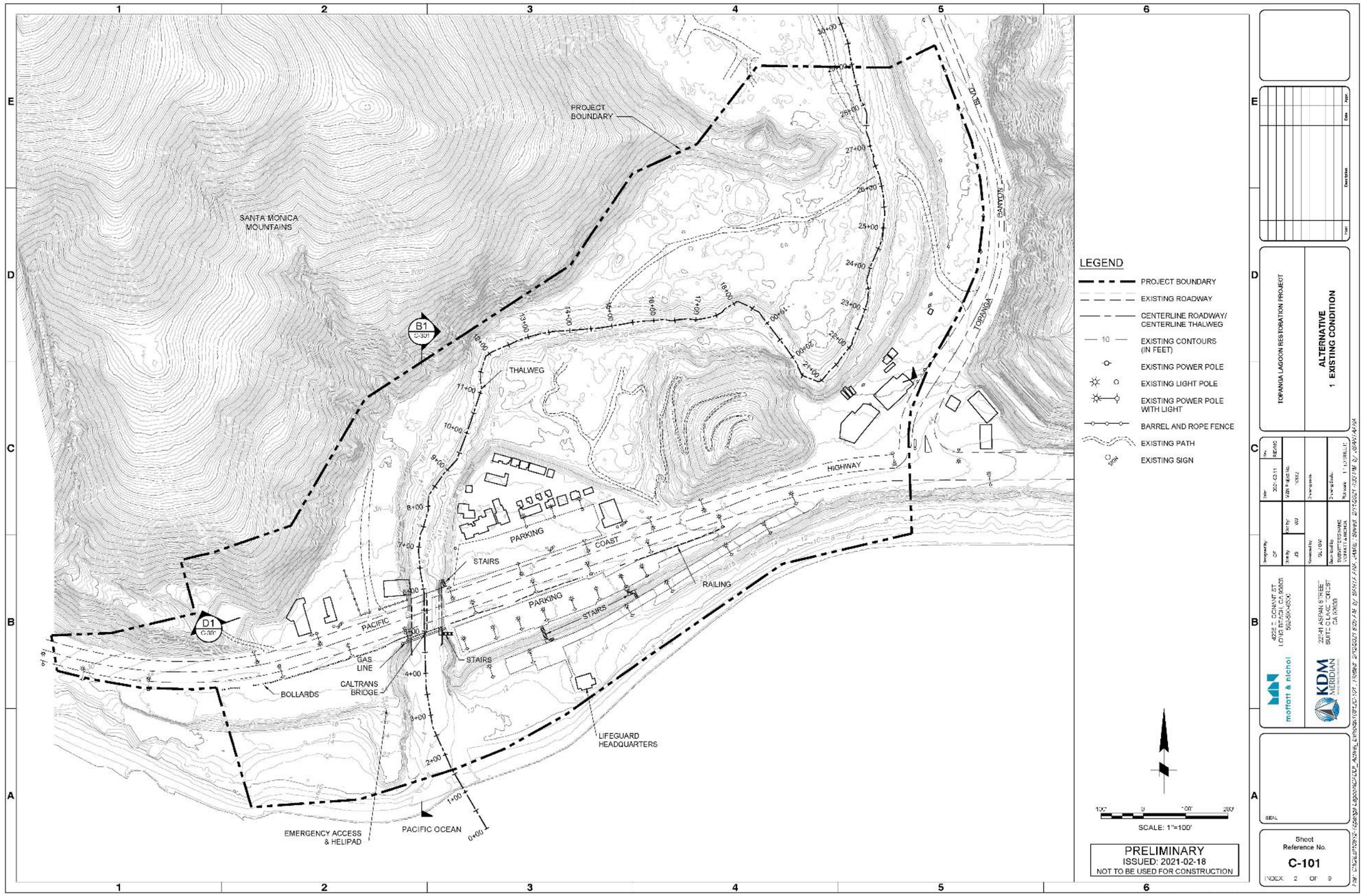


FIGURE 4.2: ALTERNATIVE 2 – MAXIMUM LAGOON HABITAT, REMOVAL OF MOTEL

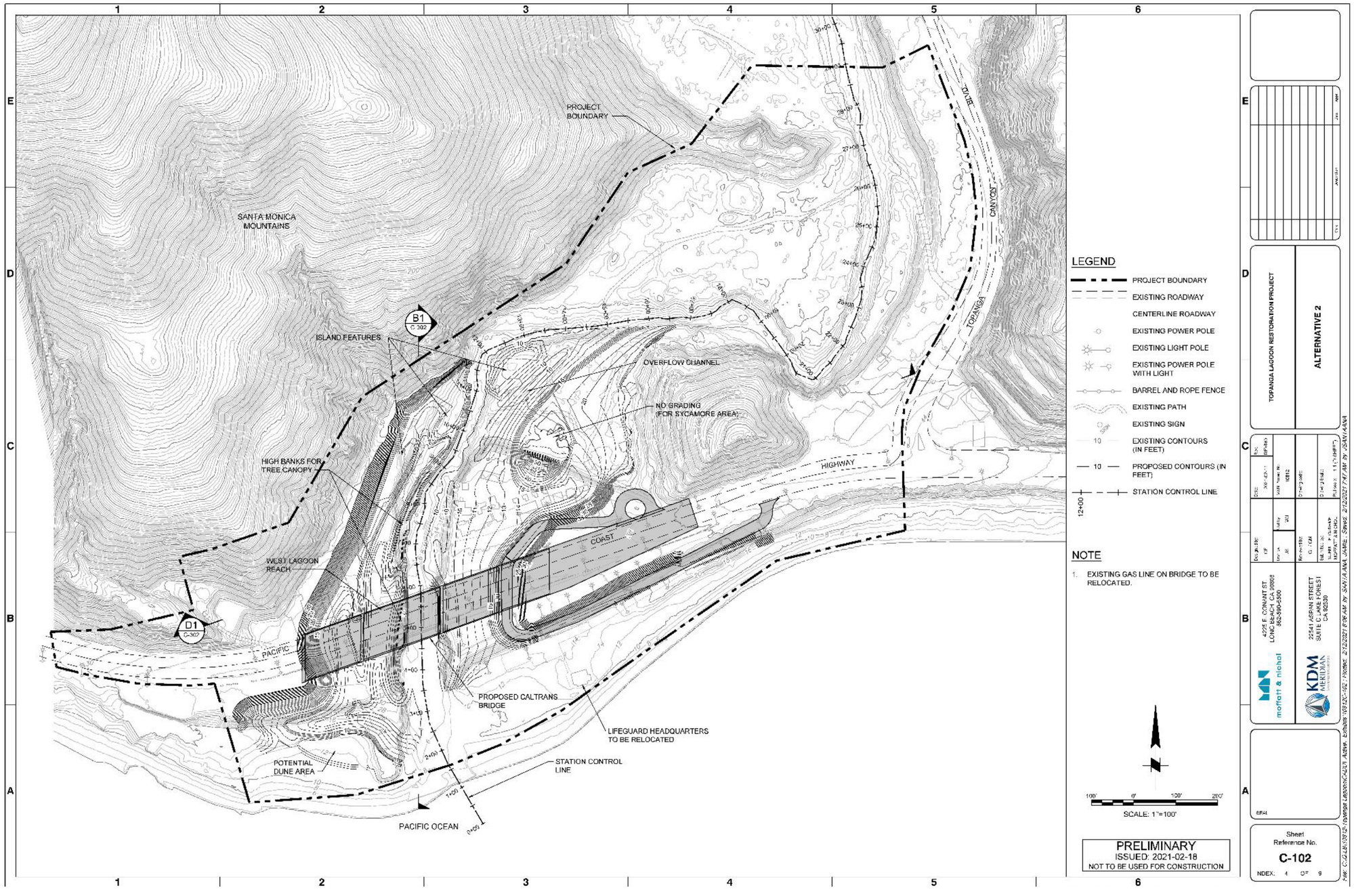


FIGURE 4.3: ALTERNATIVE 3 – LIMITED LAGOON HABITAT EXPANSION, RETENTION OF MOTEL

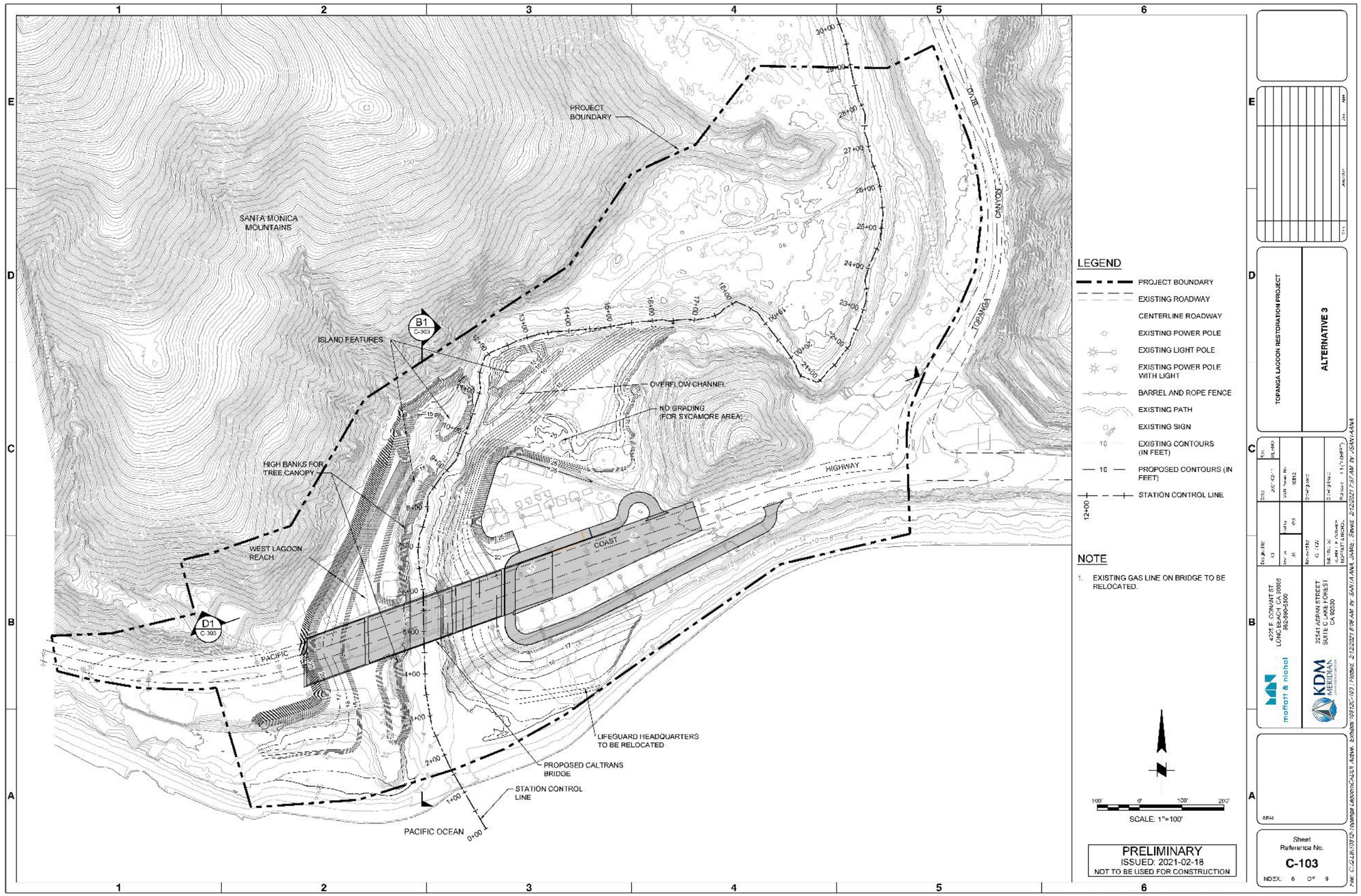
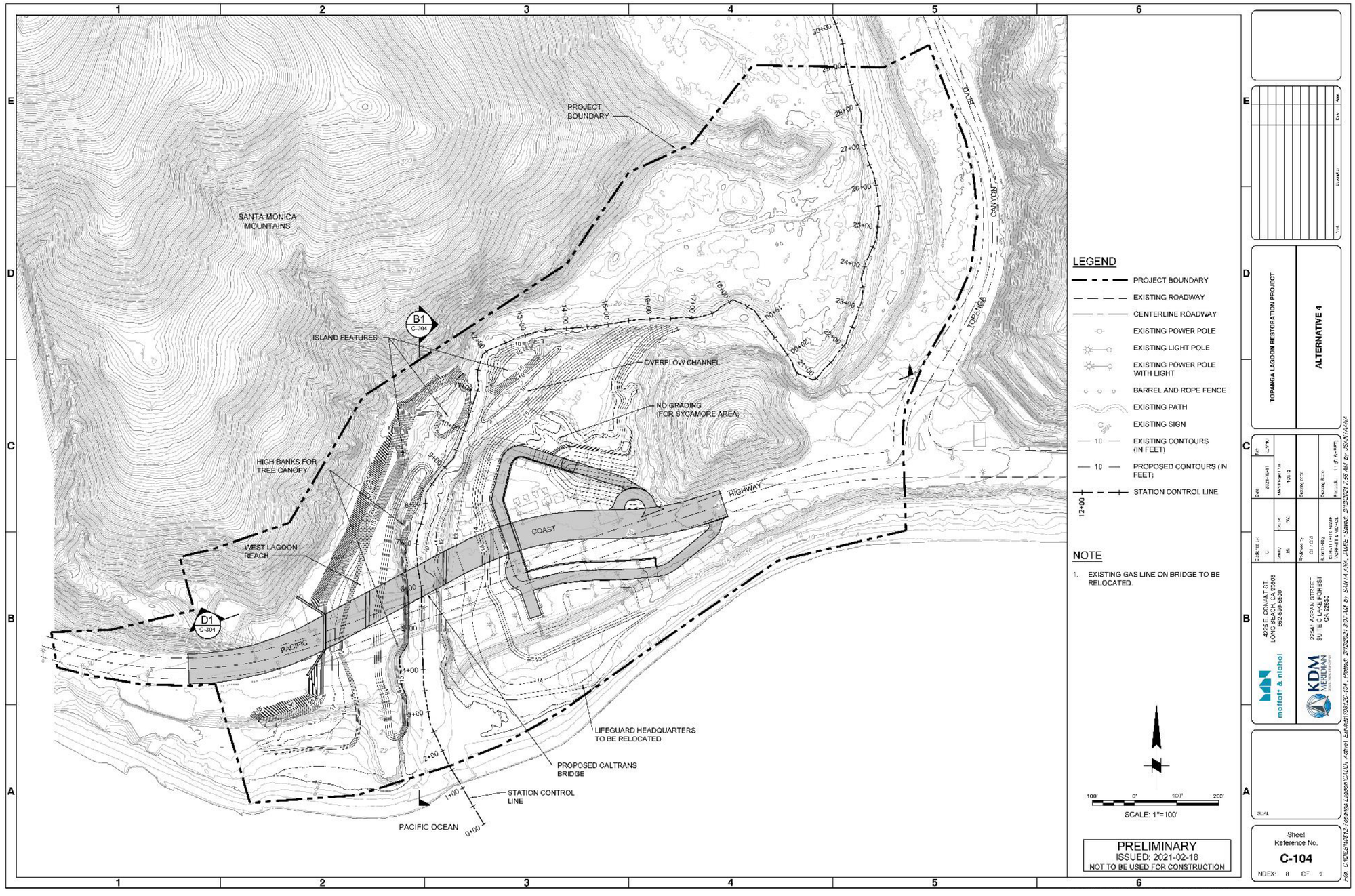


FIGURE 4.4: ALTERNATIVE 4 – MAXIMUM MANAGED RETREAT, PARTIAL MOTEL RETENTION



4.5 Alternatives Comparison

Table 4-2 compares developed features of the four alternatives. The restoration design focuses on the components of archaeological areas, Ranch Motel, wetland-riparian transition area, and graded beach transitional area. In Table 4-2, Alternative 1 is the existing No Project/No Build condition. Alternatives 2, 3, and 4 are the proposed Restored Alternatives. The total habitat restored by the three alternatives is 11.70 acres, 9.77 acres, and 10.76 acres, respectively. The grading plans of the three alternatives (Alternative 2, 3, and 4) are illustrated in Figure 4.2 through Figure 4.4.

4.6 Habitat Mapping

M&N created maps of projected habitat zones for each of the four restoration alternatives under three different SLR conditions:

1. current time horizon, no SLR;
2. 1.6 ft of SLR; and
3. 6.8 ft of SLR.

Zones were mapped using estimated habitat elevations provided by ESA (ESA 2022) for all four alternatives under the three SLR scenarios. The habitat elevations represent an average of habitat elevations for low and moderate salinity lagoon wetland habitats and were based on ESA's modeling of the Topanga Lagoon inundation frequency distributions and habitat zone inundation frequency criteria for low salinity and moderate salinity habitats. The created maps are included in the attachment to the Alternative Analyses report (M&N 2022). Table 4-1 provides a summary of habitat acreage. In terms of wetland habitats (from open water to upland transition), Alternative 2 will create about 5.9 acres more of wetlands than Alternative 1 and nearly 2 acres more than Alternatives 3 and 4. Alternatives 3 and 4 will create about 4 acres more wetland than Alternative 1. Restoration will clearly benefit habitats more than the existing conditions (Alternative 1) due to larger areas added. All proposed alternatives will create slightly more beach area ("Sand" in the table) than Alternative 1 in all sea level conditions. The disturbed areas due to the proposed lagoon grading are also included in the table.

TABLE 4-1: SUMMARY OF HABITAT ACREAGE

Summary of Habitat Acreage												
Habitat Type	NO SLR Condition				1.6 ft SLR Condition				6.8 ft SLR Condition			
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 1	Alt 2	Alt 3	Alt 4	Alt 1	Alt 2	Alt 3	Alt 4
Open Water	0.06	0.04	0.08	0.07	1.21	1.19	1.23	1.22	5.07	5.78	5.22	5.14
Seasonal Shallow Open Water	0.42	0.69	0.44	0.38	0.42	0.69	0.44	0.38	0.08	0.32	0.12	0.08
Seasonally Unvegetated Flat	0.16	1.51	0.28	0.27	0.38	1.69	0.28	0.51	0.99	3.87	2.77	2.53
Emergent Marsh	0.47	1.12	0.5	0.5	0.39	1.87	0.5	0.82	0.24	0.94	0.59	0.8
Saltgrass	0.07	N/A	N/A	N/A	0.07	N/A	N/A	N/A	0.01	N/A	N/A	N/A
Riparian	2.46	6.09	6.42	6.36	2.32	5.16	6.42	5.79	1.62	2.59	3.11	3.13
Wetted Area Below Riparian/Upland Transition	**3.6**	**9.5**	**7.7**	**7.6**	**4.8**	**10.6**	**8.9**	**8.7**	**8.0**	**13.5**	**11.8**	**11.7**
Riparian/Upland Transition	6.06	6.14	6.34	6.23	6.06	6.14	6.34	6.23	6.06	6.14	6.34	6.22
Coastal Sage Scrub	3.66	2.98	2.98	2.98	3.66	2.98	2.98	2.98	3.65	2.98	2.98	2.98
Upland	11.16	13.84	14.37	14.49	11.15	13.84	14.37	14.49	11.16	13.84	14.35	14.49
Disturbed Upland/Trails	0.49	N/A	N/A	N/A	0.49	N/A	N/A	N/A	0.49	N/A	N/A	N/A
Riparian/Upland Transition Habitats	**21.4**	**23.0**	**23.7**	**23.7**	**21.4**	**23.0**	**23.7**	**23.7**	**21.4**	**23.0**	**23.7**	**23.7**
Sand (Beach)	4.18	4.39	4.42	4.56	3.05	3.24	3.28	3.41	0.27	0.34	0.35	0.48
Total All Habitat	**29.2**	**36.8**	**35.8**	**35.8**	**29.2**	**36.8**	**35.8**	**35.8**	**29.6**	**36.8**	**35.8**	**35.9**
Roadways/Developed/Landscaped	12.43	4.84	5.78	5.78	12.43	4.84	5.78	5.78	11.99	4.84	5.78	5.78
TOTAL PROJECT AREA	**41.6**	**41.6**	**41.6**	**41.6**	**41.6**	**41.6**	**41.6**	**41.6**	**41.6**	**41.6**	**41.6**	**41.6**

TABLE 4-2: SUMMARY OF DEVELOPED FEATURES (RCDSMM, 1/18/2022)

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
North side of PCH				
No grading in known historic areas	No change	2' minimum cap over cultural resources	2' minimum cap over cultural resources	2' minimum cap over cultural resources
Number of 24 Ranch Motel structures to remain in place/ reconfigured within motel footprint/ reconfigured historic grade nearby /removed	1/0/0(*23*) 1 structure in use, 23 in decline	0/0/24 all structures removed	19/2/3 21 structures in use	14/3/7 17 structures in use
Retaining wall height for Ranch Motel and underpass	None required	None required	12' max 4' max (without underpass)	2-16' at PCH, 12'at motel wall 4' max (without underpass)
Removes or remodels restaurant (currently Reel Inn), and visitor services at corner of PCH and TCB	No (Pumping continues as present)	Removes	Remodel in place	Remodel adjacent/in place
Removes or remodels Wylie's, restaurants (Cholada)	No (Pumping continues as present)	Removes all businesses west side	Removes all businesses west side	Removes all businesses west side
Beach stair access from north	Existing pedestrian underpass east side of creek	Pedestrian underpass east of creek	Pedestrian underpass east and west of creek	Pedestrian underpass east and west of creek
Emergency Underpass (optional)	NA	Adjacent PCH	Adjacent PCH	Adjacent wetland
Relocated lifeguard HQ/restrooms	Remains vulnerable to SLR	New at East side of Topanga Beach access drive	New at East side of Topanga Beach access drive	New at East side of Topanga Beach access drive
Helipad location	W knoll PCH level	East side of HQ and creek	PCH level west end of upper parking	Beach level west of HQ, east side of creek
PARKING TOTAL With/without beach level recreational parking and underpass	341 spaces	188/*202* *Note underpass removed provides opportunity for more parking on N side*	*214/189*	*231/198*
parking increase or decrease (+/-) compared to Alt 1 *	(+0)	(-153/*-139*)	(-127/*-152*)	(-110/*-143*)
*Note all parking estimates are based on existing non-conforming conditions. Parking deficits and removed visitor serving structures can be replaced at west side PCH				

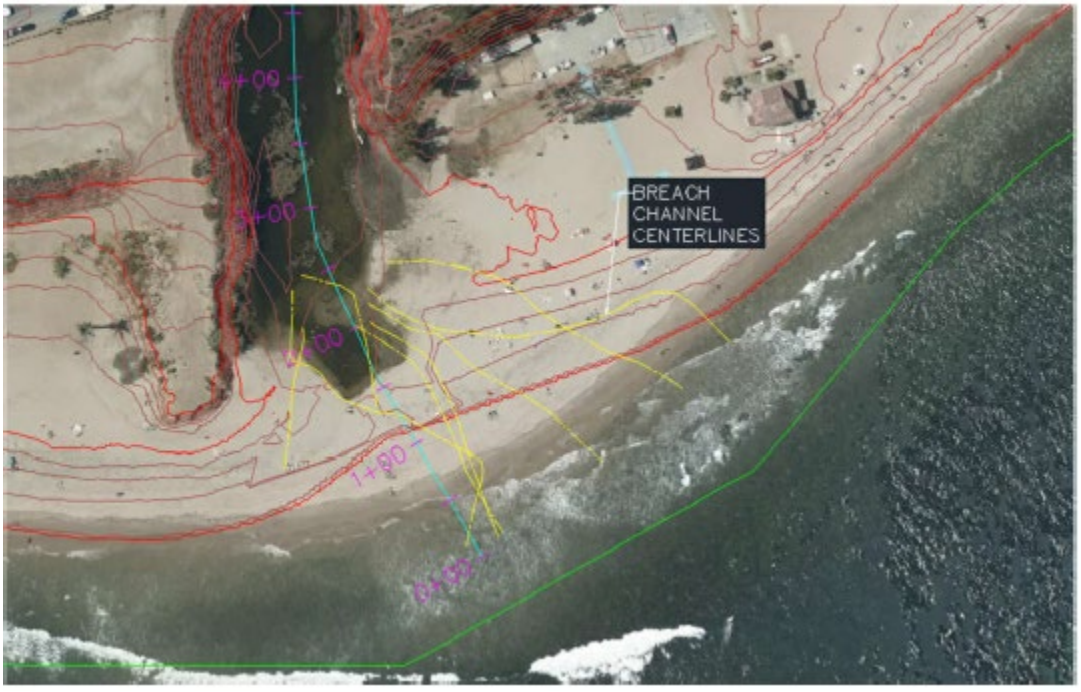
5 Beach Morphology and Breach Analyses

Beach morphology and lagoon breaching are critical for the fish passage analysis. The lagoon entrance needs to be open so that fish can immigrate into and emigrate out of Topanga Creek. The water depth needs to be high enough to ensure surface flow connectivity in areas with minimal depth and to provide sufficient depth for fish to pass natural low flow barriers and impediments (Dagit et al. 2018). The water velocity needs to be sufficiently low for fish's sustained swimming and short duration bursts. ESA has drafted a memorandum on the proposed fish passage approach for Topanga Lagoon Restoration. The approach for studying fish passage is composed of the following steps:

- Setup fish passage criteria on minimum water depth and maximum velocity;
- Analyze entrance channel breach scenarios for two-dimensional (2D) Topanga Lagoon modeling;
- Develop rating curves that relate discharge to velocity and depth at selected cross sections; and
- Determine if the lagoon is passable for the fish under both existing and proposed lagoon conditions by using the rate curves.

The beach morphology and breach analysis performed by ESA (2022) provides direct information for determining model scenarios for the 2D hydraulic model. Historical lagoon entrance aerial photos and surveys were used to study the frequency of breaching, the size of the breached channel, and the alignment of the breached channel. Figure 5.1 shows the variation of the digitized breach channel centerlines (shown as yellow lines) between 2005 and 2020. The 2D hydraulic model simulates a breached condition, as a closed entrance would not be passable for fish. A range of typical breach channel widths, lengths, and alignments were considered when determining the channel geometry for the 2D model. The narrowest/ deepest breach is more likely to be constrained for flow velocity, while the widest is more likely to be constrained for water depth. The estimated breached inlet dimensions based on a regression analysis from the lagoon database were provided by ESA and are listed in Table 5-1 (ESA 2020). The typical inlet lengths and widths are shown in bold.

FIGURE 5.1: OBSERVED BREACH CHANNEL CENTERLINES FROM 2005 – 2020



Source: ESA 2020

TABLE 5-1: BREACH INLET DIMENSION RANGES AND TYPICAL SIZES PROVIDED BY ESA

ID	Channel Alignment	Inlet Width	Inlet Length Range (ft) (from back/crest of berm to MSL Line)	Typical Inlet Length (ft) (from back/crest of berm to MSL Line)	Inlet Width Range (ft)	Typical Inlet Width (ft)
1	Straight	narrow	n/a	**160**	6.0-18.0	**15**
2	Migrated	narrow	160-210	**200**	6.6-15.0	**15**
3	Migrated	narrow extra-long	250-350	**350**	6.0-15.0	**9**
4	Straight	med	n/a	**160**	18.0-30.0	**25**
5	Migrated	med	198-230	**200**	15.0-27.0	**22**
6	Straight	wide	n/a	**160**	30.0-70	**43**
7	Migrated	wide	160-200	**170**	27.0-40.0	**37**
8	Migrated	wide extra-long	200-250	**235**	30.0-40.0	**37**

Note: not including the extra-long condition, inlet dimensions for straight channel were taken one week following the breach event, dimensions for the migrated channel at the end of spring neap cycle (2 weeks following the breach event).

The recommended breach channel profiles by ESA (2020) are separated into two types: straight channel and migrated channel. Both profiles start at approximately 5 ft above NAVD88 in the lagoon and slope down to mean lower low water (MLLW, -0.19 ft NAVD88) based on current conditions. The detailed elevations along the recommended breach channel profiles are presented in Table 5-2.

TABLE 5-2: RECOMMENDED BREACH CHANNEL PROFILES BY ESA

Breach Straight		Breach Migrated	
Station (ft)	**Elevation (ft NAVD88)**	**Station (ft)**	**Elevation (ft NAVD88)**
0	5.2	0	5.2
29	4.7	9	5.1
78	3.8	41	4.7
90	3.6	47	4.6
95	3.5	87	4
142	2.6	149	3.2
143	2.3	170	3
153	2.3	198	2.6
154	1.5	201	-0.19
156	1.4	N/A	N/A
158	-0.19	N/A	N/A

The breach inlet dimensions and breach channel profiles provided in Table 5-1 and Table 5-2 were used as input to the 2D hydraulic model (discussed in Section 7). The companion Ecohydrology Report (ESA 2022) documents the details of the lagoon hydrology/mouth morphology model, referred to as the Quantified Conceptual Model, and how the results interact with M&N's 2D hydraulic model.

6 One-dimensional Sedimentation Modeling

The purpose of this task is to assess sedimentation in the lagoon for alternative comparisons. In 2002, the RCDSMM and M&N carried out the Topanga Creek Watershed and Lagoon Restoration Feasibility Study. The 2002 study applied the Mike11 model suite from the Danish Hydraulic Institute (DHI), a complex model suite with modeling modules of watershed hydrology, hydraulics, and sediment transport. The model suite was calibrated with multiple years of measured creek discharges, creek water depth, and total suspended solid data. In this study, the previously developed and calibrated Mike11 model has been updated to reflect the latest topographic changes and has been used in computing the sediment transport under existing conditions and three proposed restoration alternatives. SLR impacts to the lagoon sedimentation are considered and discussed.

6.1 Model Description

DHI's Mike11 modeling suite includes Mike11 RR (Rainfall Runoff), Mike11 HD (Hydrodynamic model), Mike11 ST (Sediment Transport), and Mike11 GST (Graded Sediment Transport) modules. Its integrated modular structure offers great flexibility such as:

- Each module can be operated separately;
- Data transfer between modules is automatic;
- Coupling of physical processes (e.g., river morphology, sediment re-suspension, and water quality) are facilitated; and
- Updating or expansion of existing installations with renewed or additional modules is simple.

The Mike11 RR module can predict continuous hydrography over time. The HD module is capable of simulating continuous flow conditions from steep river flows to tidally influenced estuaries. In the Topanga Creek and Lagoon model developed in 2002, the watershed hydrology routing used the rainfall-runoff module, the creek/lagoon hydraulic modeling used the hydrodynamic module, and creek sediment transport used the gravel transport module. All these modules were fully coupled in the Mike11 model suite. Such a watershed modeling suite provides a complete and useful design tool for engineering, water resources, and water quality management applications.

In this analysis, the Mike11 RR-HD-ST coupled model from the 2002 study has been updated with the latest topographic data and the proposed topographic changes for the alternatives. The model calibration parameters are adopted from the well-calibrated 2002 Mike11 RR-HD-ST coupled model.

6.2 Model Area and Cross Sections

The Mike11 sedimentation model area starts from the confluence of mainstem Topanga Creek and Old Topanga Creek, which is located approximately 5 miles upstream of the Topanga Lagoon outlet to the ocean. Figure 6.1 presents the entire Topanga Creek Watershed and the beginning and ending locations of the one-dimensional (1D) model area (where the lagoon outlet is approximately 500 ft south of the PCH Bridge). A zoom-in view of the 1D network of the Mike11 model is also included, starting from the confluence up north and finishing at the lagoon outlet to the ocean. The Topanga Creek MM2, where new water level and cross-section were collected, is located approximately halfway in the network.

The whole model network is composed of three branches from downstream to upstream, with breakpoints at the PCH Bridge and MM2 (Route 27 Bridge). The creek network was characterized by a total of 84 cross-sections. Table 6-1 lists the number of cross-sections by branch. Twenty-seven cross-sections from downstream to upstream are located in the restoration area, where the topographic data has been updated and modified. Figure 6.2 depicts the locations of these 27 cross-sections (9 cross-sections in Branch 1 and 18 cross-sections in Branch 2). The topographic data sources of these 27 cross-sections are discussed in Section 3.2.1. In the analysis of SLR, the cross-sections seaward of the PCH Bridge were assumed to rise with SLR and then the effect gradually diminished from PCH bridge to the upper lagoon where no raising

was included. The remaining 57 cross-sections in Reaches 2 and 3 were adopted from the previous Feasibility Study under both existing and SLR conditions (M&N 2002). Various topographic data sources were provided in the 2002 report.

FIGURE 6.1: MODEL AREA OF 1D SEDIMENTATION MODEL

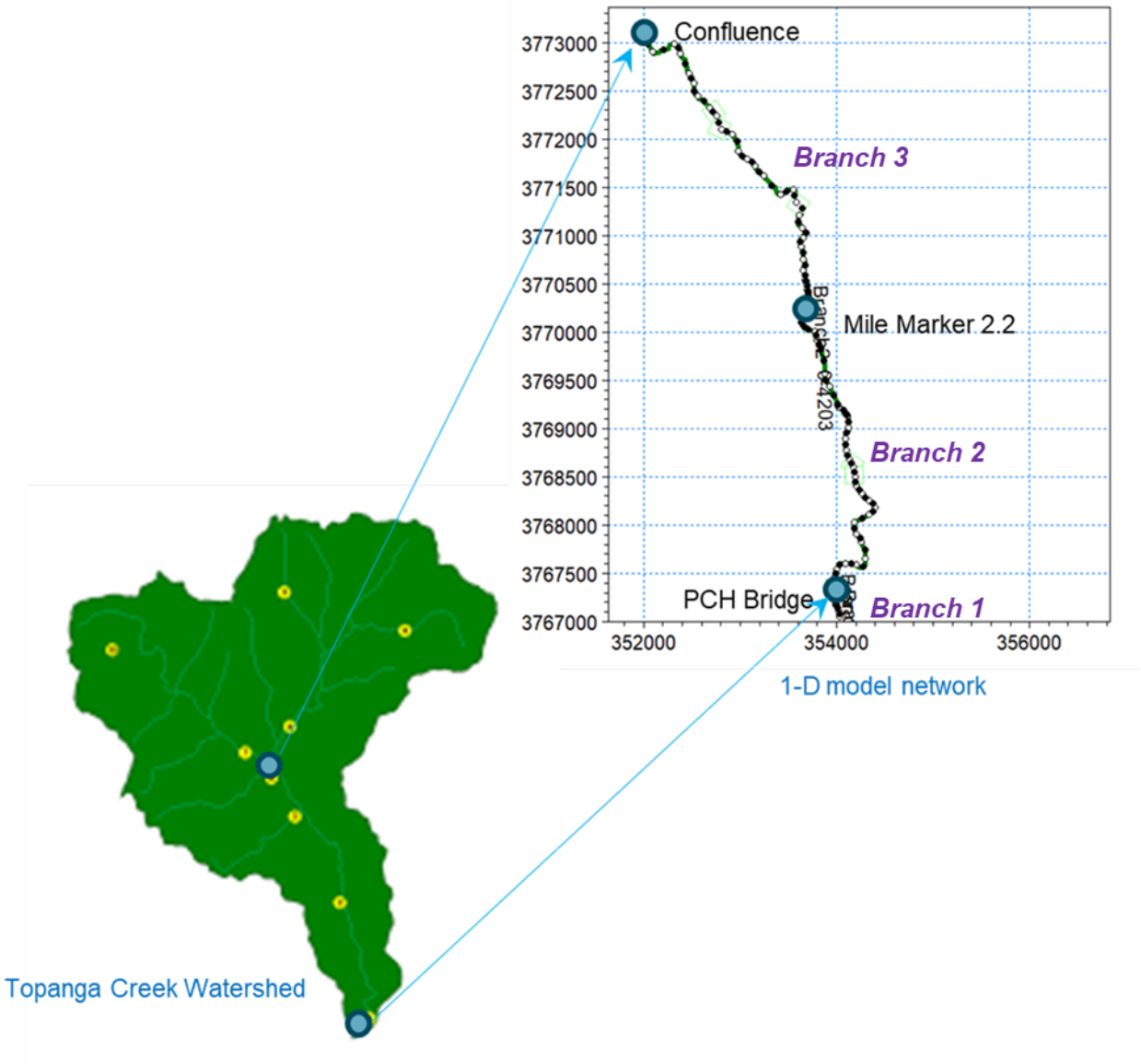


TABLE 6-1: CREEK CROSS-SECTIONS

Creek Branch	Creek Reach	Number of Cross-Sections	Length (mile)
Branch 1	Lagoon (up to PCH Bridge)	9	0.2
Branch 2	PCH Bridge to MM2 (Route 27 Bridge)	43	2.2
Branch 3	MM2 (Route 27 Bridge) to Confluence	32	2.6

FIGURE 6.2: UPDATED CROSS-SECTION LOCATIONS IN 1D MODEL NETWORK

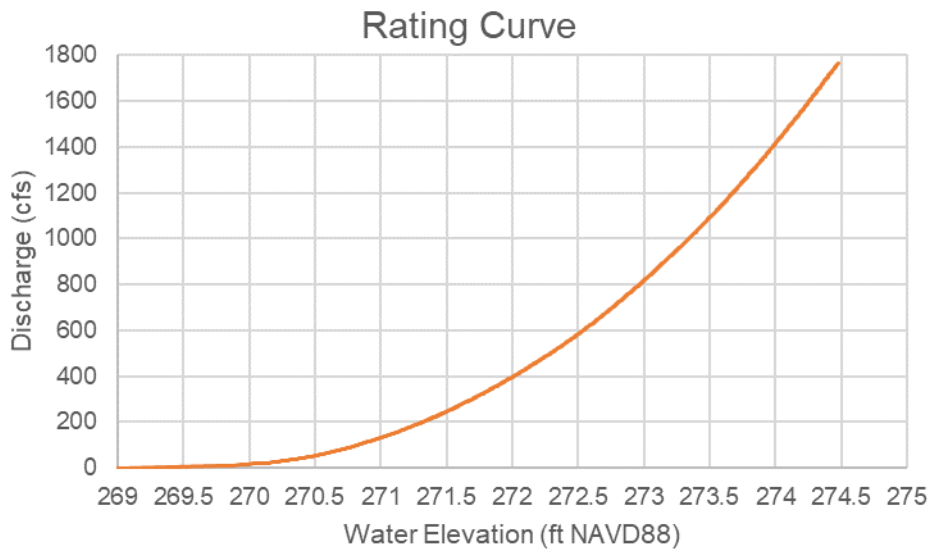
6.3 Model Boundary and Modeling Periods

6.3.1 Rating Curve Development

In addition to simulating sediment transport in the Topanga Creek and Lagoon, the 1D Mike11 model was also used to develop a rating curve at M&N Gage at MM2 (MM2/M&N gage) for inputs of the 2D hydraulic model calibration (see Section 7.4.2). The objective of developing the rating curve is to convert the recorded stages (water levels) to stream flows/discharges at M&N gage at MM2 for the period Dec 2019 – July 2020, when the water levels were being monitored. Note a stream gage (MM2/F54C-R gage) is being maintained at MM2 by the LACDPW, but the thalweg has shifted in the past few years and the MM2/F54C-R gage is no longer recording the low flows. This section discusses procedures of developing the rating curve using 1D Mike11 model:

- A linear increased discharge from 0 to 1,766 cfs (50 cms) was applied at the confluence point as the model upstream boundary. The maximum discharge amount was checked to make sure it covered the maximum observed discharge during the simulation period.
- The newly surveyed cross-section at MM2 gage has been updated to the corresponding cross-section in the 1D model network. All the other cross-sections remain the same as those from the 2002 study. The topographic changes at the downstream cross-sections in the lagoon do not impact flow hydraulics at MM2 gage.
- Only the hydraulic module from the previously calibrated Mike11 model was needed to develop the relationship between water levels and discharges.
- Time series of discharges and water levels were exported at the cross-section where the MM2/M&N gage is located. The resulting rating curve is shown in Figure 6.3. With an increasing flow from 0 to 1,766 cfs, the water elevation at the MM2/M&N gage rises from approximately 269 ft NAVD88 to 274.5 ft NAVD88.
- The synthetic discharge time series at the MM2/M&N gage was constructed using the measured water level and the rating curve developed.

FIGURE 6.3: RATING CURVE DEVELOPED AT MM2/M&N GAGE USING MIKE11 HD MODEL



6.3.2 Modeling Periods

One-dimensional (1D) models have advantages in simulating long-term hydrodynamic and morphologic changes. Compared to the 2D model, it is more time efficient. The simulations of all alternatives were run

continuously for an average flow condition period and a high flow condition period. The performance of alternatives on sediment transport was evaluated through the 1D model. These two simulation periods are:

- *Average Flow Condition* – October 1996 to March 2001.
- *High Flow Condition* – November 1979 to March 1984. This period includes 1st and 3rd peak runoff events since 1930 (February 1980 and January 1983 storms).

Both periods last approximately four and a half years. As presented in Table 3-4 in Section 3.2.4, the high flow period covers the 1st and 3rd peak storm events since 1930: 20,200 cfs on February 16, 1980 and 10,200 cfs on January 27, 1983. Therefore, the selected high flow period is sufficient to represent the high flow conditions for the Topanga Creek and Lagoon. There are no higher runoff events after 2001 that exceed these two events. The second peak happened in January 1969, which is relatively old and does not have enough detailed data to support modeling.

The average flow period includes the two water years (2000-2001, 1997-1998) ranked as 20th and 24th highest annual flows in the past 88 years. The low flow condition was not modeled as significant erosion and sedimentation are not expected during low flow conditions. The same is true for post-fire bulking, it is considered to not affect the alternative comparisons, and thus is not modeled in this analysis.

The dry weather and low flows do not transport measurable sediment; hence, no 1D modeling was performed. The last 10 year fish passage observations indicated fish passages occurred during storms with a return period less than a 5 year. Hence, a 2D hydrodynamic modeling was performed for fish passage assessment for flows less than a 5-year storm, discussed in Section 7.

6.3.3 SLR Scenarios

SLR impacts on lagoon sedimentation were evaluated using the Mike11 1D model. As listed in Table 6-2, the 2018 SLR guidance by the California Ocean Protection Council (OPC) provides the projected SLR at the project site by emission conditions and risk levels. The two SLRs simulated in the model are 1.6 ft and 6.8 ft. The 1.6-ft SLR scenario corresponds to the projected average SLR under low and high emission conditions by 2070, and 6.8 ft is the SLR projection by 2100 under medium-high risk aversion and high emission conditions. The same SLR scenarios were analyzed in the 2D hydraulic modeling, discussed in Section 7.

TABLE 6-2: PROJECTED SEA LEVEL RISES AT TOPANGA LAGOON (CALIFORNIA OPC 2018)

Emission Conditions	Low Risk Aversion	Medium – High Risk Aversion	Extreme Risk Aversion
Low emission (2070)	**1.4 ft**	3.0 ft	5.1 ft
High emission (2070)	**1.8 ft**	3.4 ft	
Low emission (2100)	2.3 ft	5.5 ft	10.0 ft
High emission (2100)	3.3 ft	**6.8 ft**	

6.3.4 Model Boundary Conditions

The boundary conditions of the 1D sedimentation model were applied at its upstream confluence boundary and downstream ocean boundary (under inlet open condition). Such boundary conditions were needed for both HD and ST modules.

For the HD module, the boundary conditions are:

- *Upstream boundary*: Recorded stream flows at Topanga Creek MM2/F54C-R by LACDPW were adjusted based on the ratio of watershed area between the confluence and the gage and applied at the confluence location, discussed in the following section.

- *Downstream boundary*: Measured tidal water levels from the Center for Operational Oceanographic Products and Services (CO-OPS) of the National Ocean and Atmospheric Administration at Santa Monica Station (#9410840). For SLR scenarios, the offshore water levels were elevated by the amount of SLR discussed in Section 6.3.3.
- Additionally, the simulated local runoffs from the previous Mike11 RR module were directly input into the HD model.

For the sediment transport module, the boundary conditions are:

- *Upstream boundary*: Sediment transport rate developed at the confluence.
- *Downstream boundary*: Sediment transport rate at the ocean, assuming no significant sediment movement occurred at its ocean boundary.

As there is no sediment transport rate available at the upstream boundary (the confluence), the following steps were used to derive the boundary time series. This method is consistent with the steps taken during the Feasibility Study and the model was proved to be well-calibrated.

1. Estimate the flow rates at the confluence by using a ratio of 1.21 between the flows at the MM2 gage and the confluence. This ratio is averaged from two aspects: First, the mean ratio of the flow rate at the MM2 gage and the confluence is 1.15 based on data predicted by the Mike11 HD model. Second, the ratio of the watershed area upstream of the MM2 gage versus the watershed area upstream of the confluence is 1.27.

2. Construct a power relationship ($Q_s = a\ Q^b$) between the sediment transport rate Q_s and the flow rate Q by using regression methods. The measurements of sediment concentrations were used for the regression analysis.

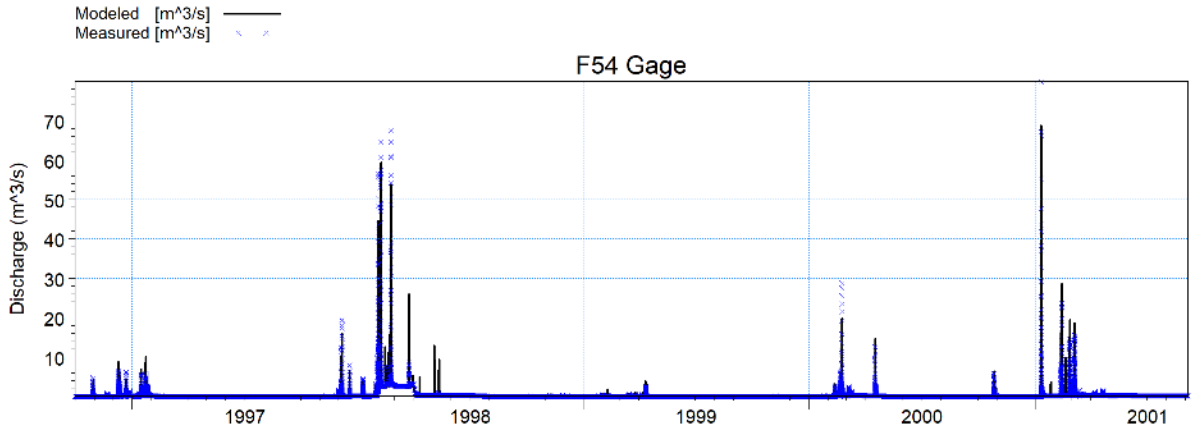
3. Calculate flow rate Q at the confluence by dividing the flow rate recorded at the MM2 gage by the ratio of 1.21 identified in Step 1.

4. Calculate the sediment transport rate at the confluence using the regression relationship developed in Step 2.

As a model verification, the simulated flow rate at the MM2/F54C-R gage was compared with the measured rate using an adjustment ratio of 1.21. Figure 6.4 presents the comparison plot. Overall, the modeled flow rates have a good match with the measurements. In the 2002 study (M&N 2002), the estimated transport rate at the confluence was verified with the Topanga Creek Watershed Erosion and Sediment Delivery Study (Orme et al. 2001) estimation and was found to be realistic.

The bed materials and their fractions were consistent with the previous 2002 study, when soil samples were either collected by M&N or provided by RCDSMM.

FIGURE 6.4: COMPARISON OF MODELED AND MEASURED FLOW RATE AT MM2/F54C-R GAGE



The water level time series downloaded from the Santa Monica tide gage and applied at the downstream ocean boundary for both simulated periods is presented in Figure 6.5. The flow rate time series at the upstream boundary of the confluence location for the same periods is illustrated in Figure 6.6.

FIGURE 6.5: WATER LEVEL TIME SERIES APPLIED AT DOWNSTREAM OCEAN BOUNDARY

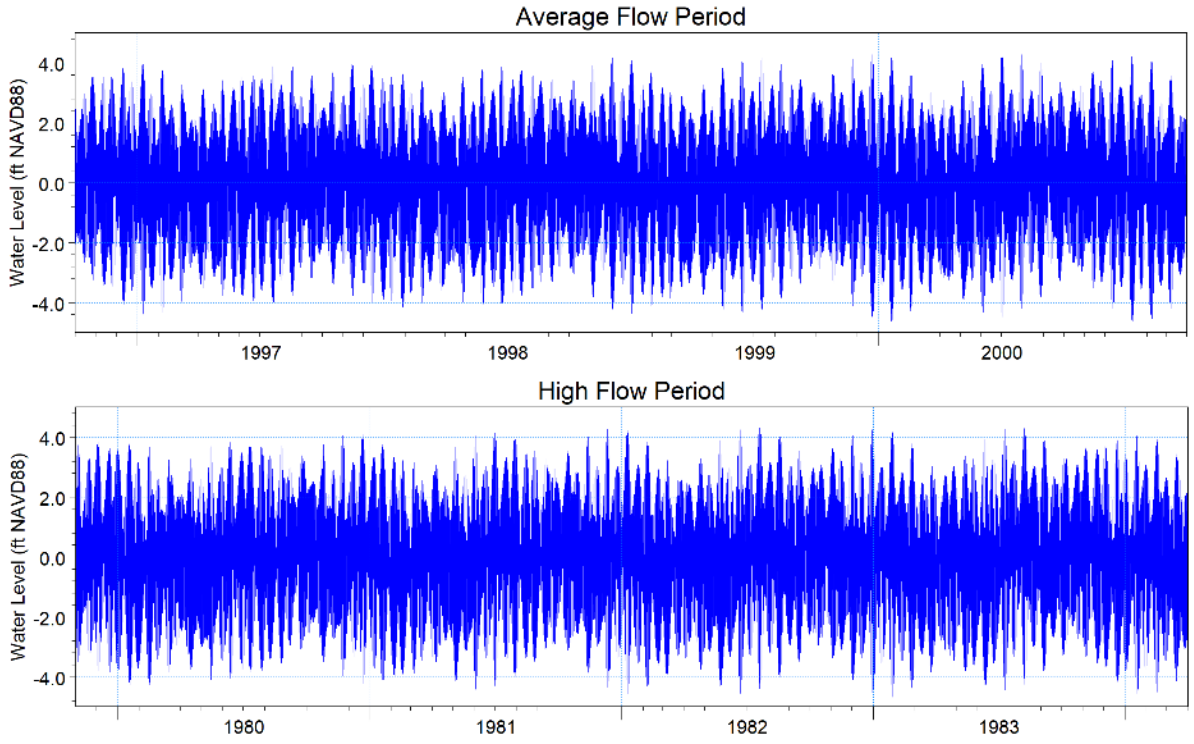
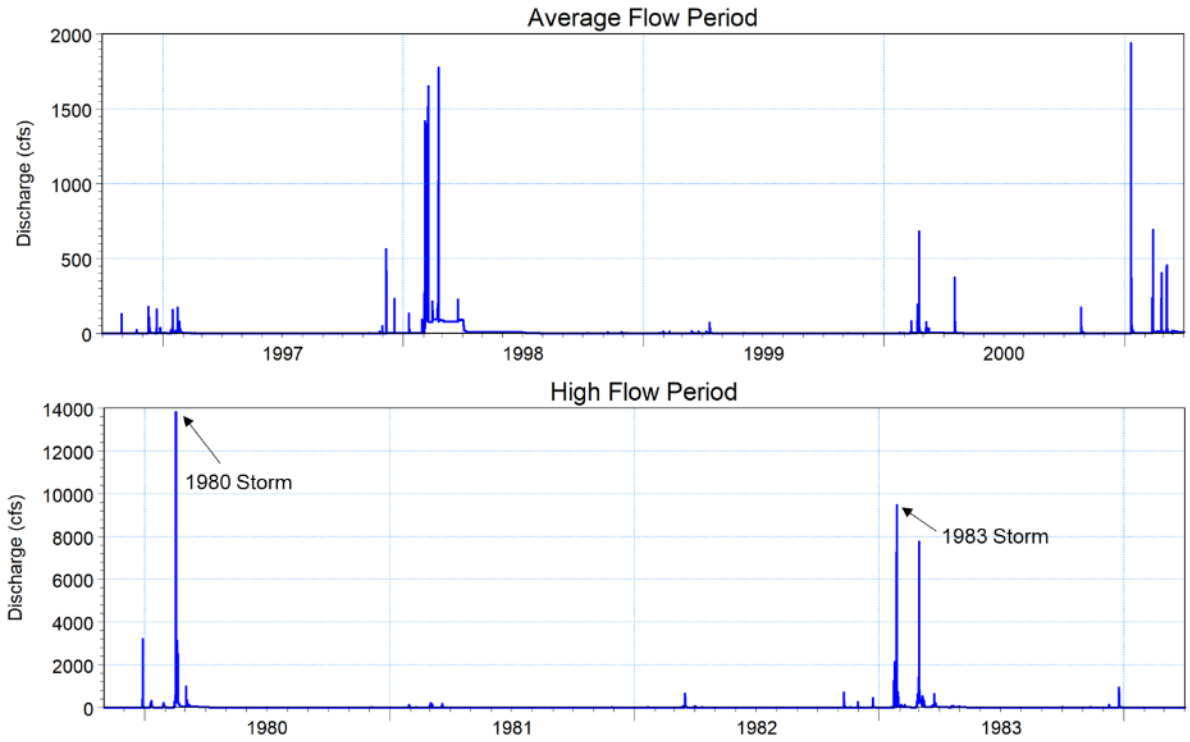


FIGURE 6.6: FLOW RATE TIME SERIES APPLIED AT UPSTREAM BOUNDARY (THE CONFLUENCE)



6.4 1D Sedimentation Model Results

6.4.1 No SLR Condition

The focus of the 1D sedimentation modeling was to compare the performance of the lagoon alternatives under high flow and average/typical flow conditions to identify potential flooding and sedimentation issues and to assist in finalizing the lagoon restoration plan.

Four alternatives were simulated, including Alternative 1 (the existing condition) as the baseline condition. The sedimentation results from the Mike11 model were summarized into three reaches from the confluence to the ocean outlet. They are:

1. *Upper Reach (length of reach: 2.6 mile)* from the confluence to MM2;
2. *Lower Reach (length pf reach: 2.1 mile)* from MM2 to the lagoon upper limit (approximate 900 ft north of PCH Bridge); and
3. *Lagoon (length of reach: 0.3 mile)* from the lagoon upper limit to Topanga Beach.

Figure 6.7 presents the three reaches with bed elevations on their beginning and ending sections. The average slope of each reach was computed. The Topanga Creek changes from a steep slope (0.11) upstream to a relatively flat slope (0.03) in the lagoon. The steep slope reach is in erosion mode, compared to deposition mode in reaches with a mild slope.

Table 6-3 and Table 6-5 summarize the total sediment accretion and erosion volumes for all four alternatives over the two simulation periods: average flow period from 1996 to 2001 and high flow period from 1979 to 1984. A positive number indicates sediment accretion, a negative number indicates sediment erosion. The sediment accretion/erosion trend is consistent in the two modeling periods, but the high flow period has higher volumes in sediment erosion/accretion than the average flow period. The results from

both periods show the upper reach from the confluence to MM2 is under a scour mode, and the lower reach from MM2 to lagoon upper limit, as well as the lagoon, is under a depositional mode. This finding can be related to the slopes of the reaches.

The proposed alternatives do not change the watershed sediment delivery. The sediment generated from the watershed is same among all alternatives. The minor difference, if there is any, is within the model accuracy and is likely due to model instability. Table 6-4 and Table 6-6 summarize the percentages of sediment being deposited in the lower reaches of the creek and being transported to the ocean under the two modeled flow periods. The sediment transported to the ocean is very consistent among alternatives, about 26% during the 1979-1984 high flow period and 6% during the 1996-2001 average flow period. The sediment deposition in the lagoon is between 28% to 32% during the average flow period and varies between 1% to 8% during the high flow period.

Upper Reach (from the confluence to MM2) is under erosion mode due to its steep slope. The erosion volume is almost identical among the alternatives for the high flow period. The slight difference between alternatives under the average flow period is likely due to model stability. The proposed alternatives do not impact this reach.

Lower Reach (from MM2 to the lagoon upper limit) is under a deposition mode due its mild slope. Most of the sediment from the watershed, more than 61%, deposits in this reach under both flow conditions. Alternative 4 has slightly higher accretion than other alternatives, especially during the high flow period. Alternative 2 has the least sediment accretion. The difference between alternatives is less than 7% under both the average and high flow periods and is much less than the overall percentage of sediment deposited in this reach.

Lagoon is under a deposition mode due to the mild slope. A higher percentage of sediment is being deposited in the lagoon during the average flow period than the high flow period for all alternatives.

- Deposition Volume: Alternative 2 has the largest deposition volume under both average and high flow periods because Alternative 2 has the largest lagoon area. Alternative 3 ranks the second, followed by Alterative 1. Alternative 4 has the least sediment accumulation in general, which may be due to its northernly bridge alignment. Under the average flow condition, the accretion volume does not vary as much as the high flow period between alternatives.

- Deposition Depth: The alternatives were further compared in terms of deposition depth after large storms. During the simulated high flow period, Alternative 2 has similar accretion depths as Alterative 1 and Alternative 3 in the lagoon upstream of PCH Bridge, ranging from 14 to 15 inches. Alternative 4 has the least amount of deposition depth, approximately 11 inches. Alternative 2 has the largest deposition volume due its larger lagoon area, not due to deposition depth. Hence, all alternatives will experience similar sedimentation impact. Deposition in the lagoon mostly happens upstream of the PCH Bridge due to the backwater effect caused by the PCH bridge. The proposed longer bridge will reduce the backwater effect.

To Ocean: The sediment transport in the Topanga Creek and its lagoon is largely impacted by storm intensity. The amount of sediment that is being transported to the ocean during the high flow period (1979-1984, see Table 6-5) is significantly larger than that during the average flow period (1996-2001, see Table 6-3). But the sediment deposited in the lagoon during the high flow period was much lower than that during the average period. This supports the finding that lagoon sedimentation is temporary and will likely be flushed to the ocean during larger storms. Generally, the proposed alternatives have little impact to the sediment transport volume to the ocean as the Topanga watershed does not contribute much sediment to the littoral cell, as concluded by the Coast of California Storm and Tidal Waves Study for Los Angeles Region (USACE 2009).

In summary, the following findings can be concluded from the sedimentation modeling:

- The proposed alternatives will not change the sediment erosion and deposition pattern, mode and sediment deposition, and erosion volumes upstream of the lagoon. Most of the sediment generated from the watershed deposits in the creek downstream of MM2 and upstream of the lagoon.

- During the average storm period, sedimentation in the lagoon and sediment transport volume to the ocean remain similar to the existing conditions for all proposed alternatives. About 28% to 32% of sediment generated from the watershed settles in the lagoon and about 6% goes to the ocean.
- During the high storm period, more sediment passes through the lagoon to the ocean compared to the average storm period for all alternatives. About 25% of sediment generated from the watershed passes through the lagoon to the ocean for all alternatives, and the percentage of sediment deposited in the lagoon is very low, less than 3%, except 8.5% for Alternative 2. More sediment is expected to settle in the lagoon for Alternative 2 compared to the other alternatives due to its larger lagoon footprint. But the difference in sediment volume of 460 cubic yard (cy) between Alternatives 1 and 2 after the high flow period (included both 100-year and 25-year storms) is negligible compared to 109,000 cy/year of alongshore transport in Topanga Beach Reach (USACE 2009). Sediment deposition depth of Alternative 2 is similar to the other alternatives.
- Over the long term, the proposed alternatives are not expected to change sediment delivery to the ocean, as sediment delivery to the ocean is minimal, which is consistent with the conclusion from the Coast of California Storm and Tidal Waves Study for Los Angeles Region (USACE 2009). The USACE study also concluded that there is no sink hole in the reach, and Topanga Beach has remained stable over the course of the 20th century. Therefore, the beach and surf break conditions at the lagoon mouth should not be affected by proposed lagoon restoration.

FIGURE 6.7: SEDIMENT ANALYSIS REACHES OF THE 1D MODEL NETWORK

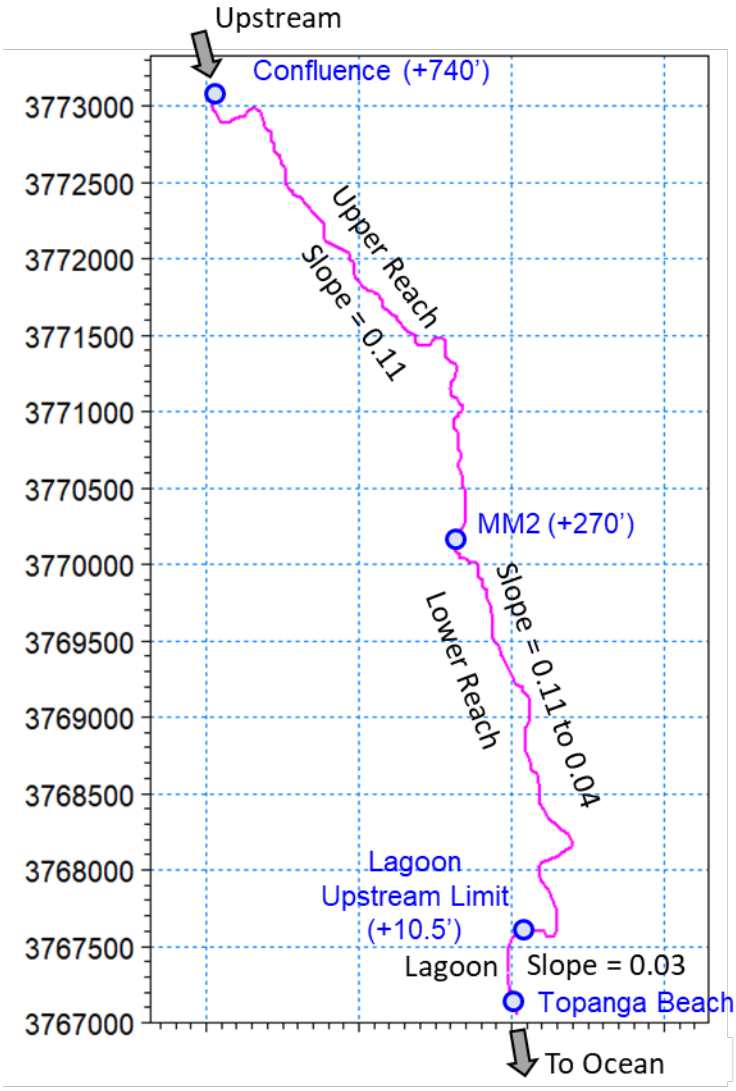


TABLE 6-3: TOTAL SEDIMENTATION VOLUMES[1,2] IN CUBIC YARDS FOR 1996-2001 AVERAGE FLOW PERIOD

Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Upstream Input (Confluence)	3780	3780	3780	3780
Upper Reach (Confluence to MM2)[3]	-8800	-9060	-8800	-8960
Lower Reach (MM2 to Lagoon Upper Limit)	8240	7920	7820	8290
Lagoon (Lagoon upper limit to Topanga Beach)	3530	4130	3990	3660
To Ocean	800	790	770	790

Note:
1 A positive number indicates sediment accretion or deposition. A negative number indicates sediment erosion.
2 The volumes are rounded to the nearest 10s of cubic yard.
3 The differences in sedimentation amount can be neglected in Upper Reach, as the hydraulic and sedimentation conditions are identical for all alternatives. These differences are likely due to numerical errors and model instabilities.

TABLE 6-4: SUMMARY OF SEDIMENT DEPOSITION PERCENTAGES FOR 1996-2001 AVERAGE FLOW PERIOD

Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Lower Reach (MM2 to Lagoon Upper Limit)	65.5%	61.7%	62.2%	65.1%
Lagoon (Lagoon upper limit to Topanga Beach)	28.1%	32.2%	31.7%	28.7%
To Ocean	6.4%	6.2%	6.1%	6.2%

TABLE 6-5: TOTAL SEDIMENTATION VOLUMES[1,2] IN CUBIC YARD FOR 1979-1984 HIGH FLOW PERIOD

Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Upstream Input (Confluence)	18840	18840	18840	18840
Upper Reach (Confluence to MM2)[3]	-15110	-15110	-15110	-15120
Lower Reach (MM2 to Lagoon Upper Limit)	23860	22580	24100	24850
Lagoon (Lagoon upper limit to Topanga Beach)	1120	2870	1040	340
To Ocean	8960	8500	8800	8770

Note:
1 A positive number indicates sediment accretion and deposition. A negative number indicates sediment erosion.
2 The volumes are rounded to the nearest 10s of cubic yard.
3 The differences in sedimentation amount can be neglected in Upper Reach, as the hydraulic and sedimentation conditions are identical for all alternatives. These differences are likely due to numerical errors and model instabilities.

TABLE 6-6: SUMMARY OF SEDIMENT DEPOSITION PERCENTAGES FOR 1979-1984 HIGH FLOW PERIOD

Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Lower Reach (MM2 to Lagoon Upper Limit)	70.3%	66.5%	71.0%	73.2%
Lagoon (Lagoon upper limit to Topanga Beach)	3.3%	8.5%	3.1%	1.0%
To Ocean	26.4%	25.0%	25.9%	25.8%

The peak currents and water levels under the PCH Bridge during the 1980 storm (equivalent to 100-year return period storm) are extracted from the 1D Mike11 HD module for all four alternatives. They are tabulated in Table 6-7. Due to the existing constriction at the PCH Bridge and the lagoon upstream of it, the peak current during the 1980 storm under Alternative 1 reaches 18 feet per second (fps), the highest among the four alternatives. Alternative 2 has the lowest current, close to 11 fps. Alternative 3 and Alternative 4 have currents of 11.7 fps and 13.6 fps, respectively, in the middle among the four alternatives. The peak water level during the 1980 storm is the lowest in Alternative 2, approximately 13 ft above NAVD88. The other three alternatives have peak water levels between 15 ft NAVD88 and 15.5 ft NAVD88. The low currents in the proposed alternatives compared to Alternative 1 are due to the wider channel under PCH Bridge and with the flattened floodplain, so the wetted area increases under the restored condition.

In summary, the proposed alternatives improve flood protection upstream of the PCH Bridge with lowered water surface elevation and reduced erosive velocity through the PCH Bridge. Among the three proposed alternatives, Alternative 2 will perform best in terms of flood protection. Reducing velocity during the storm events would also improve fish passage, discussed further in Section 7.6.

TABLE 6-7: ESTIMATED PEAK CURRENTS AND WATER LEVELS UNDER THE PCH BRIDGE DURING THE 1980 STORM

Alternatives	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Peak velocity during 1980 storm (fps)	18.0	10.9	11.7	13.6
Peak water level during 1980 storm (ft NAVD88)	15.3	12.8	15.2	15.4

6.4.2 SLR Condition

SLR impacts to lagoon sedimentation were assessed in two ways: the amount of sediment that deposits in the lagoon and the amount that goes to the ocean. Figure 6.8 and Figure 6.9 show the lagoon sedimentation volumes and sediment transport to the ocean for the average flow period from October 1996 to March 2001. Figure 6.10 and Figure 6.11 show similar sedimentation results for the high flow period from November 1979 to March 1984. Although the sediment volumes vary by modeling periods, SLR conditions, and lagoon alternatives, the trend of volume change across SLR conditions and lagoon alternatives is consistent. They can be summarized as follows:

- Sediment deposition volume in the lagoon increases with SLR for all alternatives. The deposition volume is the highest with 6.8-ft SLR, this is consistent for both average and high flow periods.
- The deposition volume within lagoon ranking from highest to lowest during the average flow period is Alternative 2, Alternative 3, Alternative 4, and Alternative 1. During high flow period, the rank changed slightly, which is Alternative 2, Alternative 3, Alternative 1, and Alternative 4.
- With SLR, the volume of sediment being transported to the ocean is in a reversed trend compared to lagoon deposition volume. The higher the SLR amount, the less the sediment goes to the ocean.
- Among the alternatives, the sediment volume being transported to the ocean varies slightly. As expected, the amount of sediment that gets flushed to the ocean is significantly higher during the high flow period than average flow period. During heavy storm events, the high-velocity flow erodes more sediment from the upstream reach and carries it to the lower reach of the creek and to the ocean. But overall, the sediment contribution from the Topanga Watershed to the ocean is minimal (USACE 2009).
- Proposed alternatives don't change the trend of more sediment being deposited in the lagoon and less sediment being delivered to the ocean due to SLR. The trend is to be expected and is beneficial to maintain the current breaching frequency. If more sediment accumulated in the lagoon, it would reduce the water volume (or storm intensity) required to breach the lagoon mouth.

FIGURE 6.8: SLR IMPACTS TO LAGOON SEDIMENTATION FOR 1996-2001 AVERAGE FLOW PERIOD

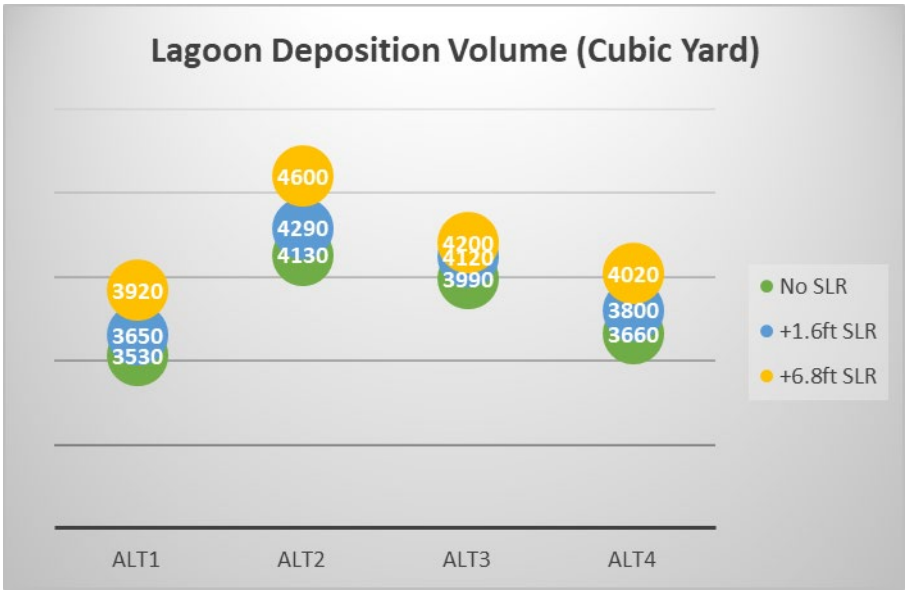


FIGURE 6.9: SLR IMPACTS TO SEDIMENT TRANSPORT TO OCEAN FOR 1996-2001 AVERAGE FLOW PERIOD

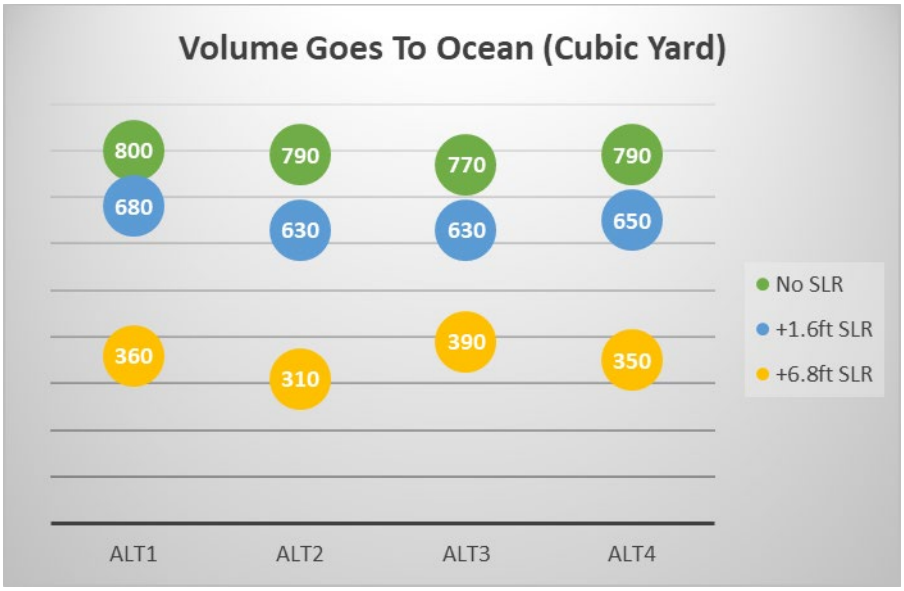


FIGURE 6.10: SLR IMPACTS TO LAGOON SEDIMENTATION FOR 1979-1984 HIGH FLOW PERIOD

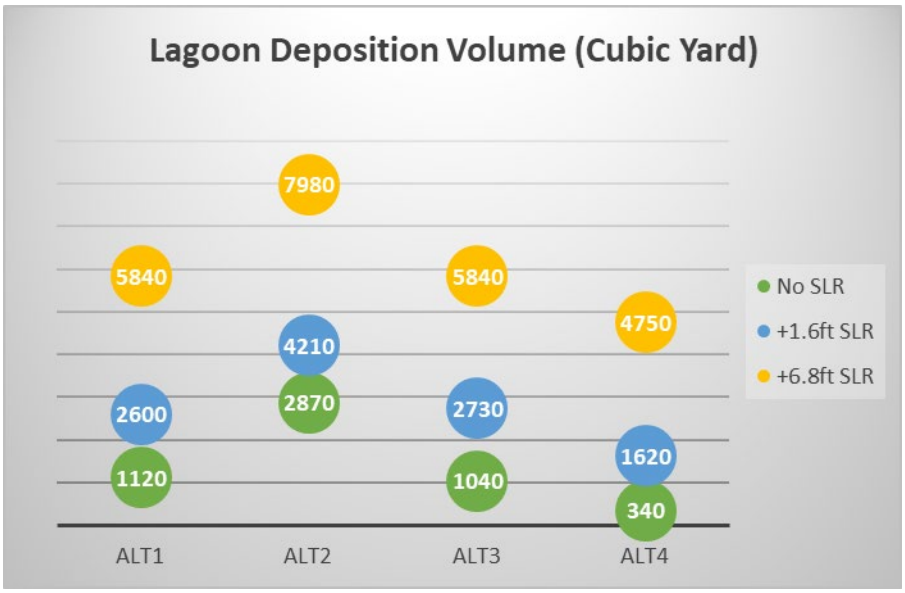
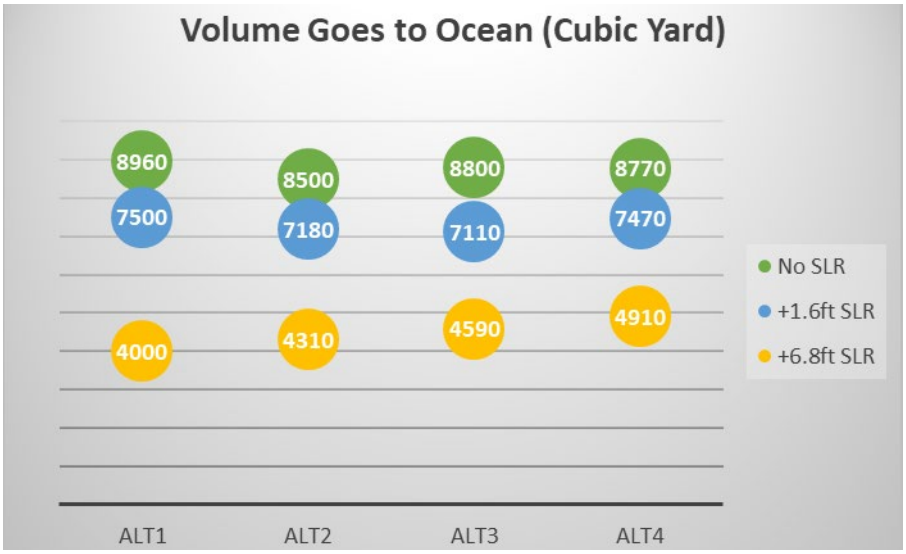


FIGURE 6.11: SLR IMPACTS TO SEDIMENT TRANSPORT TO OCEAN FOR 1979-1984 HIGH FLOW PERIOD



The flow under the PCH Bridge is a critical factor for fish passage. During the 1980 storm, peak velocities and water surface elevations under +1.6-ft and +6.8-ft SLR were compared with no SLR condition and are tabulated in Table 6-8. The conclusions are as follows:

- The peak water levels under the bridge are similar between no SLR and +1.6-ft SLR, and minor reductions occur in peak velocities. This is likely due to the fact that mean sea level (MSL) under the 1.6-ft SLR condition is still lower than the cobble beach berm crest elevation of 4.0 ft.
- With +6.8-ft SLR, the peak water levels are increased, and the peak velocities are reduced. Due to the elevated sea level, the increase of cross-section area under the PCH Bridge helps to relieve the flow contraction under the current sea level condition.
- Among the alternatives, Alternative 2 has the lowest peak water level and velocity, which are 13.8 ft NAVD88 and 8.2 fps under an SLR of 6.8 ft. Hence, Alternative 2 is most resilient to SLR in terms of flood protection. The lowered velocity is beneficial for fish passage during the storms.

TABLE 6-8: SUMMARY OF PEAK VELOCITIES AND WATER LEVELS UNDER THE PCH BRIDGE DURING 1980 STORM

Parameters	Sea Level	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Peak water level (ft, NAVD88)	No SLR	15.3	12.8	15.2	15.4
	1.6' SLR	15.3	12.8	15.1	15.4
	6.8' SLR	15.8	13.8	15.8	15.9
Peak velocity (fps)	No SLR	18.0	10.9	11.7	13.6
	1.6' SLR	17.7	10.2	11.6	13.6
	6.8' SLR	16.8	8.2	8.8	10.2

6.5 Summary of Findings

The 1D Mike11 model with integrated hydrology, hydraulic, and sediment transport modules is applied for simulating the creek and lagoon hydraulics and sedimentation for assessing alternatives. The main findings of the 1D modeling are summarized below:

- The upper reach of the creek upstream of MM2 is under a scour mode due to the steep slope. The scour volume increases with flow intensity, but it is not impacted by SLR or proposed lagoon grading.

- The lower reach downstream of MM2 is under a deposition mode due to flatter slopes. The sedimentation within lower Topanga Creek varies with flow conditions, but the overall deposition volume is very similar among alternatives with the exception of Alternative 2 under the high flow condition. The latter has slightly less sediment deposition volume, or more sediment being transported to the lagoon.
- The lagoon is under a deposition mode during average flow conditions, but more of a pass-through system under the high flow conditions. Alternative 2 has the largest deposition volume in the lagoon area among the four alternatives under both average and high flow conditions. The slightly larger deposition volume is mainly due to the increased lagoon area since the deposition depth of Alternative 2 is similar to other alternatives.
  - Under the high flow condition, the sediment deposition volume in the lagoon from high to low is Alternative 2, Alternative 3, Alternative 1, and Alternative 4.
  - Under the average flow condition, the sediment deposition volumes in the lagoon are very similar for all alternatives with slight differences. The sediment volume from high to low is Alternative 2, Alternative 3, Alternative 4, and Alternative 1.
- Sediment delivery to the ocean: during high flow storm events, the high-velocity flow erodes more sediment from the creek and watershed and transports more sediment from upstream to the ocean. The proposed grading does not change the sediment delivery appreciably. Alternative 2 slightly reduces the sediment delivery to the ocean, but not enough to cause any changes to offshore bathymetry since sediment delivery to the ocean from the Topanga watershed is minimal (USACE 2009).
- With the expansion of the lagoon and channel under the PCH Bridge, the peak currents under the PCH Bridge are lower under all proposed alternatives compared to the Existing Condition. Alternative 2 has the most reduction in water surface elevation and flow velocity. This improves fish passage conditions and flood protection. Alternatives 3 and 4 have similar water surface elevations but lower flow velocity compared to Alternative 1.
- SLR Impacts:
  - Sediment deposition volume in the lagoon increases with SLR for all alternatives and for both average and high flow periods.
  - Sediment delivery to the ocean decreases with increased SLR. Alternative 4 maintains slightly more delivery among the proposed alternatives, followed by Alternative 3, and then Alternative 2. But the difference between alternatives is negligible and is not expected to cause any impact to the littoral cell.
  - Flow velocity through the PCH Bridge reduces with increased SLR due to increase in flow area. The trends are similar for all alternatives
  - 100-year water surface elevation in the lagoon does not change with 1.6 ft of SLR and increases slightly with 6.8 ft of SLR for all alternatives. Alternative 2 has the lowest water surface elevation under all sea level scenarios due to its large lagoon area. Hence, Alternative 2 is most resilient in terms of SLR.
  - The reach upstream of MM2 is not impacted by SLR.

Table 6-9 provides a summary and comparisons of 1D sedimentation model results among the alternatives.

TABLE 6-9: 1-D MODEL RESULT COMPARISONS AMONG ALTERNATIVES AND SLR IMPACTS

Item	Order by Alternatives	SLR Impact
Peak Velocity under PCH Bridge	Alternative 1 > Alternative 4 > Alternative 3 > Alternative 2	Reduced peak currents with SLR
Peak Storm Water Level at PCH Bridge	Alternative 2 is the lowest, all other three alternatives are similar.	Water level does not change with 1.6 ft of SLR and increases slightly with 6.8 ft of SLR
Sediment Accretion in Lagoon[1]	Alternative 2 > Alternative 3 > Alternative 1 > Alternative 4	Increased sediment deposition with SLR Alt 2 is most resilient to SLR

Note: 1 The deposition depth in Alternative 2 is similar to Alternative 1 and Alternative 3 due to its larger lagoon footprint. Alternative 4 has relatively less lagoon deposition in depth than the other three alternatives.

7 Two-dimensional Hydraulic Modeling

The Topanga Lagoon hydraulic system is a shallow lagoon with a thalweg elevation of +4 ft NAVD88. The lagoon is periodically closed and breaches under large discharge events from upstream. When the lagoon is open, it is a well-mixed hydraulic system in a way that seawater gets in during high tide and freshwater runoff drains from the upstream Topanga Creek watershed. Two-dimensional (2D) hydraulic numerical modeling was performed to provide water depth and water velocity within the lagoon for fish passage analysis. Modeling results between Alternative 1 (the Existing Condition) and three proposed alternatives were compared to understand the hydraulic improvements to the lagoon's fish passage due to the restoration of Topanga Lagoon. This section describes the selected Mike21 model, the model domain, setup, and calibration and presents model results.

7.1 Model Description

The commercially-available 2D MIKE21 Flexible Mesh (FM) model suite developed by DHI was selected to study hydrodynamics in the Topanga Lagoon and its breached channel. MIKE-21-FM is a modeling system based on a flexible mesh approach, simulates water level, and velocity variations in response to a variety of forcing functions in riverine, coastal, and estuarine environments. The flexible triangular mesh can vary in size and shape. It is especially capable of capturing the complex lagoon system with meandering river channels compared to the rectangular mesh. Its robust wetting and drying algorithm improves the model stability while modeling overbank flows during flooding. The Mike21 FM model is also a FEMA-accredited model that has been approved for National Flood Insurance Program usage.

The forcing terms that Mike21 FM can model include water level variations, discharge, bottom friction, wind shear stresses, Coriolis force, barometric pressure gradients, and wave radiation stresses, among others. The 2D depth-averaged Hydrodynamic (MIKE21 FM HD) module was used to model freshwater inflow, currents, and tidal hydraulics in this study. The modeling focuses on providing water level and velocity within the lagoon under a wide range of upstream freshwater inflows. The modeled hydraulic results can be extracted at any location of interest and/or summarized over the model domain; then the rating curves generated from model results can be directly used in the fish passage analysis.

7.2 Model Approach and Scenarios

The approach of 2D hydrodynamic modeling is summarized as follows:

- Setup the model of the existing condition as a baseline condition;
- Calibrate the model of existing condition based on collected flow and water level data;
- Develop the models of three proposed alternatives; and
- Perform simulations for the following four project alternatives under various channel breach scenarios:
  - Alternative 1 (No Project/No Build)
  - Alternative 2
  - Alternative 3
  - Alternative 4

7.2.1 Channel Breach Scenarios for Existing Condition (No SLR)

The beach morphology and breach analysis discussed in Section 5 resulted in a range of breach channel sizes and alignments. A total of seven channel size and alignment variations were simulated for Alternative 1 without SLR:

1. Narrow straight channel
2. Medium straight channel

3. Wide straight channel
4. Narrow migrated channel
5. Medium migrated channel
6. Wide migrated channel
7. Narrow extra-long migrated channel

Straight channels are approximately 160-ft-long, compared to migrated channels of 200-ft-long. For each alignment, three channel widths were considered: 10 ft, 25 ft, and 40 ft. The extra-long narrow channel was set to be 9-ft-wide and 350-ft-long. Each channel variation was run with two downstream tidal levels: mean higher high water (MHHW) and MLLW. Table 7-1 lists a total of 14 scenarios that were simulated for each project alternative. The inflow that applied at the model upstream boundary ranges from 0 cfs to 4,000 cfs. The upper limit of the inflow that is close to a 5-year fluvial storm event recommended by ESA was based on peak daily discharges from water year 1968-1969. Table 7-1 lists 14 modeled inlet breach scenarios. The inflow discharge ranging from 0 to 4,000 cfs was applied at the model upstream boundary for each scenario. No SLR is considered in the model runs listed in Table 7-1.

TABLE 7-1: MODELED CHANNEL BREACH SCENARIOS FOR EACH PROJECT ALTERNATIVE

Channel Alignment	Inlet Channel Width		Upstream Inflow	Breach Inlet length	Downstream Tides
Straight	Narrow Channel	10 ft	0 to 4,000 cfs	160 ft	MHHW; MLLW
Straight	Medium Channel	25 ft	0 to 4,000 cfs	160 ft	MHHW; MLLW
Straight	Wide Channel	40 ft	0 to 4,000 cfs	160 ft	MHHW; MLLW
Migrated	Narrow Channel	10 ft	0 to 4,000 cfs	200 ft	MHHW; MLLW
Migrated	Medium Channel	25 ft	0 to 4,000 cfs	200 ft	MHHW; MLLW
Migrated	Wide Channel	40 ft	0 to 4,000 cfs	200 ft	MHHW; MLLW
Migrated	Narrow Channel (extra-long)	9 ft	0 to 4,000 cfs	350 ft	MHHW; MLLW

7.2.2 Channel Breach Scenarios for SLR Condition

Additional scenarios were modeled to evaluate SLR impacts. Consistent with the 1D modeling, SLRs of 1.6 ft and 6.8 ft were modeled in the 2D hydrodynamic analysis. As discussed previously in Section 6.3.3, 1.6 ft is the projected SLR by 2070 under low-risk aversion and average emission (average of low and high emissions), and 6.8 ft is the SLR projection by 2100 under high emission and medium-high risk aversion.

The beach berm will likely rise with SLR, but the breached channel thalweg could have two scenarios:

- Breach Channel Condition A: the beach berm and channel thalweg rise with the same amount of SLR; and
- Breach Channel Condition B: the beach berm rises with the same amount of SLR, but the channel thalweg remains at its current elevation. This is a likely scenario for cobble beaches, such as Topanga Beach.

Based on ESA's breach analysis and recommendation (2020), modeling runs were reduced compared to the no SLR runs by eliminating those scenarios in which breaches rarely occur. Breach scenarios that occur less than 3% of the time were excluded in the modelling, and the modeled scenarios are summarized in Table 7-2 and Table 7-3 for the two breach channel conditions. For the 6.8-ft SLR scenario, modeling runs were further reduced by only modeling breach events with discharge larger than 6.28 cfs (2 cms). The modeling results are summarized based on the two breach channel conditions discussed above:

- Breach Channel Condition A: both beach berm and channel thalweg rise with SLR.

- For 1.6-ft SLR scenario, it is assumed that the beach berm, lagoon bed, and channel thalweg rise with the same amount of SLR.
- For 6.8-ft SLR scenario, beach berm rises with the same amount of SLR, but lagoon and channel thalweg rise by 1/3 of the SLR amount. This scenario was determined based on the lagoon sediment deposition volume and depth from the 1D sediment transport modeling.

TABLE 7-2: BREACH SCENARIOS MODELED WITH 2D HYDRODYNAMIC MODEL WITH SLR – CONDITION A

+1.6-ft SLR	+6.8-ft SLR
• narrow-straight-inlet channel • medium-straight-inlet channel (excludes Alternative 2) • wide-straight-inlet channel • wide-migrated-inlet channel • narrow-extra-long-inlet channel	• medium-straight-inlet channel • wide-straight-inlet channel

- Breach Channel Condition B: the beach berm rises with the same amount of SLR, but the channel thalweg remains at its current elevation of 4 ft NAVD88 for both SLR scenarios. Per ESA's analysis (2020), the breached thalweg cuts down close to the 4 ft NAVD88 cobble berm elevation for all alternatives about 30% of the time of the modeled scenarios listed in Table 7-3.

TABLE 7-3: BREACH SCENARIOS MODELED WITH 2D HYDRODYNAMIC MODEL WITH SLR – CONDITION B

+1.6-ft SLR	+6.8-ft SLR
• narrow-straight-inlet channel • medium-straight-inlet channel • wide-straight-inlet channel • wide-migrated-inlet channel	• medium-straight-inlet channel • wide-straight-inlet channel

7.3 Model Domain and Bathymetry

The model domain illustrated in Figure 7.1 and Figure 7.2 covers the nearshore ocean, Topanga Lagoon, and the upstream Topanga Creek up to contour elevation of roughly 34 ft NAVD88. The upstream boundary of the model domain is about 0.7 mile north of Topanga Beach. The offshore boundary extends approximately 0.9 mile offshore from Topanga Beach. In the upstream Topanga Creek, the model domain not only includes the channel of Topanga Creek, but also covers its floodplain up to a minimum elevation of +30 ft NAVD88. This 30-ft elevation is a lot higher than MHHW with the projected SLR (0.5% probability by 2100), approximately +12.3 ft NAVD88, so that it is high enough to cover the overbank flow areas during the 100-year flood event with future SLR.

The overall triangular flexible mesh developed for the 2D hydraulic model is illustrated in Figure 7.1. The mesh varies from large grid size in the offshore area to fine grid size in the project areas: Topanga Beach berm and lagoon and tributary area. Figure 7.2 shows a zoomed in view of the mesh under the Existing Condition. The mesh varies slightly at the breach channel depending on the breach scenario and alternative. Table 7-4 lists the mesh grid size (resolution) for all domain areas and summarizes all the bathymetry data used in this study. As discussed in Section 3.2.1, the LARIAC4 LIDAR for Los Angeles County was used for the Existing Condition of Topanga Lagoon and Creek. The 30% grading plans of alternatives were used in developing meshes for alternatives.

TABLE 7-4: BATHYMETRY DATA SOURCE INVENTORY AND MESH RESOLUTION

Model Area	Data Source	Mesh Resolution
Offshore	2009 Southern California USACE NCMP Bathymetric LIDAR	300 ft
Topanga Beach Berm	2015-2016 Los Angeles County LARIAC4 dataset	3 ft
Topanga Lagoon and Creek	Existing Condition – 2015-2016 Los Angeles County LARIAC4 dataset, supplemented by spot elevation survey Proposed Condition – 30% grading plans for all three alternatives	12 ft

FIGURE 7.1: MODEL DOMAIN AND FLEXIBLE MESH OF 2D HYDRODYNAMIC MODEL

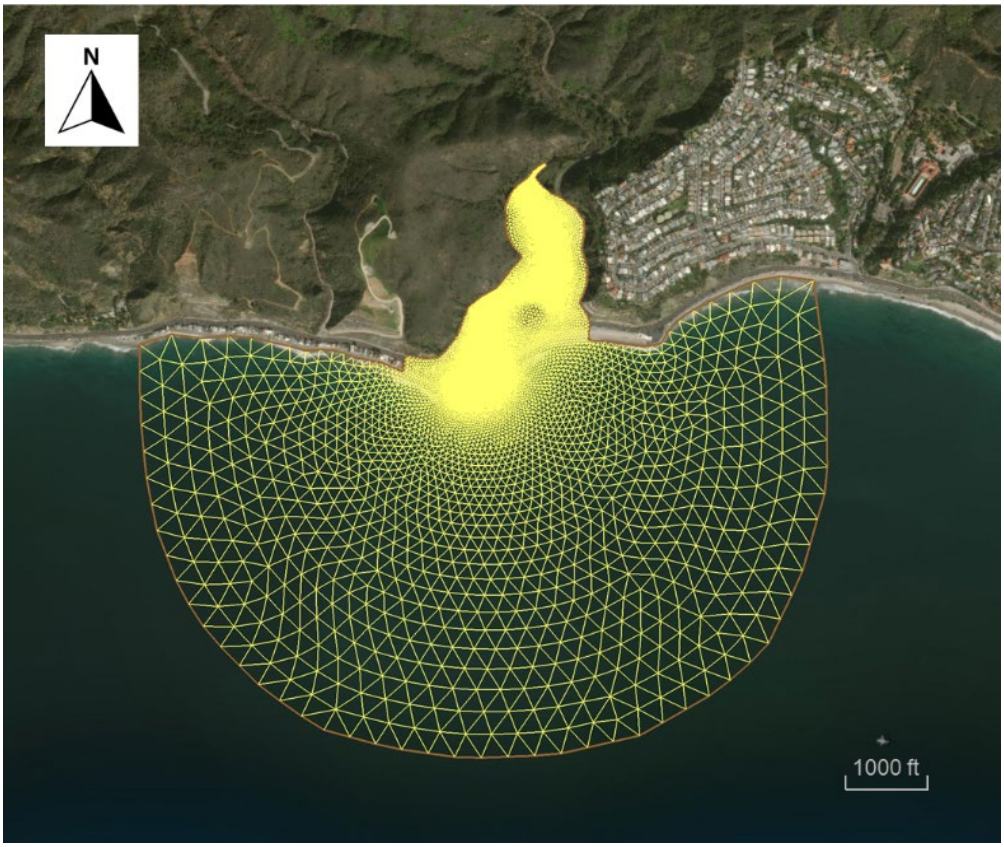
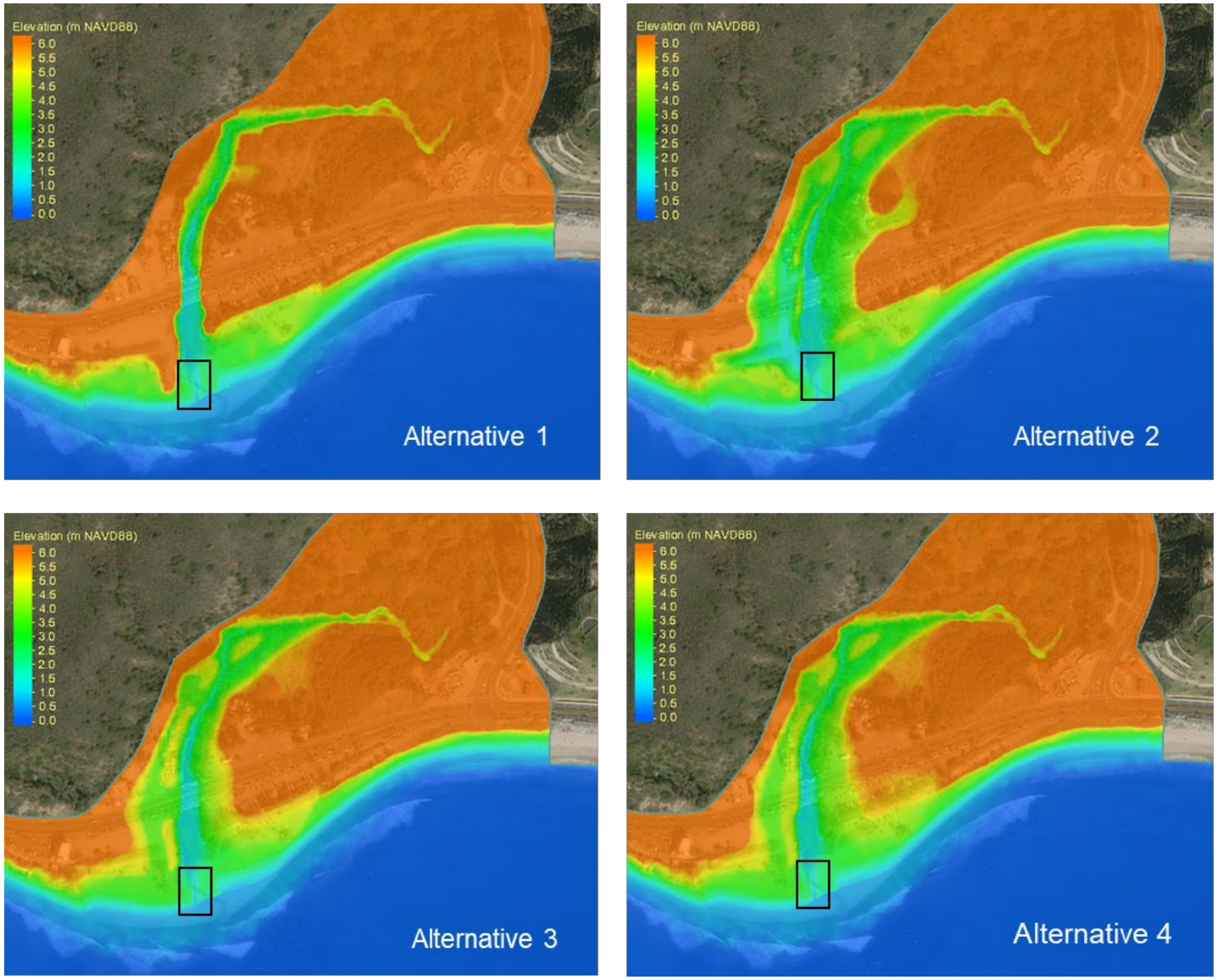


FIGURE 7.2: MODEL DOMAIN AND FLEXIBLE MESH OF ZOOMED IN LAGOON AREA

Figure 7.3 depicts the model bathymetry for all four alternatives (Alternative 1 is the Existing Condition). As shown, Alternatives 2 through 4 have wider floodplains in the lagoon area than Alternative 1. By lowing the creek floodplains, the lagoon's capacity to pass significant storms is improved.

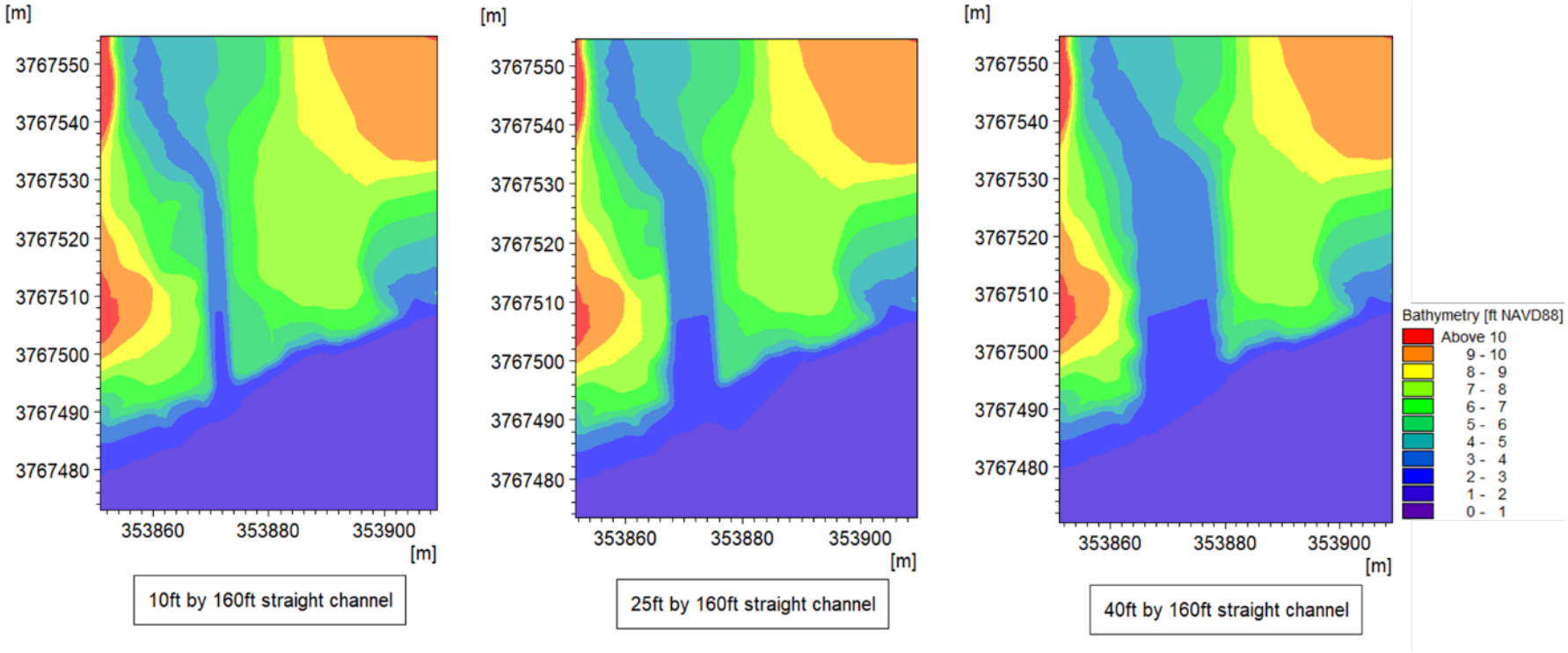
Figure 7.4 through Figure 7.6 present the model bathymetry of three representative breached channels that were selected for this modeling study as representative channel alignment and size. As listed in Table 7-1, there are a total of seven mesh variations for each alternative, including narrow, medium, and wide channels with straight or migrated alignment.

FIGURE 7.3: MODEL BATHYMETRY FOR ALTERNATIVES



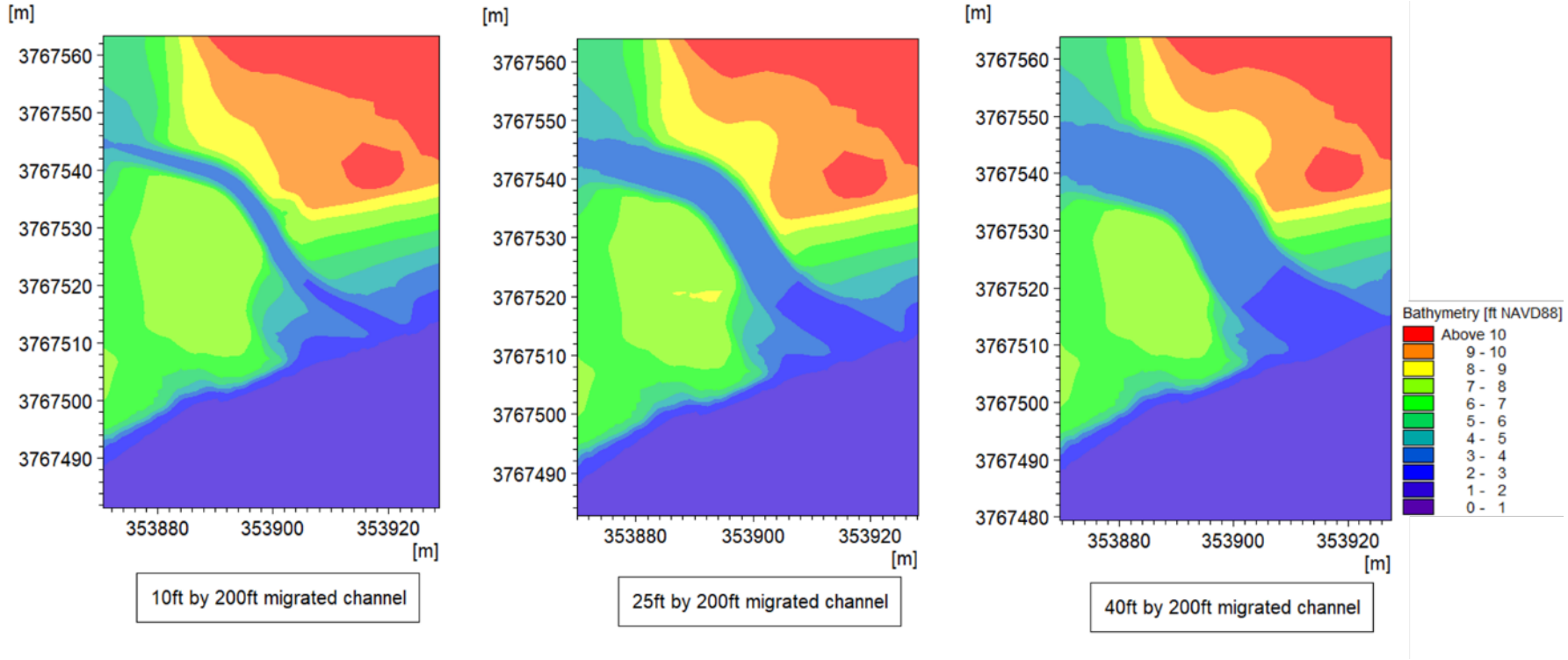
Note: Inlet channel option for plotting is the narrow straight channel (area shown in the black box)

FIGURE 7.4: ZOOMED IN VIEWS OF BREACH INLET BATHYMETRY FOR STRAIGHT CHANNEL ALIGNMENT



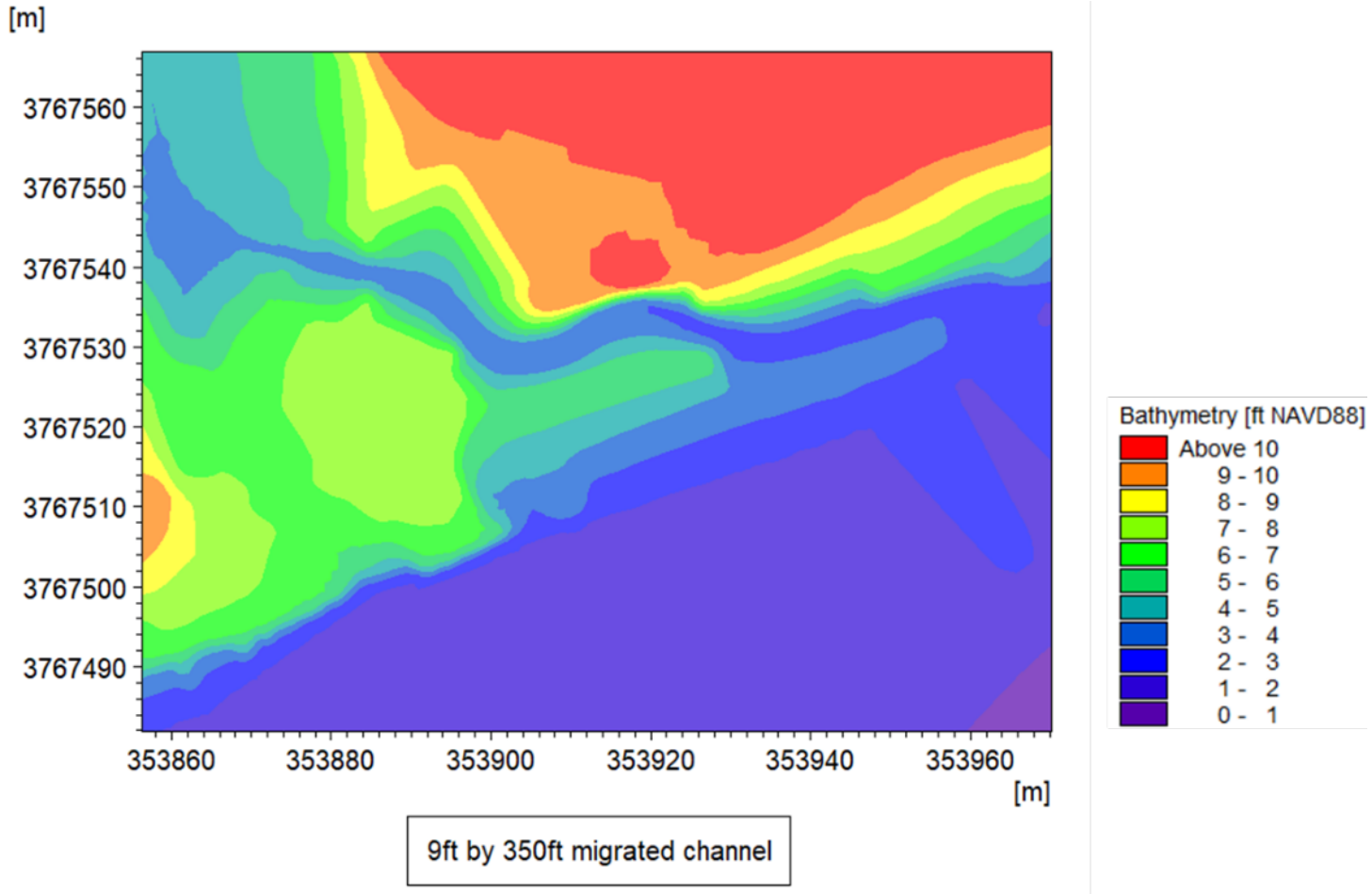
Note: The base model mesh used for the plot is the Existing Condition mesh.

FIGURE 7.5: ZOOMED IN VIEWS OF BREACH INLET BATHYMETRY FOR MIGRATED CHANNEL ALIGNMENT



Note: The base model mesh used for the plot is the Existing Condition mesh.

FIGURE 7.6: ZOOMED IN VIEWS OF BREACH INLET BATHYMETRY FOR EXTRA-LONG MIGRATED CHANNEL ALIGNMENT



Note: The base model mesh used for the plot is the Existing Condition mesh.

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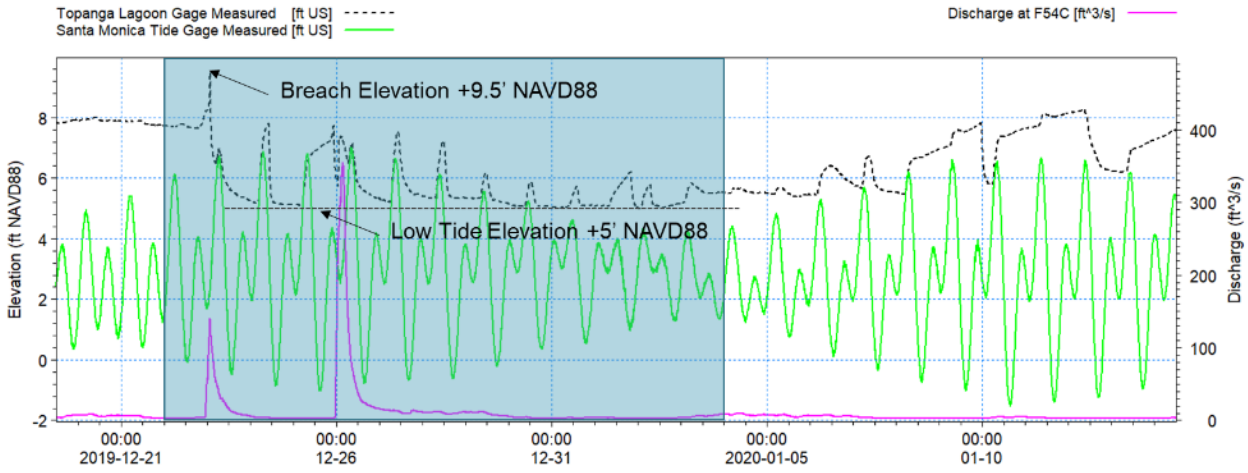
7.4 Model Calibration

The calibration included verification of lagoon bathymetry and roughness coefficients used in the model. The Mike21 FM HD model is a fixed-bed model, which means the model bathymetry remains the same during the entire modeling period. Although it is not able to simulate the breach moment when the closed lagoon opens, it is capable of modeling the lagoon interaction with tidal water under a breached condition. After breaching, the breached berm elevation and channel width were selected based on water level and lagoon bathymetry information and further adjusted and verified during model calibration. The calibration process also included adjustments of the roughness coefficients such that the model-predicted tidal elevations match to those measured best.

7.4.1 Water Levels During Calibration Period and Lagoon Mouth Photos

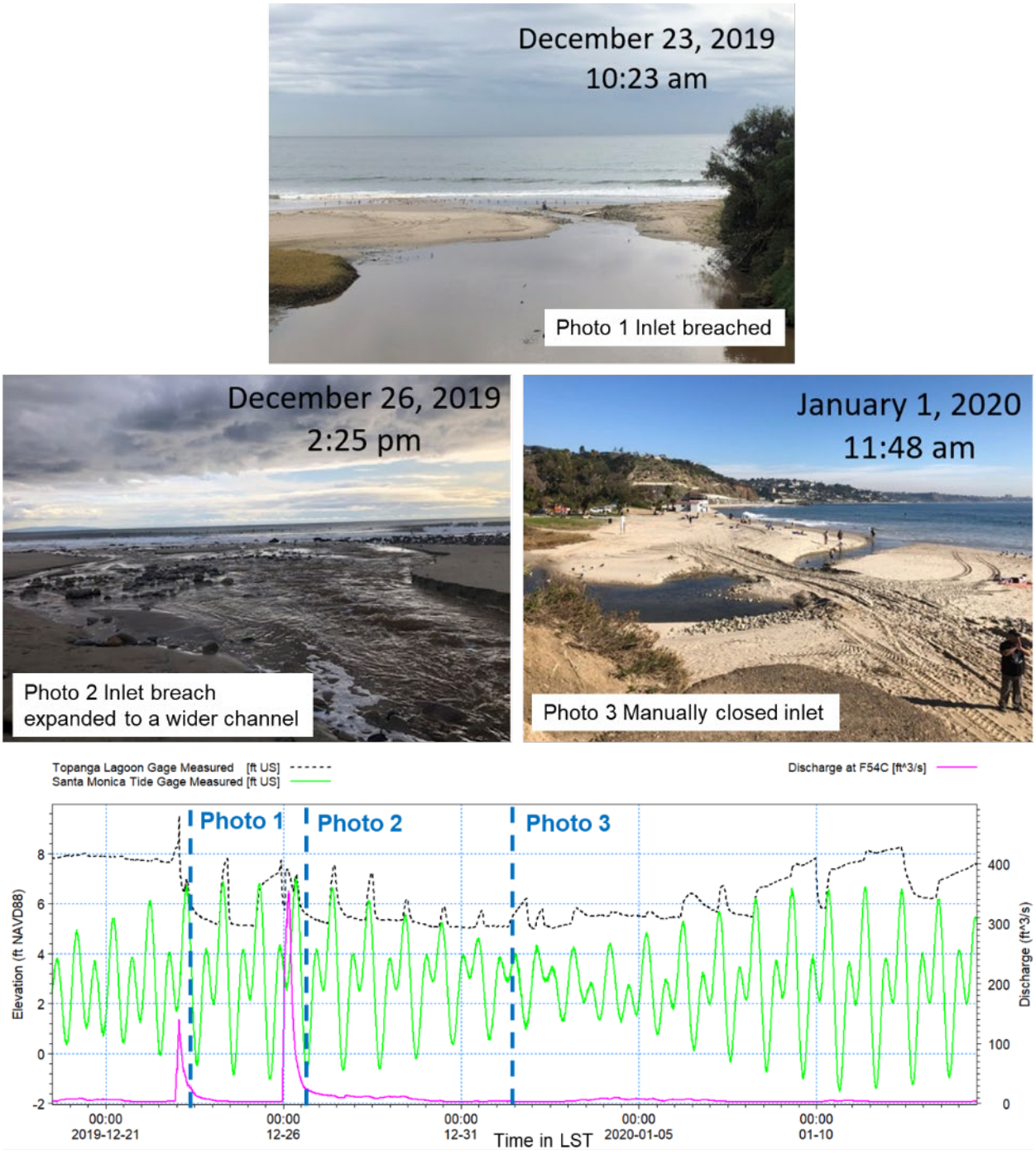
The water level measurements at the Topanga Lagoon Gage 1 were compared with modeled water levels during the hydrodynamic model calibration. Figure 7.7 plots the measured water level at Gage 1, overlaid with offshore tides and freshwater flows at model upstream boundary near Gage 2 and station F54C-R. The first breach event identified is around December 23, 2019. The water level started with a relatively constant closed lagoon elevation of +8 ft NAVD88, quickly increased to the breaching elevation of +9.5 ft NAVD88, and then dropped down to open lagoon low elevation of +5 ft NAVD on December 23, 2019. The discharge curve (shown in pink) peaked on the same day the lagoon was breached. The minimum water elevation measured at Gage 1 is about +5 ft NAVD88, which indicates the approximate beach berm elevation at that time. The model was calibrated from December 22, 2019 to January 4, 2020 when the lagoon was perched. The calibrated period is shaded in Figure 7.7.

FIGURE 7.7: WATER LEVEL MEASUREMENTS AT GAGE 1 OVERLAID WITH OCEAN TIDES AND FRESHWATER DISCHARGE



RCDSMM provided lagoon mouth photos as supporting information for the breach analysis. Three photos, shown in Figure 7.8, were taken during the calibration period. The moments when these photos were taken are marked in the water level time series plot in Figure 7.8. Photo 1 shows the mouth condition right after the first breach on December 23, 2019. The lagoon mouth captured in Photo 2 was right after the second storm peak on December 26, 2019. The breach channel width in Photo 2 is larger than the one on Photo 1 because the peak discharge in the second storm is more than double compared to the first storm. Large cobbles are also observed in Photo 2. Photo 3 shows the lagoon mouth was manually closed around January 1, 2020. This closure has been verified because a water level increase with duration longer than normal tidal signals is observed in the time series.

FIGURE 7.8: LAGOON MOUTH PHOTOS CAPTURED DURING THE CALIBRATION PERIOD

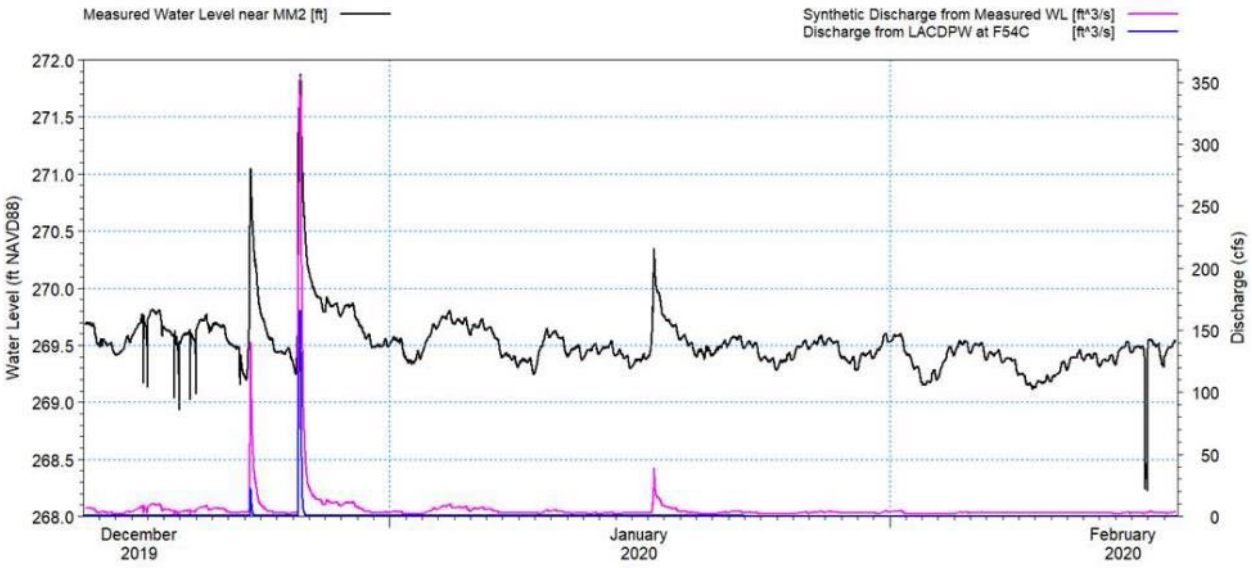


7.4.2 Boundary Conditions

Two boundary conditions were applied when running the hydraulic model: downstream boundary at the ocean and upstream boundary at Topanga Creek. The water levels recorded at the nearest Santa Monica tide gage (Station #9410840) over the calibration period were downloaded and applied at the model offshore boundary (as depicted in Figure 7.7 in the green curve). The discharges provided by the LACDPW at Station F54C-R were initially applied at the upstream boundary. However, the modeled water elevations at the lagoon (Gage 1) were consistently lower than those measured, indicating an underestimate of the

discharge at MM2/F54C-R gage. That was not a surprise as the creek thalweg has shifted, the gage is no longer recording low flows, and the rating curve of the County gage is no longer accurate and needs to be updated. To resolve the issue, a stream gage (MM2/M&N Gage 2) was installed, and a new rating curve was developed for the M&N Gage 2 at MM2, as described in Section 6.3.1. Discharges at MM2 are calculated based on measurements from M&N Gage 2. Figure 7.9 compares the two discharge time series: the blue curve shows flows provided by LACDPW based on MM2/F54C-R gage station, and the pink curve shows the discharges based on measured water levels and the M&N rating curve. The water levels measured at Gage 2 are plotted in black in the background. The simulated water level at Gage 1 matches the measurements well by applying the M&N discharges at the model upstream boundary.

FIGURE 7.9: COMPARISON OF STREAM FLOW AT MM2



7.4.3 Calibration Results

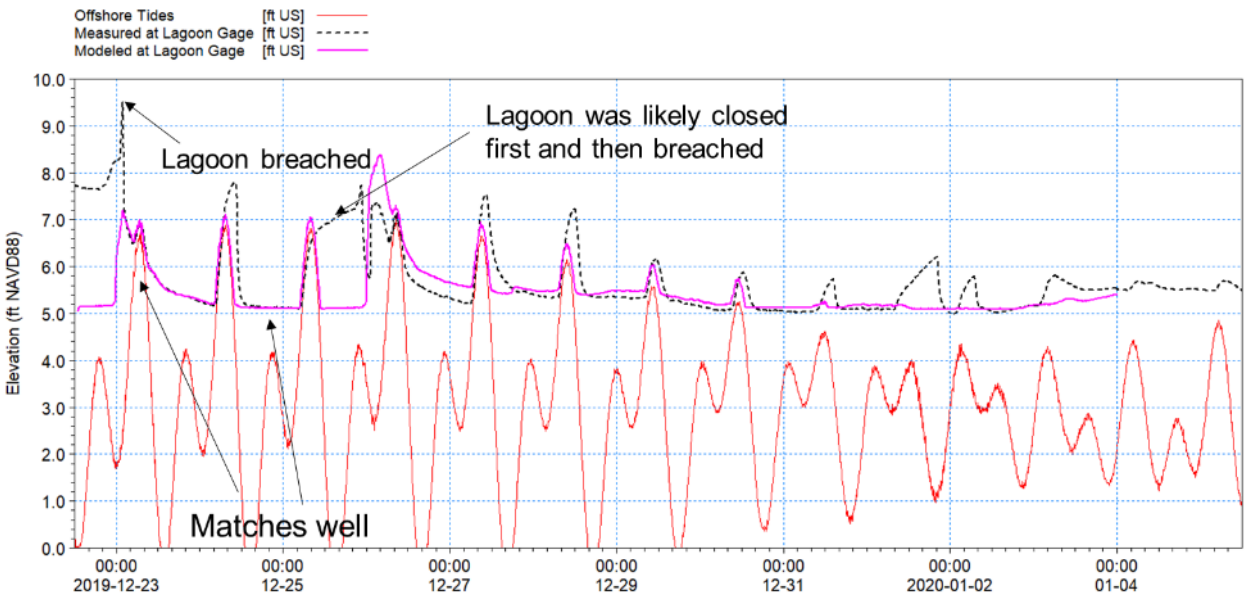
Figure 7.10 below compares the modeled water levels at Gage 1 with the measured. As the model was built with a breached condition (inlet open), it is impossible to capture the build-up of water depth when the lagoon is initially closed. However, after the lagoon is perched, the modeled water levels match well with the measured for both the peak elevation and the lowest elevation. The poor match before the fourth peak is likely a result of a short duration of lagoon closure after the first breach. The mouth was then breached again by the storm on December 26, 2019. Overall, the model predicts the water level under breached conditions quite accurately when compared to measurements. In the final calibrated model when the best match occurs, the inlet channel width was set as 10 ft with a berm crest elevation of +4 ft NAVD88. The berm crest elevation matches the general cobble crest elevation.

The Manning's *M* bed roughness was the calibration parameter that refines the hydrodynamic model during the calibration process. The *M* value is the reciprocal of the conventional roughness n value. *M* values selected in the final calibration model run are summarized in Table 7-5 .

TABLE 7-5: SUMMARY OF CALIBRATED ROUGHNESS COEFFICIENTS

Model Area	Manning's *M* ($ft^{1/3}/s$)	Manning's n ($1/M$) ($s/ft^{1/3}$)
Offshore	32	0.031
Intertidal Zone along Topanga Beach	28	0.036
Topanga Lagoon and Topanga Creek Channel	28	0.036
Topanga Lagoon and Topanga Creek Floodplain	24	0.042

FIGURE 7.10: COMPARISON OF MEASURED AND MODELED WATER LEVELS AT GAGE 1 IN THE LAGOON



Inlet channel width is 3m/10ft, berm breach elevation is +1.2m /+4ft NAVD88.

7.5 2D Hydraulic Model Results

This section discusses model results of the 2D hydraulic model, focusing on providing key hydraulic parameters (water depth and velocity under varying discharges) for fish passage analysis. The model was run for both with and without sea level conditions. Results are presented in the following sections.

7.5.1 No SLR Condition

As recommended in ESA's methodology of fish passage analysis (2022), the project area was divided into three migration areas:

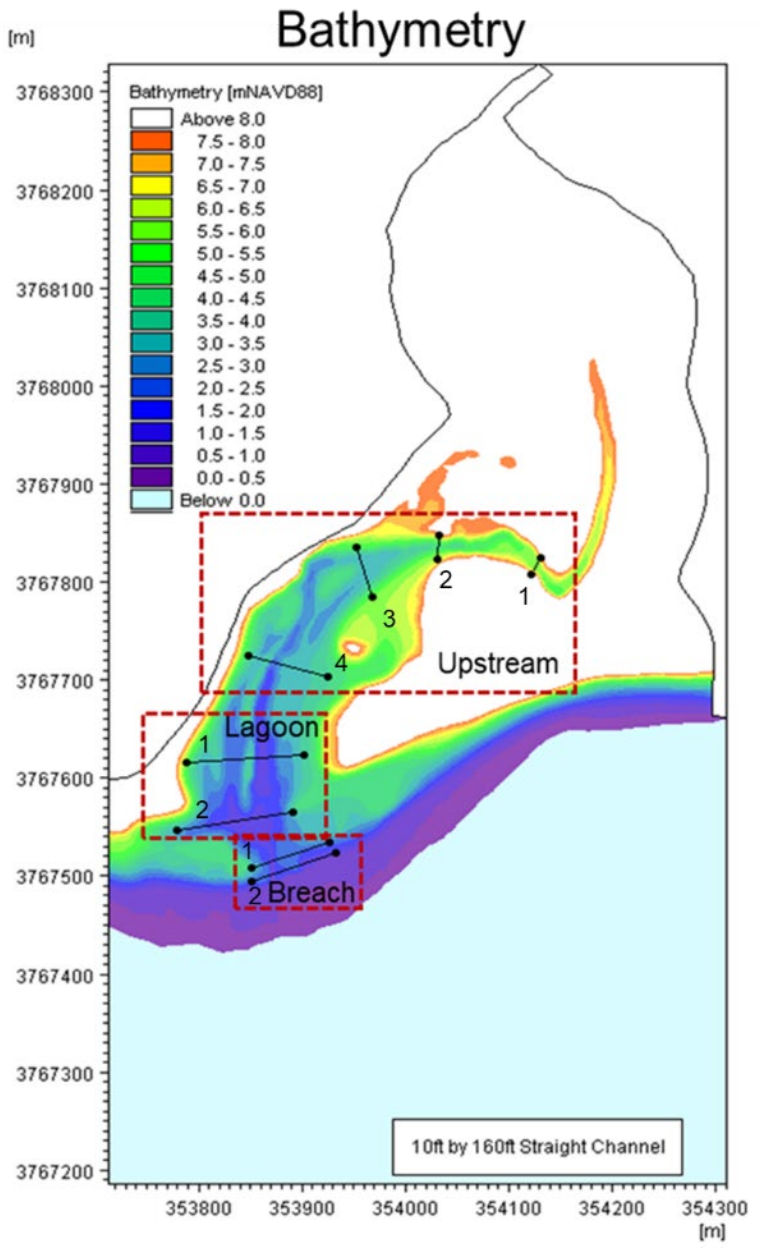
1. The upstream fluvial channel (Topanga Creek);
2. The lagoon body (Topanga Lagoon); and
3. The breach plus breach channel (Topanga Beach).

A number of representative cross-sections across each migration area were selected based on review of the hydraulic model output for areas with potential fish passage constrictions (high velocity or low depth). Within each cross-section, rating curves were extracted from the thalweg, along the edge of the bankfull channel where appropriate, and on the edge of the floodplain or lagoon. As flow increases, the thalweg is generally the first place to meet passage criteria for sufficient depth. But when the flow continuously increases, high flow velocity becomes a limitation and the location ceases meeting passage criteria. However, when the thalweg becomes velocity-limited, the outer bankfull channel fringe often starts to meet both depth and velocity criteria until it also becomes velocity-limited, at which point the floodplain may meet the criteria. Thus, more than one rating curve per cross-section was extracted to capture potential passage conditions.

A total of eight cross-sections within the entire modeling domain were selected as representative cross-sections: four in the upstream fluvial channel, two in the lagoon body, and two in the breach channel. The locations of these cross-sections were determined through careful review of the modeled depth and velocity. Figure 7.11 and Figure 7.12 depict the eight cross-section locations with model bathymetry and modeled maximum water depth in the background, respectively. The maximum water depth helps

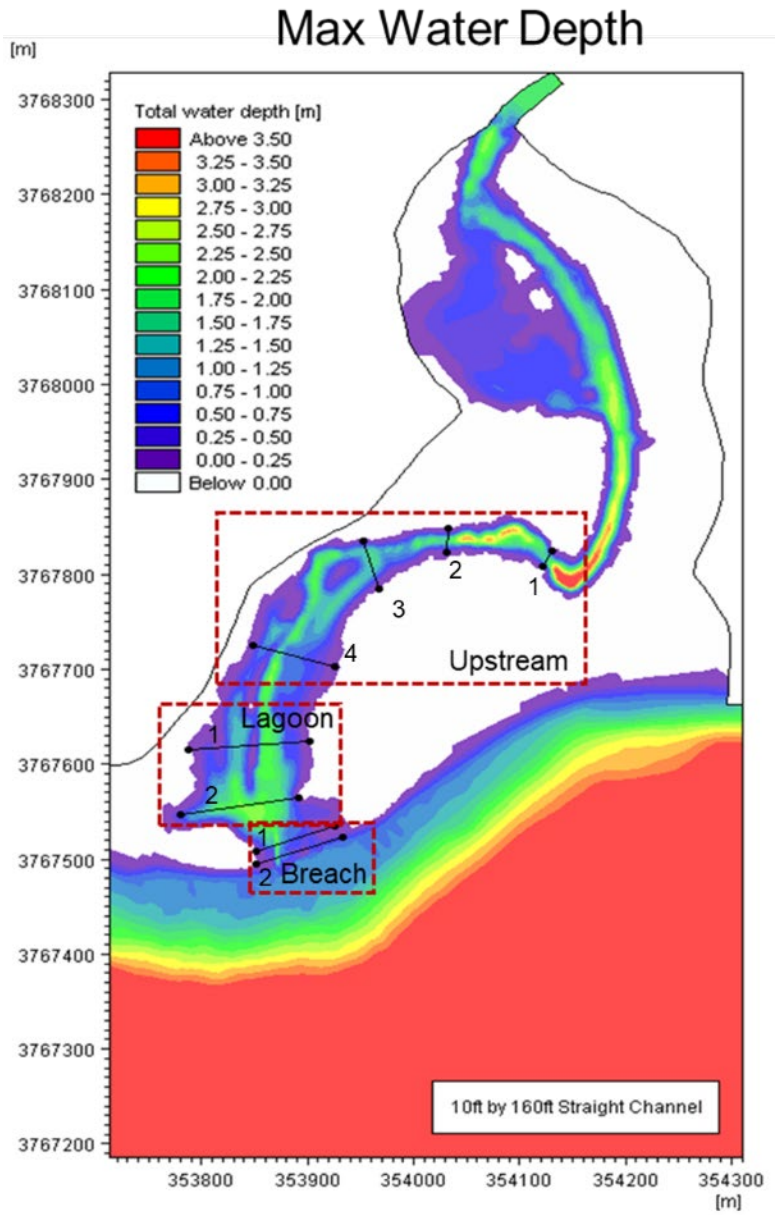
determine the width of cross-section to make sure the entire wetted area across the cross-section is included in the analysis. The model scenario presented in Figure 7.11 and Figure 7.12 is Alternative 2 with a 10-ft-wide and 160-ft-long straight channel. The cross-section locations at the upstream channel and lagoon body are identical for all model scenarios. The cross-section locations at the breach channel vary by breach channel options because the channel size and alignment vary quite significantly.

FIGURE 7.11: REPRESENTATIVE CROSS-SECTIONS PLOTTED ON MODEL BATHYMETRY



Note: Model bathymetry is showing Alternative 2 with a 10-ft by 160-ft straight channel.

FIGURE 7.12: REPRESENTATIVE CROSS-SECTIONS PLOTTED ON MODELED MAXIMUM WATER DEPTH



Note: Maximum water depth is showing results from Alternative 2 with a 10-ft by 160-ft straight channel.

As an example, Figure 7.13 and Figure 7.14 present the flow velocity rating curves at thalweg points for all eight cross-sections. In each cross-section plot, the rating curves from all four alternatives are included.

Upstream Area, at the two most upstream cross-sections, the velocity differences among the alternatives are not significant, except for the velocity is slightly lower at upstream cross-section #2, where the velocity is slightly lower under Alternative 1 for discharges from 10 to 50 cfs. Cross-section #2 is located at the upstream end of the lagoon grading. The high velocity under the proposed alternatives is likely due to flow acceleration as a result of the sudden lagoon expansion. The grading will be fine-tuned in future phases of the project to reduce flow acceleration and ultimately improve fish passage at this location. At upstream cross-sections #3 and #4, the velocities from the proposed alternatives are reduced compared to the Existing Condition, indicating improvement for fish passage.

Lagoon Area, the velocities in the lagoon body are similar among Alternatives 1, 3, and 4, but Alternative 2 has much lower velocities. The latter is the result of the much wider lagoon and floodplains proposed in Alternative 2. One of the cross-sections in the lagoon body is at the PCH Bridge (lagoon cross-section #1), as it is a critical point for fish passage. The maximum velocities under the PCH Bridge during modeled peak flow (equivalent to a 5-year storm) were investigated and are listed in Table 7-6. The velocities are listed by alternatives and by breach channel scenarios. As Alternative 4 has a north PCH alignment, the velocities were extracted at the new PCH alignment location. Velocity at the upstream face of the current PCH is used for Alternatives 1 through 3. Alternative 1 (the Existing Condition) and Alternative 4 have similar flow velocities under the bridge, and both are higher than the other two alternatives. This can be explained by the fact that Alternative 1 has the narrowest cross-section under the existing PCH Bridge compared to Alternatives 2 and 3. The relocated PCH Bridge in Alternative 4 is also on a narrower channel compared to the existing location. Among the four alternatives, Alternative 2 has much lower velocities than the other alternatives, and Alternative 3 has the second lowest velocities. There are slight variations among the beach channel scenarios between alternatives. The wide straight and migrated channel scenarios result in the highest velocities under the bridge. This is likely because the flow is confined within the channel instead of spreading on overbanks for narrow channel scenarios.

Breached Inlet Area, the velocity differences among the alternatives become smaller at the two cross-sections in the breach channel.

FIGURE 7.13: MODELED VELOCITIES AT UPSTREAM CROSS-SECTIONS (NUMBERED 1 TO 4 FROM UPSTREAM TO DOWNSTREAM)

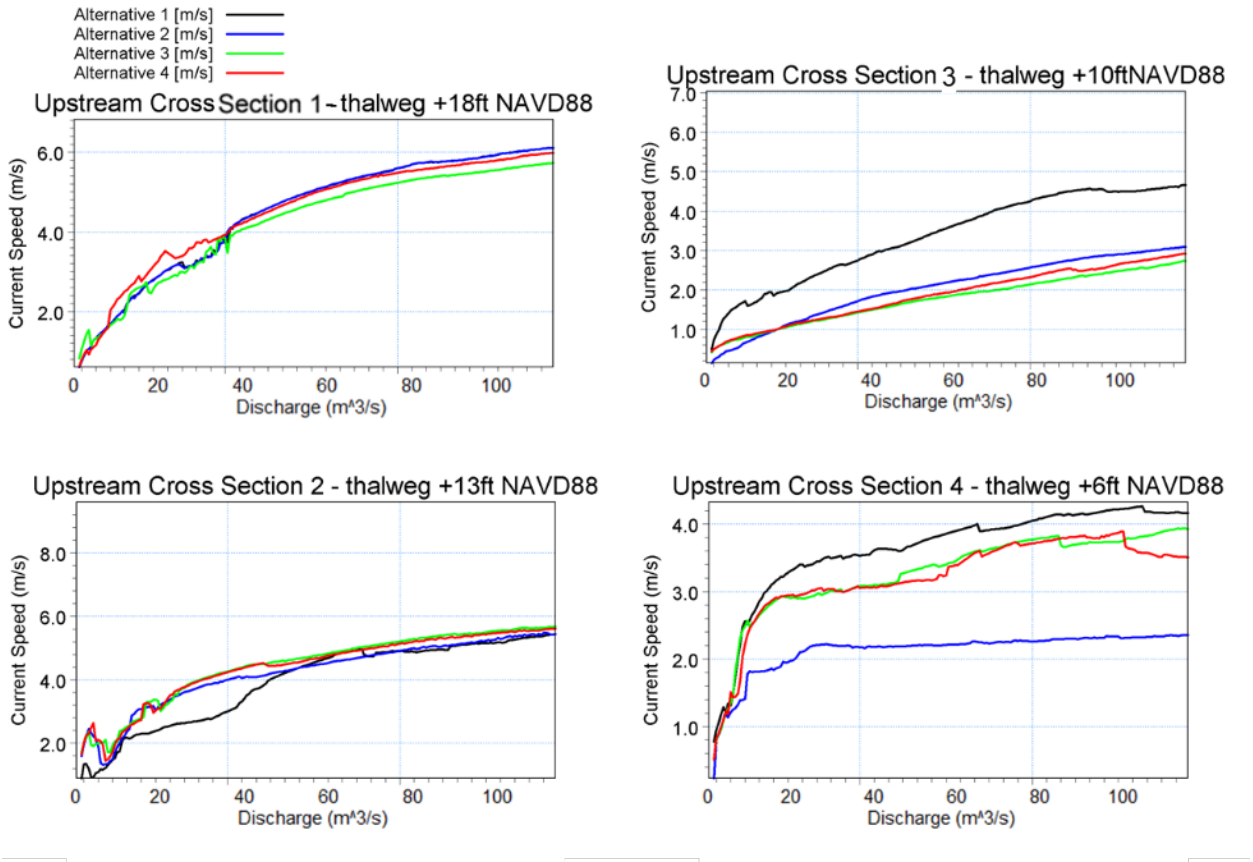


FIGURE 7.14: MODELED VELOCITIES AT LAGOON AND BREACH CHANNEL CROSS-SECTIONS (NUMBERED 1 TO 2 FROM UPSTREAM TO DOWNSTREAM)

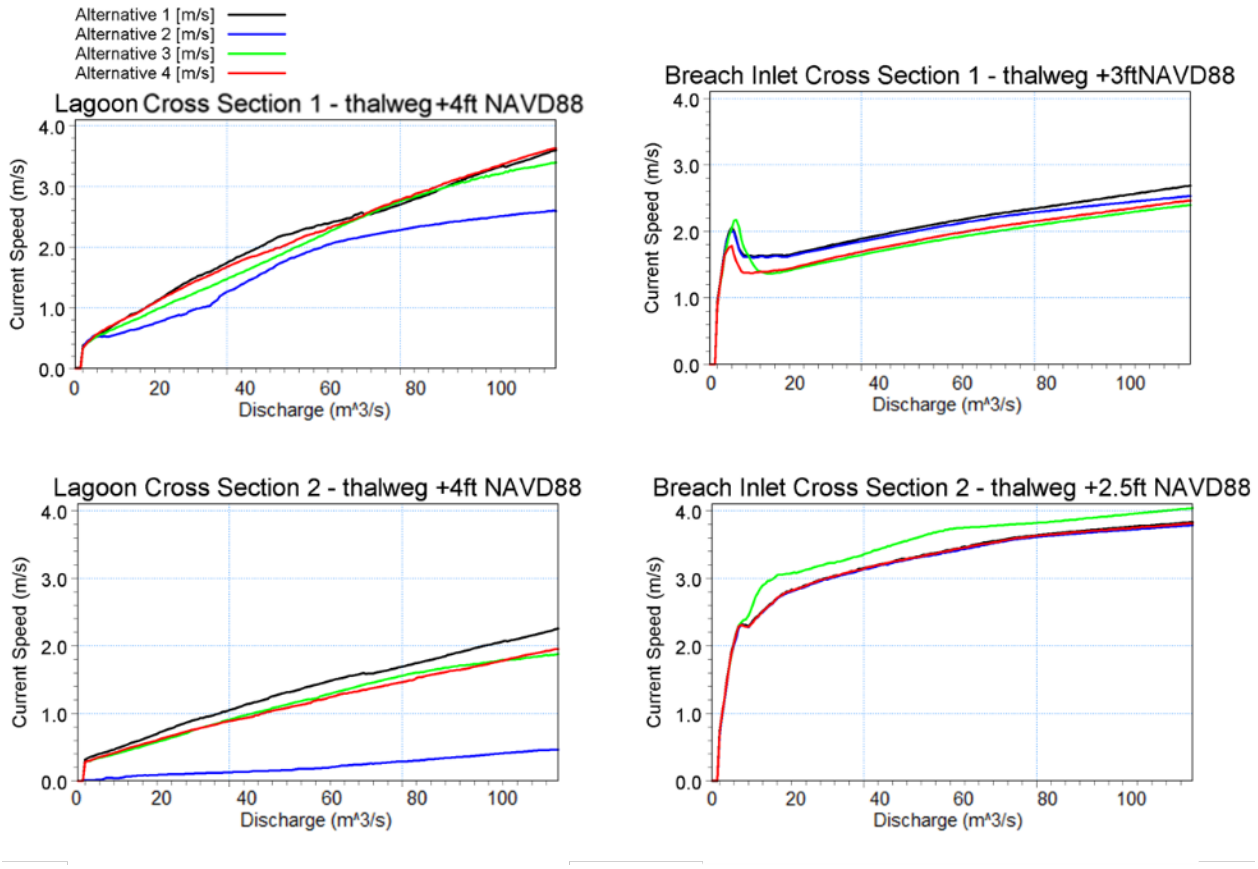


TABLE 7-6: 5-YEAR STORM PEAK VELOCITIES (FPS) UNDER THE PCH BRIDGE [1,2]

Alternatives	Alternative 1	Alternative 2	Alternative 3	Alternative 4 [3]
Narrow Straight Channel	13.3	8.3	11.2	13.8
Medium Straight Channel	13.6	8.7	11.3	13.9
Wide Straight Channel	13.9	9.5	11.6	13.9
Narrow Migrated Channel	13.5	8.5	11.3	13.8
Medium Migrated Channel	13.8	9.0	11.5	13.9
Wide Migrated Channel	13.9	9.7	11.7	13.9
Narrow Extra-long Migrated Channel	13.7	8.8	11.3	13.9

Notes:
[1] The peak flow is the modeled 5-year storm peak, approximately 4000 cfs at MM2.
[2] Under the same breach inlet channel scenario, velocities at the PCH Bridge are similar for MHHW and MLLW boundary conditions.
[3] Velocities are extracted at the relocated PCH Bridge for Alternative 4.

7.5.2 SLR Condition

Multiple SLR runs were conducted by using the same Mike21 2D hydraulic model for different channel breach scenarios, offshore tidal levels, and SLR amount, as indicated in Section 7.2.2. The rating curves at selected cross-sections were provided to ESA for the fish passage analyses.

One of the critical cross-sections for fish passage is at the PCH Bridge (lagoon cross-section #1). Table 7-7 compares the maximum velocity under the PCH Bridge among alternatives under the three SLR conditions. For each SLR amount, two breach conditions (A and B), discussed in Section 7.2.2, were modeled. The main difference between the two breach conditions is whether the lagoon bottom elevation and breach channel thalweg elevation rise with beach berm under SLR conditions. With the increase of sea level, the peak velocity under the PCH Bridge reduces due to flow area increase with the depth. For instance, the Existing Condition has a peak flow velocity of 13.9 fps. With 1.6-ft and 6.8-ft SLR, the peak velocities with Breach Condition A reduce to 13.6 fps and 11.8 fps, respectively. Overall, Breach Condition B with non-elevated lagoon and channel has a slightly higher velocity than Breach Condition A. With SLR, the peak velocity order from high to low is Alternatives 1 and 4, Alternative 3, and Alternative 2, similar to the No SLR condition.

TABLE 7-7: COMPARISON OF VELOCITIES IN FPS FOR WIDE STRAIGHT CHANNEL

SLR Condition	Alternative 1	Alternative 2	Alternative 3	Alternative 4 [3]
No SLR	13.9	9.5	11.6	13.9
+1.6-ft SLR – Breach Cond. A [1]	13.6	8.8	11.4	13.9
+6.8-ft SLR – Breach Cond. A	11.8	4.7	10.1	10.3
+1.6-ft SLR – Breach Cond. B [2]	13.8	9.4	11.6	13.9
+6.8-ft SLR – Breach Cond. B	12.1	6.0	10.4	12.0

Notes:
[1] Breach Condition A: Beach berm and lagoon and channel thalweg rise with SLR
[2] Breach Condition B: Beach berm rises with SLR, but lagoon and channel thalweg remain at their current elevations
[3] Velocities are extracted at the relocated PCH Bridge for Alternative 4.

As examples, the rating curves of wide-straight inlet channel with 1.6-ft and 6.8-ft SLR Breach Condition A are illustrated in Figure 7.15 through Figure 7.18. These plots include flow velocity and water depth at the lagoon and breach channel representative cross-sections among all four alternatives. These rating curves were provided to ESA as inputs for the fish passage analyses.

FIGURE 7.15: VELOCITY VS. DISCHARGE RATING CURVES AT LAGOON AND BREACH CHANNEL WITH 1.6-FT SLR, CONDITION A

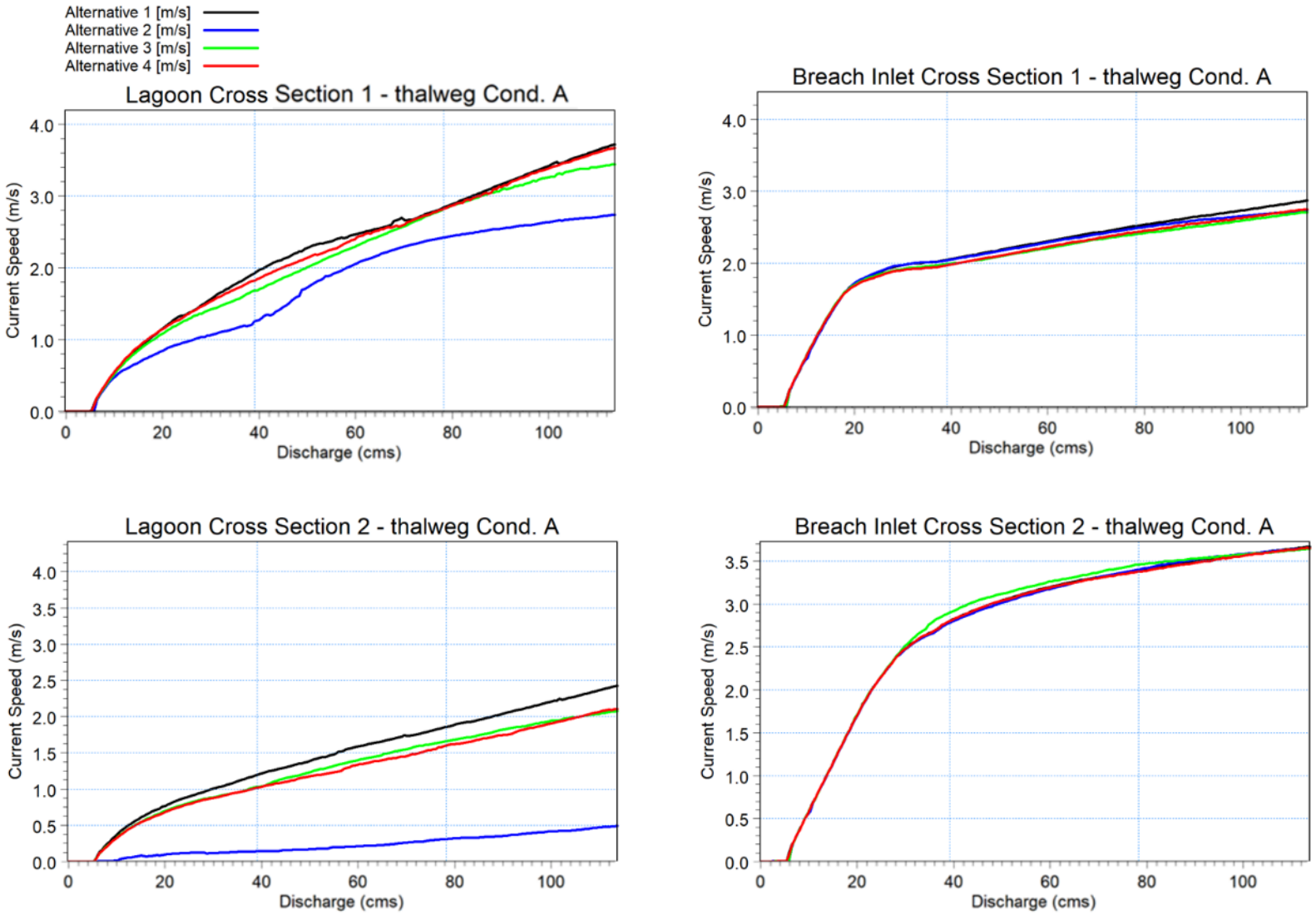


FIGURE 7.16: VELOCITY VS. DISCHARGE RATING CURVES AT LAGOON AND BREACH CHANNEL WITH 6.8-FT SLR, CONDITION A

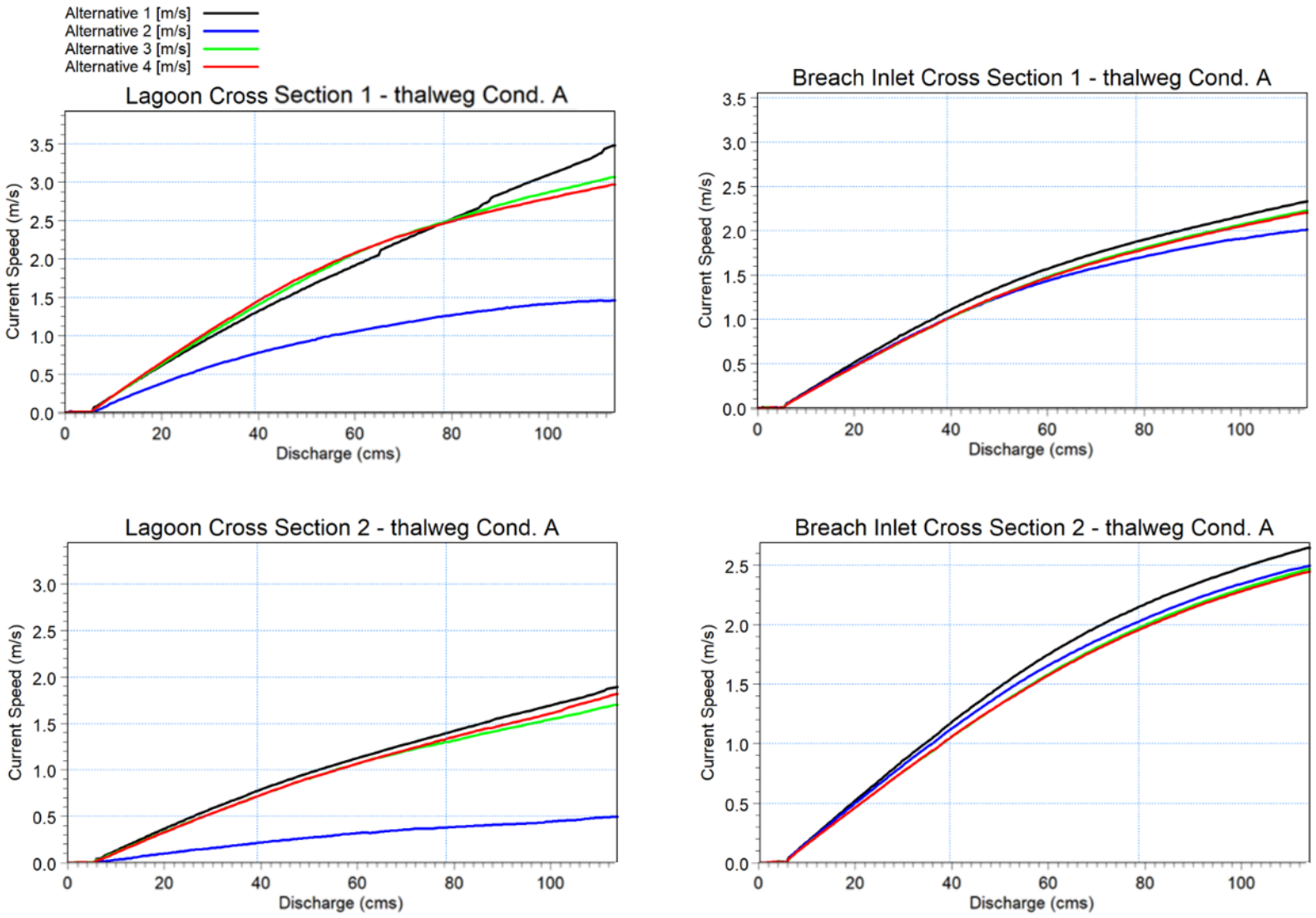


FIGURE 7.17: WATER DEPTH VS. DISCHARGE RATING CURVES AT LAGOON AND BREACH CHANNEL WITH 1.6-FT SLR, CONDITION A

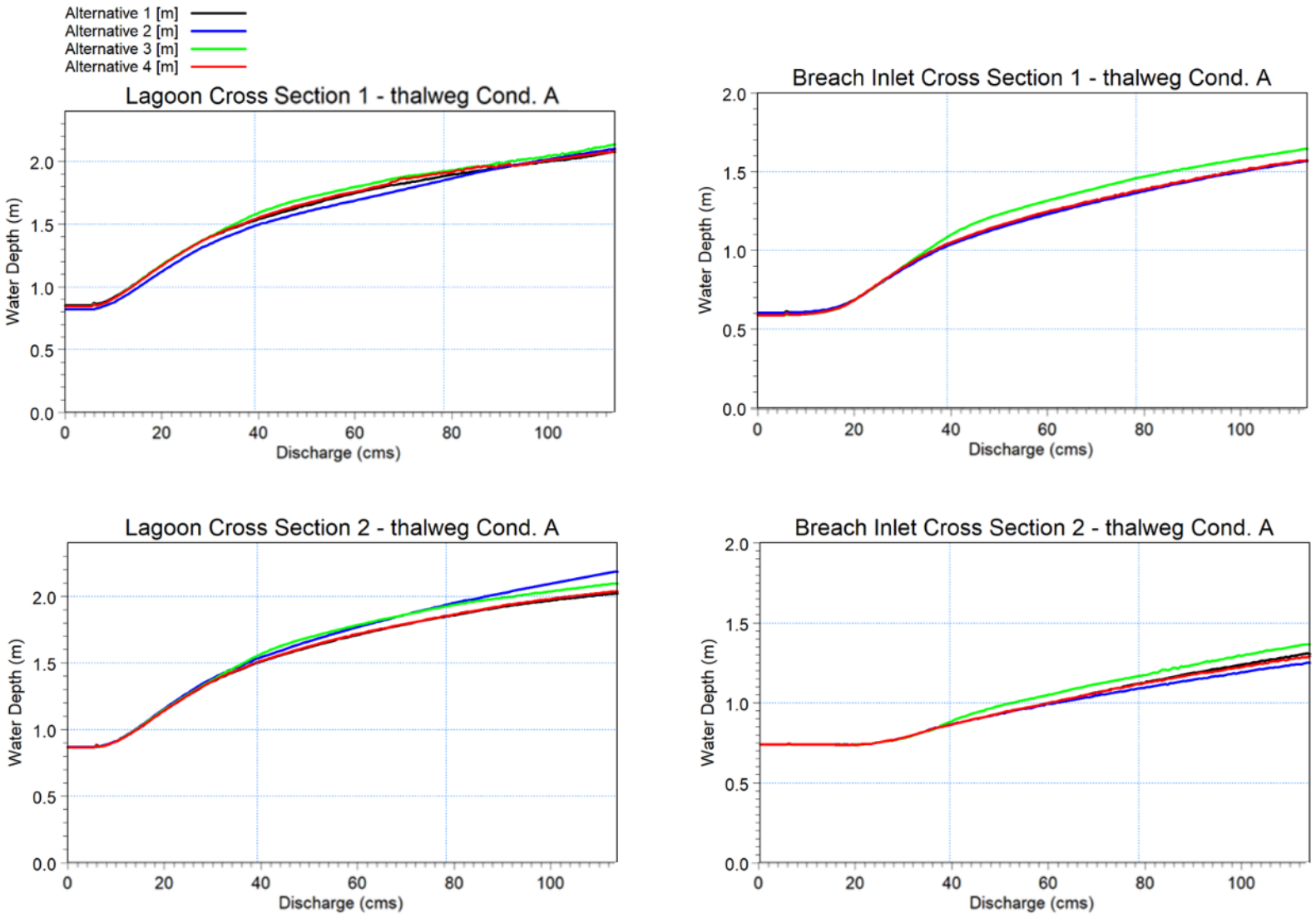
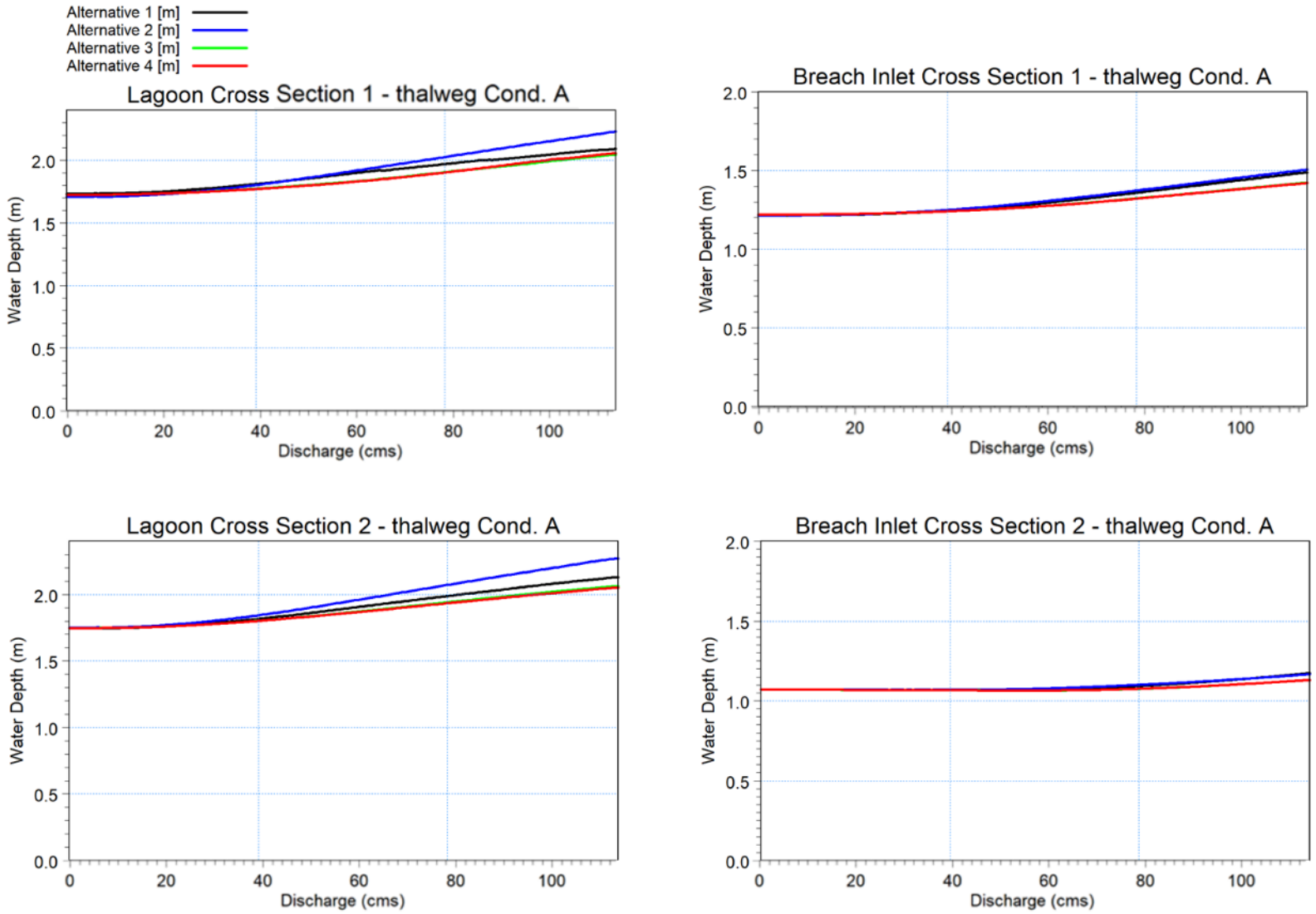


FIGURE 7.18: WATER DEPTH VS. DISCHARGE RATING CURVES AT LAGOON AND BREACH CHANNEL WITH 6.8-FT SLR, CONDITION A



7.6 Fish Passable Area Analysis

The PCH Bridge over Topanga lagoon was identified as a partial fish passage barrier by CalTrout (2006). Besides providing the rating curves to ESA for fish passage analysis, the 2D hydraulic model results were used to compute the passable areas under the PCH Bridge for breach events that occurred over the last 10 years. These breach scenarios for no SLR, 1.6-ft SLR, and 6.8-ft SLR conditions are listed in Table 7-8 through Table 7-10. With flow-event specific discharges provided in the following tables, the flow conditions (velocity and depth) at the PCH Bridge cross-section were extracted from the 2D model based on breach scenario and thalweg condition (thalweg condition for 1.6-ft and 6.8-ft SLR only). By applying a passable velocity threshold of 9 fps, the area of the passable cross-section was calculated for all four alternatives.

TABLE 7-8: CHANNEL BREACH SCENARIO CODES FOR HISTORICAL BREACH EVENTS – NO SLR (PROVIDED BY ESA)

Event Date	Discharge (cfs)	Alternative 1 Scenario[1]	Alternative 2 Scenario[1]	Alternative 3 Scenario[1]	Alternative 4 Scenario[1]
2/18/2011	77.4	1	1	1	1
2/25/2011	114.2	1	1	1	1
2/26/2011	314.2	3	3	3	3
3/17/2012	81.6	1	1	3	3
3/25/2012	257.0	1	1	1	1
2/28/2014	291.1	3	5	3	3
3/1/2014	64.7	1	5	5	5
3/6/2016	216.4	1	5	5	5
1/17/2019	1097.7	5	5	5	5
2/2/2019	496.3	5	5	5	5
2/14/2019	689.0	5	5	5	5
3/6/2019	85.2	3	5	3	3
4/6/2020	324.0	5	5	5	5

Note:
[1] Scenario Code: 1- narrow straight inlet, 2-narrow migrated inlet, 3-medium straight inlet, 4-medium migrated inlet, 5-wide straight inlet, 6-wide migrated inlet, 7-narrow extra-long inlet.

TABLE 7-9: CHANNEL BREACH SCENARIO CODES BY BREACH EVENTS – 1.6-FT SLR (PROVIDED BY ESA)

Event Date	Discharge (cfs)	Alternative 1		Alternative 2		Alternative 3		Alternative 4	
		Scenario[1]	Thalweg[2]	Scenario[1]	Thalweg[2]	Scenario[1]	Thalweg[2]	Scenario[1]	Thalweg[2]
2/18/2011	77.4	1	A	Inlet closed		1	A	1	A
2/25/2011	113.0	5	A	5	A	5	A	5	A
2/26/2011	314.4	5	B	5	B	5	B	5	B
3/17/2012	82.3	5	B	5	B	5	B	5	B
3/25/2012	257.2	5	B	Inlet closed		5	B	5	B
2/28/2014	291.3	5	B	5	B	5	B	5	B
3/1/2014	64.7	5	B	5	B	5	B	5	B
3/6/2016	216.5	5	B	5	B	5	B	5	B
1/17/2019	1105.0	5	B	5	B	5	B	5	B
2/2/2019	501.6	5	B	5	B	5	B	5	B
2/14/2019	697.9	5	B	5	B	5	B	5	B
3/6/2019	85.7	3	B	Inlet closed		5	B	5	B
4/6/2020	324.2	5	B	5	B	5	B	5	B

Notes:
[1] Scenario Code: 1- narrow straight inlet, 2-narrow migrated inlet, 3-medium straight inlet, 4-medium migrated inlet, 5-wide straight inlet, 6-wide migrated inlet, 7-narrow extra-long inlet.

[2] Thalweg Code: A – channel thalweg rising with SLR, B – channel thalweg remains its current level.

TABLE 7-10: CHANNEL BREACH SCENARIO CODES BY BREACH EVENTS – 6.8-FT SLR (PROVIDED BY ESA)

Event Date	Discharge (cfs)	Alternative 1		Alternative 2		Alternative 3		Alternative 4	
		Scenario[1]	Thalweg[2]	Scenario[1]	Thalweg[2]	Scenario[1]	Thalweg[2]	Scenario[1]	Thalweg[2]
2/18/2011	77.42	Inlet closed		Inlet closed		Inlet closed		Inlet closed	
2/25/2011	113.04	5	A	Inlet closed		5	A	Inlet closed	
2/26/2011	314.43	5	B	5	A	5	B	Inlet closed	
3/17/2012	82.26	5	A	Inlet closed		Inlet closed		Inlet closed	
3/25/2012	257.15	Inlet closed		Inlet closed		Inlet closed		Inlet closed	
2/28/2014	291.29	5	B	5	B	5	B	5	A
3/1/2014	64.71	5	B	5	B	5	B	Inlet closed	
3/6/2016	216.54	5	B	5	B	5	B	5	B
1/17/2019	1104.96	5	B	5	B	5	B	Inlet closed	
2/2/2019	501.57	5	B	Inlet closed		Inlet closed		Inlet closed	
2/14/2019	697.87	5	B	5	B	5	B	Inlet closed	
3/6/2019	85.75	Inlet closed		Inlet closed		Inlet closed		Inlet closed	
4/6/2020	324.20	5	A	5	A	5	A	5	A

Notes:
[1] Scenario Code: 1- narrow straight inlet, 2-narrow migrated inlet, 3-medium straight inlet, 4-medium migrated inlet, 5-wide straight inlet, 6-wide migrated inlet, 7-narrow extra-long inlet.
[2] Thalweg Code: A – channel thalweg rising with SLR, B – channel thalweg remains its current level.

Estimated passable areas are provided in Table 7-11 through Table 7-16. The passable areas were compared among various SLR conditions and the alternatives. The alternative with the largest passable area is highlighted in green in the tables. Below are findings on passable area comparisons at the PCH Bridge:

- Passable areas increase with SLR.
- Passable areas between MHHW and MLLW downstream water level conditions are similar under the Existing Condition (No SLR). With SLR, the passable areas are largely increased under the MHHW boundary condition than those under MLLW. With SLR and a high tidal boundary, the water surface is higher at the lagoon and the cross-section expands wider, compared to low tidal boundary conditions.
- With no SLR, all alternatives have the same number of breach events, but Alternative 2 has the largest accumulative passible area.
- With 1.6-ft SLR, Alternative 2 has three less passible breach events, but each breach event is expected to open longer in duration than other alternatives due to its larger tidal prism, and Alternative 3 has the largest accumulative passible area.
- With 6.8-ft SLR, Alternative 1 has the most passible events, but Alternative 2 has a much larger accumulative passible area than other three alternatives, and Alternative 2 is expected to have a longer opening duration for each breaching due to its larger tidal prism.
- Overall, Alternative 2 has the largest accumulative passable area.

TABLE 7-11: ESTIMATED PASSABLE AREA IN SQ. FT UNDER PCH BRIDGE BY BREACH EVENTS – NO SLR, MHHW

Passable Area (ft^2)	2/18/11	2/25/11	2/26/11	3/17/12	3/25/12	2/28/14	3/1/14	3/6/16	1/17/19	2/2/19	2/14/19	3/6/19	4/6/20	Accumulated Passable Area	Total No. of Passable Events
ALT1	50	70	110	53	132	104	39	117	189	127	151	48	100	1290	13
ALT2	51	70	131	53	151	117	39	79	243	160	188	53	124	1459	13
ALT3	52	72	114	52	141	108	39	82	208	135	163	53	107	1326	13
ALT4	51	71	102	53	121	98	39	81	191	121	149	53	97	1227	13

TABLE 7-12: ESTIMATED PASSABLE AREA IN SQ. FT UNDER PCH BRIDGE BY BREACH EVENTS – NO SLR, MLLW

Passable Area (ft^2)	2/18/11	2/25/11	2/26/11	3/17/12	3/25/12	2/28/14	3/1/14	3/6/16	1/17/19	2/2/19	2/14/19	3/6/19	4/6/20	Accumulated Passable Area	Total No. of Passable Events
ALT1	43	70	110	50	132	103	12	117	189	127	151	45	100	1249	13
ALT2	44	69	131	52	151	116	12	79	243	160	188	53	124	1422	13
ALT3	45	71	113	52	141	108	12	82	208	135	163	53	107	1290	13
ALT4	45	71	102	52	121	98	12	81	191	121	149	53	97	1193	13

TABLE 7-13: ESTIMATED PASSABLE AREA IN SQ. FT UNDER PCH BRIDGE BY BREACH EVENTS – 1.6FT SLR, MHHW

Alternative	2/18/11	2/25/11	2/26/11	3/17/12	3/25/12	2/28/14	3/1/14	3/6/16	1/17/19	2/2/19	2/14/19	3/6/19	4/6/20	Accumulated Passable Area	Total No. of Passable Events
ALT1	122	116	126	114	122	124	115	119	195	142	159	114	127	1695	13
ALT2	closed	117	151	115	closed	147	114	119	253	174	197	closed	152	1539	10
ALT3	124	118	130	116	125	128	117	123	212	149	171	116	131	1760	13
ALT4	110	107	116	104	112	114	105	110	195	131	156	104	116	1580	13

TABLE 7-14: ESTIMATED PASSABLE AREA IN SQ. FT UNDER PCH BRIDGE BY BREACH EVENTS – 1.6FT SLR, MLLW

Alternative	2/18/11	2/25/11	2/26/11	3/17/12	3/25/12	2/28/14	3/1/14	3/6/16	1/17/19	2/2/19	2/14/19	3/6/19	4/6/20	Accumulated Passable Area	Total No. of Passable Events
ALT1	75	72	99	44	87	94	11	76	194	128	153	46	100	1179	13
ALT2	closed	72	119	52	closed	116	12	79	250	161	191	closed	124	1176	10
ALT3	70	73	104	52	93	100	12	82	211	136	165	53	107	1258	13
ALT4	69	73	96	53	87	91	12	81	194	122	151	53	97	1179	13

TABLE 7-15: ESTIMATED PASSABLE AREA IN SQ. FT UNDER PCH BRIDGE BY BREACH EVENTS – 6.8FT SLR, MHHW

Alternative	2/18/11	2/25/11	2/26/11	3/17/12	3/25/12	2/28/14	3/1/14	3/6/16	1/17/19	2/2/19	2/14/19	3/6/19	4/6/20	Accumulated Passable Area	Total No. of Passable Events
ALT1	closed	299	411	299	closed	411	411	411	412	411	412	closed	300	3777	10
ALT2	closed	closed	848	closed	closed	999	999	1015	1028	closed	1019	closed	864	6772	7
ALT3	closed	425	545	closed	closed	545	545	545	546	closed	546	closed	426	4123	8
ALT4	closed	closed	closed	closed	closed	376	closed	481	closed	closed	closed	closed	376	1233	3

TABLE 7-16: ESTIMATED PASSABLE AREA IN SQ. FT UNDER PCH BRIDGE BY BREACH EVENTS – 6.8FT SLR, MLLW

Alternative	2/18/11	2/25/11	2/26/11	3/17/12	3/25/12	2/28/14	3/1/14	3/6/16	1/17/19	2/2/19	2/14/19	3/6/19	4/6/20	Accumulated Passable Area	Total No. of Passable Events
ALT1	closed	167	118	114	closed	115	101	109	200	138	158	closed	227	1447	10
ALT2	closed	closed	541	closed	closed	138	99	113	263	closed	196	closed	549	1899	7
ALT3	closed	194	118	closed	closed	116	96	104	228	closed	165	closed	276	1297	8
ALT4	closed	closed	closed	closed	closed	238	closed	100	closed	closed	closed	closed	248	586	3

7.7 Summary of Findings

A 2D Mike21-FM hydrodynamic model was created for the lagoon and nearshore ocean to generate flow velocity and depth data to be used by ESA for fish passage analyses. The model was calibrated with recorded water levels in the lagoon. The resulting water depth and velocity data were used to determine whether the lagoon system is fish passable under a given flow condition and to identify potential bottle necks. The key findings are summarized below:

- All proposed alternatives lower flood water level and reduce flood flow currents in the lagoon, especially under the PCH Bridge, which improves flood protection. The improvement is the best for Alternative 2, second for Alternative 3, and third for Alternative 4.
- The fish passable area under the PCH Bridge was estimated for 13 historic breach events between 2011 and 2020. Overall, Alternative 2 has the largest accumulative passable area and comparable breach events among the four alternatives. Alternative 3 is slightly better than Alternatives 1 and 4.
- SLR will help increase the passable area and lower velocities in the lagoon basin and at the PCH Bridge. However, the number of breaches will reduce due to SLR. As indicated in ESA's Lagoon Restoration Ecohydrology Report (2022), the beach berm moves up with SLR and the increased volume of lagoon behind the beach berm will need a longer time to fill with runoff and breach naturally, which means the seasonal closure could last longer. However, the lagoon will have a larger tidal prism with SLR, which will increase currents at the mouth and possibly extend the duration of opening after breached. The ESA study (2022) suggested that Alternative 2 is predicted to have an overall increase in the duration of mouth closures, and Alternative 3 and 4 are not significantly affected in terms of mouth closure. Combining the mouth closure information from ESA and the 2-D hydraulic model results, the passable areas and number of passable events are summarized as follows:
    - Under the current sea level scenario, Alternative 2 has the largest passable areas, followed by Alternatives 3, 1, and 4. All alternatives have the same number of breach events.
    - Under the 1.6-ft SLR scenario, the accumulated passable area from high to low is Alternative 3 > Alternative 1 > Alternative 4 > Alternative 2. Alternative 2 is still the top alternative with the largest passible area by individual breach event, but its accumulated passible area is relatively low due to lower number of breach events. According to ESA's analysis (2022), Alternative 2 has a longer duration of breach events than other alternatives due to a larger water storage volume during SLR.
    - Under the 6.8-ft SLR scenario, Alternative 2 has the largest passible area both accumulated and by individual breach event. Alternative 1 has more breaching events than other alternatives, but its accumulated passible area is relatively low due to its smaller lagoon footprint. Alternative 4 offers the least passible area and the lowest number of passible events.

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Appendix F

Parking Analysis Technical Memo (RCDSMM 2023) UPDATED 11/13/23

The Appendices herein contain supporting information. These Appendices contain highly detailed figures and other graphic information, which are difficult to translate for screen reading software; therefore, the Appendices have not been translated into an auditory format. If you have a disability and/or have difficulty accessing any material in this document, please contact us by mail, email, or telephone, and we will work with you to make all reasonable accommodations. Please indicate 1) the nature of the accessibility need; 2) your preferred format; 3) the material you are trying to access and its location within this document; and 4) how to reach you if questions arise while fulfilling your request. You can direct your requests to:

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PARKING ANALYSIS TECHNICAL MEMO
FINAL draft
7 December 2023

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The Resource Conservation District of the Santa Monica Mountains (RCDSMM) had previously submitted a parking analysis for the Topanga Lagoon Restoration Project on 3/26/23. Upon review of Chris Nelson & Associates conceptual designs (dated 6/8/23) and a subsequent assessment of the conformity with existing standards, we realized previous counts were not fully accurate and that the past analysis did not clearly facilitate a comparison of existing versus potential future parking per alternative. This was largely due to the confounding effects of substantial nonconforming parking that currently exists but would not be approved for a future project. We have sought to clearly identify existing conforming vs non-conforming parking per landowner for all project alternatives, as well as available parking for the following categories: Motel Exclusive. Concession Exclusive, Public Fee, and Public Free. The clarification of parking spaces available per category and their geographic distribution gives further insights into effects of each project alternative on available parking.

Alternative 1, No Project: Existing Parking

Existing parking per landowner and category is shown on Figure 1 and in Table 1.

Project Area Totals.
There are a total of 390 parking spaces in use within the project area, including 213 that conform to current standards and 177 that do not. These totals were based upon overlaying the dimensions on an aerial of the project, as well as counting marked spaces. We assumed the following dimensions for a conforming parking space: 1) 9 feet wide and 16-18 feet long within a lot, and 2) 25 feet long for parallel spaces with adequate ingress and egress (Figure 1). Because use of drones over the beach and state park are prohibited, a count of existing parking spaces along the road shoulder of the Pacific Coast Highway (PCH) in the project area was conducted visually on Saturday August 20, 2022, between 1-2 pm. These parking counts were compared to parking counts using aerial images from Google Earth overlayed with conforming parking spaces.

Parking Per Landowner.
Of the 390 parking spaces available, 174 are associated with California Department of Park and Recreation (CDPR) lower Topanga State Park north of the PCH, 119 with California Department of Transportation (Caltrans) Right of Way (ROW) on PCH and TCB, and 97 with the existing Los Angeles County Department of Beaches and Harbors (DBH)Topanga Beach lot located S of PCH.

CDPR. Of the 174 spots within CDPR property, 126 are conforming, and 48 are nonconforming. Parking is largely comprised of Concession Exclusive that are associated with CDPR concessions located on the NW and NE sides of Topanga Creek, and more limited Public Fee parking associated with the CDPR Topanga Ranch Motel lot NE of the Creek that includes Concession Exclusive (20 spots: 13 conforming, 7 nonconforming; and Public (50 spots: 28 conforming, 22 nonconforming).

Figure 1. Existing Parking

Table 1. Summary of Existing Parking. C=Conforming, N=Nonconforming

Location	Motel Exclusive		Concession Exclusive		Public Free		Public Fee		TOTAL	Notes
	C	NC	C	NC	C	NC	C	NC		
CDPR										
NW of Creek (Cholada/Wylie/Rosenthal)	0	0	63	18	0	0	0	0	**81**	
NE Creek (Topanga Ranch Motel Public Parking, Reel Inn Concession)	0	0	13	7	0	0	28	22	**70**	Motel use associated with ranger residence not included in graphics for any alt, so not counted here
TCB (Feed Bin/Oasis)	0	0	22	1	0	0	0	0	**23**	
CDPR Conforming	0	0	98	0	0	0	28	0	**126**	
CDPR Nonconforming	0	0		26	0	0	0	22	**48**	
CDPR Subtotal	**0**		**124**		**0**		**50**		**174**	
Caltrans										
TCB N shoulder	0	0	0	0	0	20	0	0	**20**	
TCB S shoulder	0	0	0	0	0	20	0	0	**20**	
PCH N Shoulder	0	0	0	0	0	30	0	0	**30**	
PCH S Shoulder	0	0	0	0	0	49	0	0	**49**	
Caltrans Conforming	0	0	0	0	0	0	0	0	**0**	Not strictly conforming, as parking on bridge deck, various parking angles, no striping.
Caltrans Nonconforming	0	0	0	0	0	119	0	0	**119**	
Caltrans Subtotal	**0**		**0**		**119**		**0**		**119**	
DBH										
SE of Creek (Existing Parking Area)	0	0	0	0	0	0	87	10	**97**	Assume 2 additional staff parking but not shown (park to W in unstriped area). Not included in counts
SW Creek (Potential Parking Area)	0	0	0	0	0	0	0	0	**0**	None currently exists
DBH Conforming	0	0	0	0	0	0	87	0	**87**	
DBH Nonconforming	0	0	0	0	0	0	0	10	**10**	
DBH Subtotal	**0**		**0**		**0**		**97**		**97**	
SUBTOTAL: Conforming	0	0	98	0	0	0	115	0	**213**	
SUBTOTAL: NonConforming	0	0	0	26	0	119	0	32	**177**	
TOTAL	**0**		**124**		**119**		**147**		**390**	

Parking types on CDPR property are not clearly differentiated. Parking on the NW side of the creek near concessions (Cholada, Wiley's, Rosenthal) is Concession Exclusive, has just a few places striped and does not require fees to be paid to CDPR, although the concessions often charge a fee to park there on weekends. Parking on the NE side of the lagoon near the CDPR-owned Topanga Ranch Motel and concessions (Reel Inn, Feed Bin) is striped, but there is no clear differentiation between free parking associated with Concession Exclusive use versus Public Fee parking for other day-use visitors to the beach.

ADA parking is currently provided in front of each CDPR concession and the Topanga Ranch Motel, but counts are not specifically called out here. CDPR staff utilizes existing parking or unmarked areas within Topanga State Park.

Caltrans. Parking counts were limited to the N and S shoulders of PCH between the project boundary on the W and the intersection with Topanga Canyon Boulevard (TCB) on the E. Parking along TCB is estimated to contain 20 non-conforming spaces on both N and S road shoulder (total 40 unmarked spaces) that are anticipated to be restricted during portions of the road widening and restriping in this area during project construction, but will become available once construction is completed.

A total of 79 parking spots were identified in Caltrans shoulder ROW along PCH: 30 on the N side of PCH, and 49 on the S. All are considered generally nonconforming as no existing striping exists, parking is often at slight angles, and parking on the existing Caltrans bridge deck is routine, which would not be permitted once a longer bridge is installed.

DBH. A total of 97 parking spots are associated with the Topanga Beach Fee lot S of PCH and SE of Topanga Creek, 87 are conforming and 10 are not. This includes 3 ADA designated spots and 3 lifeguard staff spaces at the beach level and 1 ADA designated spot at the PCH level. Staff utilize both striped spots, and unstriped areas to the W of the ADA parking at the beach level. There is no current public parking on the SW side of the creek within the existing DBH dirt lot.

Alternative 1 No Project vs Build Alternatives 2-4

Any future approved development onsite will require parking to conform with current standards. For this reason, one focus of this summary is on the availability of conforming parking for all project alternatives. Our intent is to provide an "apples to apples" comparison that can clearly show how existing parking for coastal access and recreation is affected by the proposed project and how it would vary per alternative.

Figures 2-4 show the parking identified in the conceptual design for Alternatives 2-4. Tables 2 and 3 summarize the availability of parking per landowner and per parking category for each project alternative.

Changes In Parking Per Category.
Understanding how the type of parking changes throughout the project area, regardless of the ownership of individual parking spaces, is important for the visiting public. The public tends to utilize the closest and/or most affordable parking to the areas they are most interested in visiting, regardless of ownership.

A total of 390 parking spaces currently exists in the project area. Of these, only 213 are conforming. Although there is a decrease in available parking from a total of 390 existing spaces (213 conforming) to 314 (Alt 2) -343 (Alt 4) conforming spaces, this is due to the significant decrease (104) in Concession Exclusive parking. The availability of public day-use parking (both Public Fee and Public Free) increases from 226 existing spaces (115 conforming) to 287-308 conforming spaces. It should be noted that Public Free parking would decrease along PCH under all alternatives from 79 nonconforming to 51-53 conforming. Free parking along the shoulders of TCB would remain the same (estimated at 40 potentially conforming spaces) but would be unavailable during widening and restriping of TCB to create new left turn lane. There would be 15-25 new Motel Exclusive parking spots created and dedicated to users of park facilities associated with the Motel.

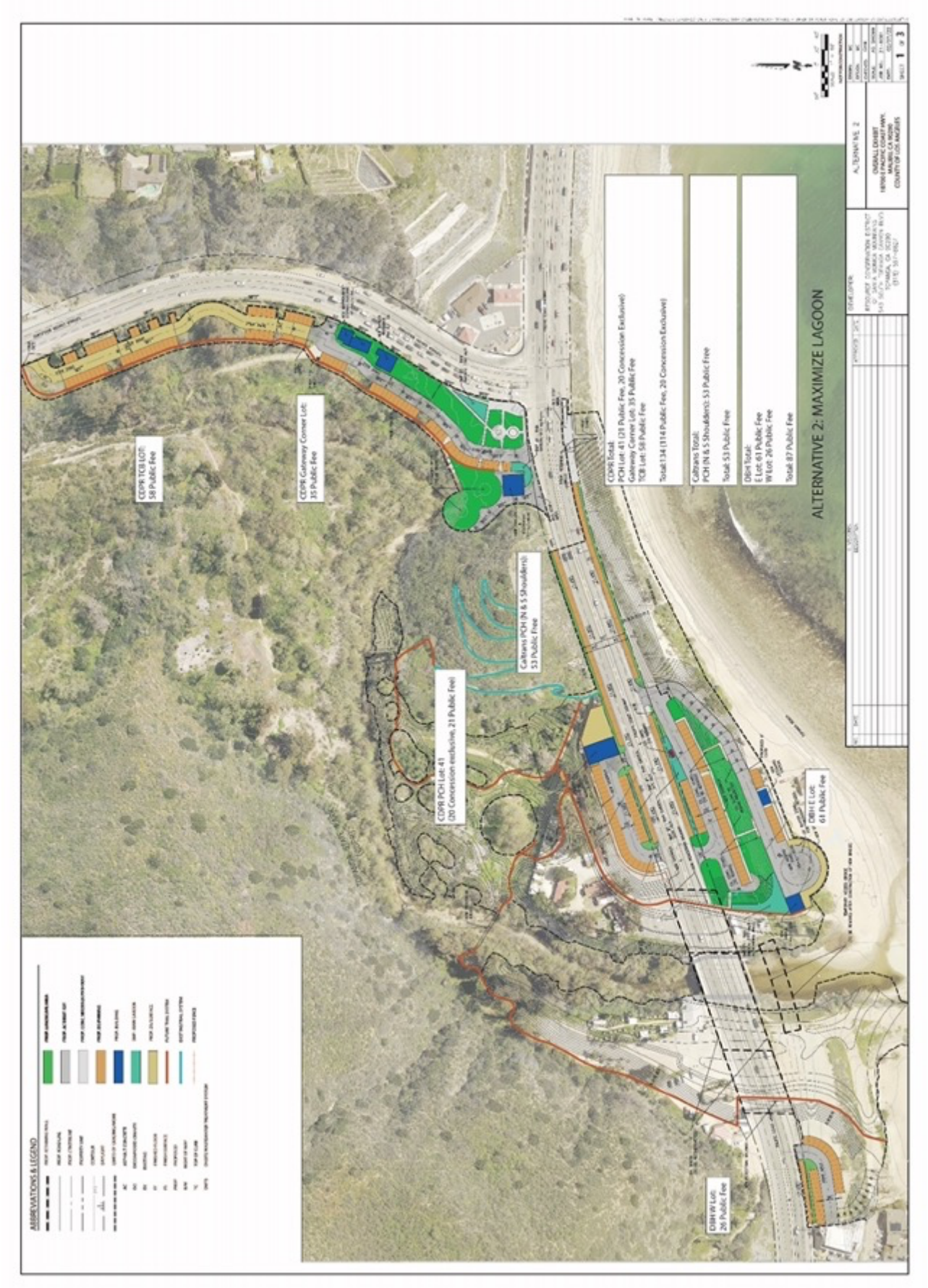

Figure 2. Alternative 2 Proposed Parking

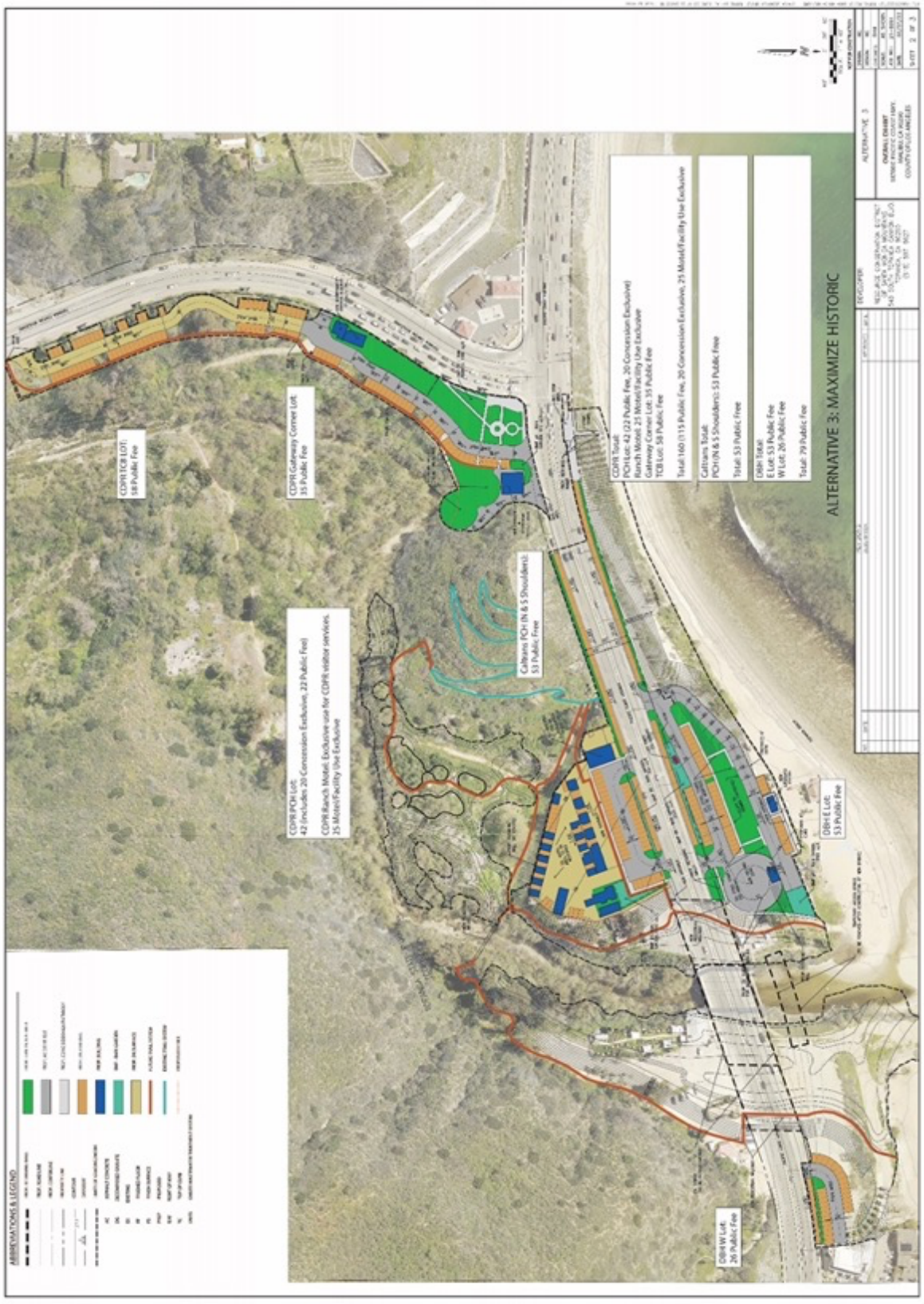

Figure 3. Alternative 3 Proposed Parking

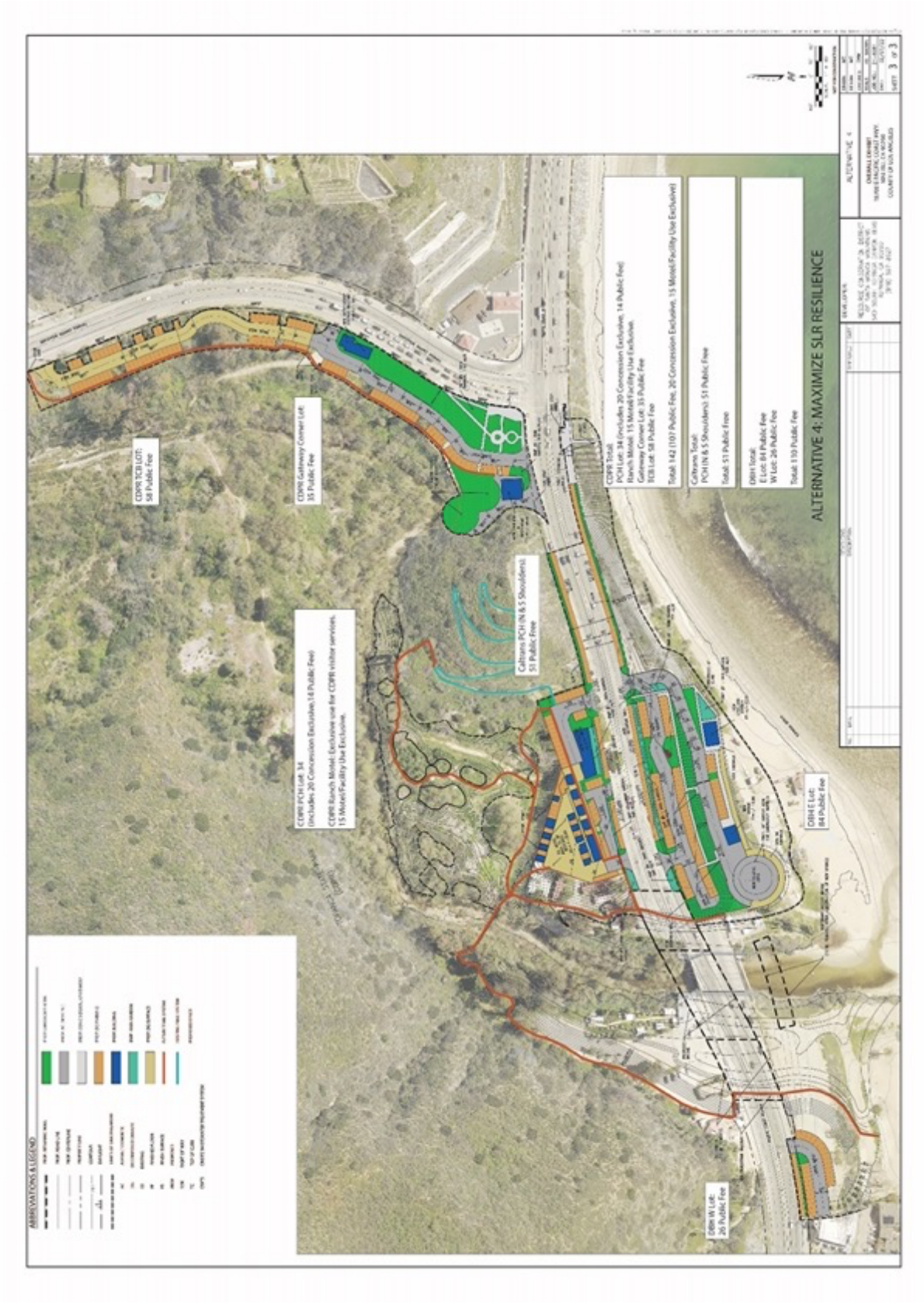

Figure 4. Alternative 4 Proposed Parking

Details on specific parking categories for the entire project area are summarized below.

Table 2. Summary of Parking Per Landowner and Category

LOCATION	EXISTING			PROPOSED			COMMENTS
	Conforming	Non-conforming	Subtotal	Conforming			
CDPR (N of PCH)	**Alt 1**			**Alt 2**	**Alt 3**	**Alt 4**	
Motel Exclusive	0	0	0	0	25	15	
Concessions Exclusive	98	26	124	20	20	20	
Public Fee	28	22	50	114	115	107	
Subtotal CDPR	**126**	**48**	**174**	**134**	**160**	**142**	See map markups. Did not count ranger residence or maintenance use under any alts, assumed will be provided near specific structures.
Caltrans							
TCB N & S: Public Free	**0**	**40**	40	**40**	**40**	**40**	***These may still be nonconforming***
PCH N & S: Public Free	**0**	**79**	79	**53**	**53**	**51**	
DBH (S of PCH)							
E & W Lots: Public Fee	**87**	**10**	97	**87**	**79**	**110**	Did not count staff parking as assumed parking in other areas (unstriped for Alt 1, in Garage for alt 2-4)
TOTAL	**213**	**177**	**390**	**314**	**332**	**343**	

Table 3. Summary of Parking Per Category

CATEGORY	EXISTING			PROPOSED		
	Conforming	Non-conforming	Subtotal	Conforming		
	Alt 1			Alt 2	Alt 3	Alt 4
Motel Exclusive (CDPR)	**0**	**0**	**0**	**0**	**25**	**15**
Concessions Exclusive (CDPR)	**98**	**26**	**124**	**20**	**20**	**20**
Public Day Use						
Public Fee (CDPR + DBH)	115	32	147	201	194	217
Public Free (Caltrans)	0	119	119	93	93	91
Public Day Use Subtotal	**115**	**141**	**266**	**294**	**287**	**308**
TOTAL	**213**	**177**	**390**	**314**	**332**	**343**

Motel Exclusive. No public or parks-facility parking currently exists within the fenced off area of the Topanga Ranch Motel. Potential restoration of a portion of the Motel would occur under Alternatives 3 and 4 and could provide potential low cost overnight accommodation or other future unidentified parks use. This would result in up to 25 new Motel Exclusive parking spaces under Alternative 3, and 15 under Alternative 4, that could be used for motel or other park-specific parking. No Motel Exclusive parking would be provided under Alternative 2 as the motel is removed under this Alternative.

Concession Exclusive. Concession Exclusive Parking sees a large decrease under every project alternative from 124 existing spaces (98 conforming) to 20 conforming under Alternatives 2-4. This is due to the reduction of concessions on CDPR property from six to one to accommodate the area needed for lagoon restoration and to align with the Topanga State Park General Plan goals.

Public Day Use (Fee and Free). Day use parking increases with all Alternatives however there is more Fee than Free parking provided. Public Fee parking increases under all build alternatives from the existing 147 spots (115 conforming in Alternative 1) to 201 conforming spots in Alternative 2, 194 conforming spots under Alternative 3, and 217 conforming spots under Alternative 4. Public Free parking along TCB in the Caltrans ROW will remain as exists at 40 nonconforming spaces. Public Free parking within Caltrans ROW along PCH is decreased from 79 nonconforming existing spaces to 53 conforming under Alternatives 2 and 3, versus 51 under Alternative 4. This is due to the requirement that all new parking comply with existing standards, which involves no parking on the longer bridge deck or within certain distances of parking lot entrances, among other Caltrans standards.

In addition to providing more public day-use parking under all build alternatives, the geographic distribution of day-use parking is improved by providing more choices for the visiting public to park closer to the amenities they are most interested in visiting. The existing Public Fee and Free parking is centered within the project area along the PCH and does not provide easy access to the far eastern and western portions of Topanga Beach. New Public Fee parking on the S side of the PCH becomes available under Alternatives 2-4 by development of the SW DBH lot, making portions of the W Topanga Beach more easily accessible due to reduced walking distances and increased visibility. Development of the CDPR Gateway Corner and TCB lots N of PCH at the E end of the project not only creates Public Fee parking adjacent to new CDPR visitor facilities located at the Gateway Corner, but also improves access to E Topanga Beach via the improved beach stairway at the intersection with PCH and shortened walking distances.

Changes in Parking Per Landowner.
It is important to understand how the proposed project could change parking totals and makeup for each landowner as this directly affects each landowners' income generation that directly supports facilities maintenance and management.

CDPR. Overall parking decreases within lower Topanga State Park from the existing 174 spaces (126 conforming Alternative 1) to 134 under Alternative 2, up to 160 under Alternative 3, and 142 in Alternative 4. This is largely due to the decrease in concessions from six to one, resulting in a decrease in the associated commercial Concession Exclusive parking spaces from 124 to 20 under all build Alternatives. Public day-use parking sees a substantial increase with development of the new Gateway Corner and TCB lots. The 50 existing Public Fee spaces (28 conforming Alternative 4) are increased to 114 spaces under Alternative 2, 115 spaces under Alternative 3, and 107 spaces under Alternative 4. 25 and 15 Motel Exclusive use spaces are created with Alternatives 3 and 4 respectively and are located in and adjacent to the Topanga Ranch Motel.

Caltrans. As noted above, in order to comply with existing parking standards, Public Free parking within Caltrans PCH ROW is estimated to be decreased from 79 existing nonconforming spaces to 51-53 conforming spaces under all development alternatives. Public Free parking along TCB in the Caltrans ROW will remain as exists at 40 nonconforming spaces.

DBH. A total of 97 day-use Public Fee spaces (87 conforming Alternative 1) currently exist onsite in the SE lot. With modification of the existing SE lot and creation of a new SW lot, Alternatives 3 and 2 would reduce available parking to 79 and 87 conforming Public Fee spaces respectively while Alternative 4 increases DBH parking to 110 conforming Public Fee spaces. The expanded footprint of the new helipad and incorporation of rain gardens (vegetated areas to capture storm flows) are key causes of reduced Public Modification of these elements in the design phase may facilitate retention of additional parking spaces. Note that some modification of the DBH parking lot could result in increased parking spaces if helipad location is adjusted to beach level in Alternative 3.

Parking During Construction

Shifting Parking with Construction State.
Temporary parking would shift around during the four-year construction period and would utilize areas that are not actively being developed to protect public access to the beach and concessions to the maximum extent feasible (Figures 5-7). The first construction stage would remove all structures at the CDPR Gateway Corner, and develop temporary Public Fee parking within the proposed Gateway Corner and TCB parking lots. Additional temporary Public Fee parking could be included in the landscaped areas near the entrance, if landscaping of this area is delayed until the end of construction.

Parking would then be generally unavailable on the N side of PCH in the existing CDPR NW and NE lots in order to provide space for construction staging. The exception is the 20 Concession Exclusive spots that would be retained in the CDPR NE lot to serve the remaining concession located at the site of the Reel Inn. Potential parking on the S side of PCH within the DBH SE lot will be maintained to the maximum extent possible, although some areas may require short-term closure for specific construction activities such as temporary bridge construction or to maintain public safety. Pedestrian access from parking areas located between the PCH and the temporary bridge/road alignment to the S would require a temporary pedestrian overpass to access the beach safely.

Once the lagoon, bridge and DPR work N of PCH are completed and the temporary bridge and roadway are removed, work will shift to areas S of PCH, freeing up parking opportunities to the N of PCH, while constraining available parking to the S of PCH.

Additional parking during construction could be possible but would vary with the preferred alternative selected, the construction stage, and the need to conform to Caltrans safety regulations. Tables 4 and 5 provide a conceptual summary of potential parking spaces per landowner and per parking category. A more detailed analysis of actual spaces will be completed during the final design process for the identified preferred alternative. The numbers shown are provided for conceptual comparison only.

Construction Parking Changes Per Category.
In general, we anticipate a reduction in the total number of available parking spaces onsite during construction from 390 existing in Alternative 1 to between 254-262 under Alternatives 2-3 and 228-285 under Alterative 4 as described in Appendix A *Draft Construction Parking Memo* (LLG 2023). This is largely due to the reduction of Concession Exclusive parking by 104 spaces; these spaces will no longer be needed during and post-construction as only one concession is proposed to be retained under Alternatives 2-4. As further detailed in Appendix A, the amount of parking varies during different construction stages. These estimates are preliminary for comparison use but will evolve and be refined once a preferred alternative is selected.

Public day-use parking is functionally maintained during construction. Temporary parking will move around during the 5-year construction period as shown in Table 4 (Alternatives 2 and 3) and Table 5 (Alternative 4). Parking will utilize areas that are not actively being developed to protect public access to the beach to the maximum extent feasible. All temporary construction parking areas will be located within previously disturbed or developed areas within the Project area. However, all of this day-use parking is anticipated to be Public Fee rather than a mix of Fee and Free, as the existing 79 Public Free spots along the PCH will no longer be available during construction, and the 40 spaces along TCB will be temporarily unavailable, resulting in more out of pocket costs to day-use visitors during the 5-year construction period. Alternatively, DBH and CDPR could decide to provide some number of Public Free spaces during construction to address this difference.

No Motel Exclusive parking is currently available now or would be required during construction as the Topanga Ranch Motel will be either being restored (Alternatives 3 and 4) or removed (Alternative 2).

Concession parking could be available during construction of Alternatives 2 and 3, however it would not be available during construction and relocation of the concession building in Alternative 4.

Table 4. Potential Parking during Construction Alternatives 2 and 3 (LLG)

CONSTRUCTION SEQUENCE/ACTIVITY	APPROX. CONSTRUCTION IN MONTHS	PCH OFF-STREET (NORTH SIDE)	PCH OFF-STREET (SOUTH SIDE)	PCH ON-STREET	TCB ON-STREET	TCB/GATEWAY CORNER OFF-STREET	TOTAL
1 - Building Demo & Temporary Parking Provisions Construct Municipal Bus Stop & Beach Access Stairs Construct Gateway Corner Parking Facilities	1-6	20	97	79	0	115	311
2 - Relocate Utilities (Includes Work by Utility Owners)	6-15	20	97	79	40	115	351
3 - Construct Temporary Road / Bridge (Stage 1) Install Protection of Wetted Areas as Required Remove Concrete Embedded in East Bank Fill from 1920's Bridge	15-21	20	0 to 53	79	40	115	254 to 307
4 - Demo NB Half of Existing Bridge	22-23	20	53 to 100	0	40	115	228 to 275
5 - Construct NB Road / Bridge (Stage 2)	24-36	20	53 to 100	0	40	115	228 to 275
6 - Demo SB Half of Existing Bridge	37-38	20	53 to 70	0	40	115	228 to 245
7 - Construct SB Road / Bridge (Stage 3)	39-51	20	53 to 70	0	40	115	228 to 245
8 - Demo Temporary Bridge (Stage 4) Construct Helipad & New DBH Parking Grade for Garage, Roadway, Lifeguard/Restroom Building Create Temporary Access for Trucks Moving Excavated Fill for Either Beneficial Reuse or to Landfills	52-53	20	53 to 87	0	40	115	228 to 262
9 - Lagoon Grading (Starts on West and Moves East) Construct New Parking on DBH SW Lot Construct Lifeguard/Restroom Building, then Demo Old Building	52-58	20	79 to 87	0	40	115	254 to 262
10 - Restore Beach Area	59-60	20	79 to 87	0	40	115	254 to 262

Table 5. Potential Parking during Construction Alternatives 4

CONSTRUCTION SEQUENCE/ACTIVITY	APPROX. CONSTRUCTION IN MONTHS	PCH OFF-STREET (NORTH SIDE)	PCH OFF-STREET (SOUTH SIDE)	PCH ON-STREET	TCB ON-STREET	TCB/GATEWAY CORNER OFF-STREET	TOTAL
1 - Building Demo & Temporary Parking Provisions Construct Municipal Bus Stop & Beach Access Stairs Construct Gateway Corner Parking Facilities	1-6	20	97	79	0	115	311
2 - Relocate Utilities (Includes Work by Utility Owners)	6-15	20	97	79	40	115	351
3 - Construct Temporary Road / Bridge (Stage 1) Install Protection of Wetted Areas as Required Remove Concrete Embedded in East Bank Fill from 1920's Bridge	15-21	20	0 to 53	79	40	115	254 to 307
4 - Demo NB Half of Existing Bridge	22-23	0	53 to 70	0	40	115	208 to 225
5 - Construct NB Road / Bridge (Stage 2)	24-36	0	53 to 70	0	40	115	208 to 225
6 - Demo SB Half of Existing Bridge	37-38	0	53 to 70	0	40	115	208 to 225
7 - Construct SB Road / Bridge (Stage 3)	39-51	0	53 to 70	0	40	115	208 to 225
8 - Demo Temporary Bridge Construct Helipad & New DBH Parking Grade for Garage, Roadway, Lifeguard/Restroom Building Create Temporary Access for Trucks Moving Excavated Fill for Either Beneficial Reuse or to Landfills	52-53	20	53 to 70	0	40	115	228 to 245
9 - Lagoon Grading (Starts on West and Moves East) Construct New Parking on DBH SW Lot Construct Lifeguard/Restroom Building, then Demo Old Building	52-58	20	53 to 110	0	40	115	228 to 285
10 - Restore Beach Area	59-60	20	53 to 110	0	40	115	228 to 285

Figure 5. Alternative 2, Potential Construction Sequence Parking Opportunities.
Note that these are subject to change during final design to comply with Caltrans regulations.

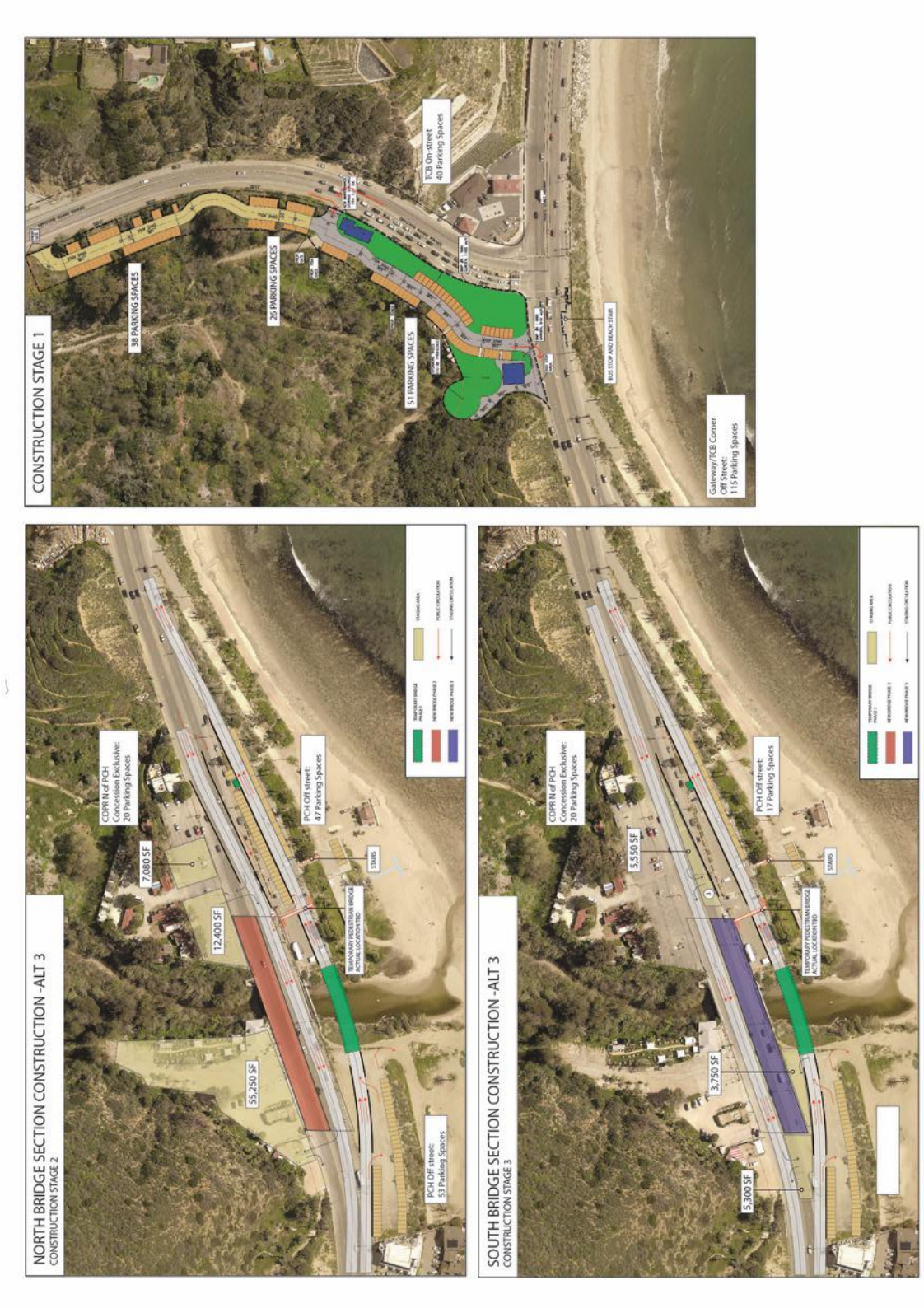

Figure 6. Alternative 3, Potential Construction Sequence Parking Opportunities.
Note that these are subject to change during final design to comply with Caltrans regulations.

Figure 7. Alternative 4, Potential Construction Sequence Parking Opportunities.
Note that these are subject to change during final design to comply with Caltrans regulations.

APPENDIX A

DRAFT CONSTRUCTION PARKING MEMO

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MEMORANDUM

To:	Rosi Dagit Resource Conservation District of the Santa Monica Mountains	Date:	October 5, 2023
From:	David S. Shender, P.E. Alfred C. Ying, P.E., PTP Linscott, Law & Greenspan, Engineers	EA: LLG Ref:	23930 1-22-4487-1
Subject:	**Topanga Lagoon Restoration Project – Updated Draft Construction Traffic and Emergency Management Plan**		

Linscott, Law & Greenspan, Engineers (LLG) has prepared this Draft Construction Traffic and Emergency Management Plan for the Topanga Lagoon Restoration project (the "Project"). This memorandum includes a description of the proposed Project, a discussion on the various construction activities, construction circulation, a summary of intersection and roadway operations, as well as emergency response and access.

This Draft Construction Traffic and Emergency Management Plan has been prepared in conjunction with Mitigation Measure TRA-1 recommended in the Draft Environmental Impact Report (Draft EIR) prepared for the Project. Mitigation Measure TRA-1 recommends the preparation of a Construction Traffic Management and Emergency Response Plan during final design and prior to issuance of demolition, grading, or any construction permits issued for the Project. This document is intended to serve as a preliminary/draft plan for informational purposes only and does not represent the final plan recommended for preparation through Mitigation Measure TRA-1. The final plan can only be prepared in conjunction with the preparation of final design when additional details related to the construction of the Project are known and therefore suitably addressed through the Construction Traffic Management and Emergency Response Plan.

Project Description

The Topanga Lagoon Restoration Project is located along Pacific Coast Highway (PCH, State Route 1 or SR-1[1]) in the Malibu area of Los Angeles County. The Project area is understood to be generally between the SR-1 intersection with Coastline Drive to the east and the boundary of the City of Malibu just west of the current Cholada Thai restaurant. In addition, it is understood the Project area extends northerly along Topanga Canyon Boulevard (TCB, State Route 27 or SR-27) from SR-1 by approximately 0.5 miles.

The Projects consists of the proposed restoration of Topanga Lagoon and will include the replacement of the SR-1 bridge over the lagoon. The new bridge will have similar features in terms of roadway width as compared to the existing bridge. In addition,

[1] While SR-1 is a north-south highway through California, this plan references SR-1 as an east-west roadway based on its orientation in the Project area.

some changes may be proposed related to vehicle access to the commercial properties located along the north side of SR-1 in the Project area, as well as the vehicle parking area on the south side of SR-1. All existing uses will be removed from the north side of SR-1 west of the Topanga Lagoon. The area north of SR-1 and east of the Topanga Lagoon will be redeveloped with visitor serving uses. Finally, new parking areas may be developed along the west side of SR-27 north of SR-1.

Four Project alternatives are being examined as part of the environmental review process, including the no action/ no build alternative (i.e., Alternative 1) and three build alternatives (i.e., Alternatives 2, 3, and 4). It is noted that Alternatives 2 and 3 follow the existing PCH alignment while Alternative 4 proposes to realign PCH to the north. Construction of the Topanga Lagoon Restoration is expected to commence in the year 2027 and continue for approximately 60 months.

It is noted that if an offsite sewer option is selected for wastewater management, the process for acquiring right of way, inclusion into the required Los Angeles County sphere of influence for accepting the effluent, and actual construction are not detailed at this time. It is anticipated that it would take an additional two to three years to obtain the required permits and funds for this effort, with construction of the sewer extension expected to take approximately one year.

Purpose of the Construction Traffic and Emergency Management Plan

The purpose of the Construction Traffic and Emergency Management Plan is to facilitate timely completion of the Project, coordinate schedules with other potential construction activities within the immediate vicinity of the Project area, and to minimize any potential impact that may be experienced by the surrounding community in connection with construction of the Project. The Construction Traffic and Emergency Management Plan shall apply during all aspects of construction related to the Project, and the Lead Agency/Project Sponsor will coordinate with the appropriate agencies to ensure construction of the Project should be scheduled so as to not create adverse construction-related traffic effects in the area. A communication plan between local landowners/stakeholders, construction contractors, and emergency service providers will be established.

Public Outreach Plan

A public outreach campaign, including signage plans for public notification before and during the construction period, will also be prepared. The Lead Agency/Sponsor Project team will utilize appropriate communication means (Project website, social media, etc.) to provide information to the public as to status of construction and issues that may affect the public such as temporary travel lane closures or other roadway adjustments, available beach parking, access to local concessions, etc. This electronic media campaign will be accompanied by on-the-ground signage in the Project area,

such as identifying available public parking and any forthcoming travel lane closures on PCH and TCB. Appropriate signage will be provided prior to the start of construction activities to inform travelers and the public of such construction activities.

Construction Contact

The Lead Agency/Project Sponsor shall appoint a Construction Contact to respond to inquiries or concerns of surrounding residents, as well as the general public. There are three landowners for the Topanga Lagoon Restoration project: California Department of Parks and Recreation (CDPR), California Department of Transportation (Caltrans), and Los Angeles County Department of Beaches and Harbors (DBH). Each landowner will assign a point of contact to assist with coordination. The Construction Contact may be an employee or representative of either the General Contractor or Lead Agency/Project Sponsor. A Project Hotline will be provided for local neighbor complaints or any inquiries related to the construction process. A response to comments or inquiries shall be provided within 72 hours of receipt. The Project Hotline number shall be conspicuously posted at the construction site. The Construction Contact shall notify the Lead Agency/Project Sponsor if the Construction Contact is notified of any construction activities that potentially violate this plan or any of the construction-related conditions of approval.

Construction Activities

During Project bridge and lagoon construction, four lanes (i.e., two through lanes in each direction) of circulation will be maintained on PCH at all times. In addition, at least one lane in each direction on all other public roadways, and access to neighboring commercial and residential properties will be maintained.

The potential construction sequence and staging areas for Alternative 2 are provided in ***Figure 1***. The potential construction sequence and staging areas for Alternative 3 are provided in ***Figure 2***. The potential construction sequence and staging areas for Alternative 4 are provided in ***Figure 3***.

Construction of the aforementioned offsite sewer option for wastewater management would primarily be done in the center median of PCH on its segment from Coastline Drive to TCB. However, an adjacent travel lane on PCH may require closure to accommodate construction equipment and vehicles. To the extent feasible, any travel lane closures will be confined to the period of off-peak beach activity (Labor Day to Memorial Day). Further, travel lane closures on PCH will, to the extent feasible, avoid peak weekday commuter traffic flows (i.e., no travel lane closures in the eastbound direction during the 7:00 – 9:00 AM period and no travel lane closures in the westbound direction during the 4:00 – 6:00 PM period).

Construction Hours

Since the Project area is located in unincorporated Los Angeles County, Project construction shall take place in accordance with Title 12, Chapter 12.12 of the Los Angeles County Code. In order to ensure timely completion of the Project while minimizing impacts on the surrounding community, exterior noise-generating construction shall be limited to Monday through Saturday from 7:00 AM to 8:00 PM. No construction activities shall occur on Sundays or on any federal holiday without a separate permit. Management, supervisory, administrative, and inspection activities shall take place within the designated construction hours to the extent feasible; however, such activities may take place outside of the designated construction hours if approved by the appropriate agencies.

Construction Phasing/Staging

The anticipated sequence and approximate duration of the proposed Project construction are summarized in ***Table 1***.

TABLE 1

LAGOON RESTORATION CONSTRUCTION SEQUENCE[2]

Sequence	Activity
1	Building Demo & Temporary Parking Provisions Construct Municipal Bus Stop and Beach Access Stairs Construct Gateway Corner Parking Facilities
2	Relocate Utilities (Includes Work by Utility Owners)
3	Construct Temporary Road / Bridge (Stage 1) Install Protection of Wetted Areas as Required Remove Concrete Embedded in East Bank Fill from 1920's Bridge
4	Demo NB Half of Existing Bridge
5	Construct NB Road / Bridge (Stage 2)
6	Demo SB Half of Existing Bridge
7	Construct SB Road / Bridge (Stage 3)
8	Demo Temporary Bridge (Stage 4) Construct Helipad and New DBH Parking Grade for Garage, Roadway, Lifeguard/Restroom Building. Create Temporary Access for Trucks Moving Excavated Fill for Either Beneficial Reuse or to Landfills

[2]*Construction Sequencing Report Topanga Lagoon Restoration Project*, Moffatt & Nichol, September 13, 2023.

9	Lagoon Grading Starts on West and Moves East. Construct New Parking on Southwest DBH Lot. Construct Lifeguard/Restroom Building, then Demo Old Building.
10	Restore Beach Area
Total Construction Duration: 60 months	

It is noted that prior to the start of construction, existing building demolition, provision of temporary parking within the Project area, as well as relocation of utilities will first occur. Refer to the Draft Parking Management Plan for further details regarding temporary vehicle parking which will be provided during Project construction. After the initial phase is completed, a temporary roadway/bridge will be constructed south of PCH across the Topanga Lagoon during Stage 1 Project construction. This temporary roadway/bridge will provide two travel lanes and will facilitate eastbound travel along PCH. Next, the westbound half of the existing bridge will be demolished. Construction of the new westbound roadway/bridge will then follow during Stage 2 Project construction. After completion, the new westbound roadway/bridge will provide two travel lanes and will facilitate westbound travel along PCH. Next, the eastbound half of the existing bridge will be demolished. Construction of the new eastbound roadway/bridge will then follow during Stage 3 Project construction. After completion, traffic accommodated by the temporary roadway/bridge will be moved to the new eastbound roadway/bridge. This is followed by the demolition of the temporary roadway/bridge during Stage 4 Project construction. Lagoon grading will occur next and finally restoration of the beach area will take place. As summarized in *Table 1*, Project construction is expected to take a total of approximately 60 months to complete. It is anticipated that development of the commercial components of the Project may also take place during this time period. Additionally, if the offsite sewer option is selected for wastewater management, the associated construction could begin during Sequence 9 and is expected to take an additional 12 months. During sewer installation, periodic closure of the Number 1 westbound travel lane on PCH between Coastline Drive and TCB is anticipated, as previously noted.

Barricades

All construction barriers will be maintained in accordance with the appropriate State and County regulations and their appearance will be maintained in a visually attractive manner throughout the construction period. The General Contractor will coordinate installation, maintenance and removal of these barriers with each landowner.

Signs will be posted along the fencing stating that no unauthorized materials are permitted to be posted. The General Contractor will ensure with daily morning walks by designated personnel that no unauthorized materials are posted on any

temporary barricades or any temporary fencing. Graffiti on barricades will be removed or covered at the earliest possible time after the General Contractor is aware of its existence.

Construction Site Security

The Lead Agency/Project Sponsor in coordination with all landowners will utilize all appropriate security measures, including, but not limited to security guards, lighting, fencing, and locks at all entrances as deemed appropriate to maintain safety in and around the construction site.

Construction Circulation

Traffic Control Plans (Caltrans)

Worksite traffic control plans (TCP) will be prepared and submitted for review/approval by Caltrans for any potential temporary lane closures, detours, on-street staging areas and/or temporary changes in street traffic control that may be required during construction on State highways (PCH and TCB). Temporary traffic control procedures will be employed as appropriate to address circulation requirements. These procedures could include, but are not limited to, traffic cones, temporary signs, changeable message signs, and flagmen. The TCP will prescribe the specific measures to be taken with respect to implementation of the temporary traffic control devices throughout the construction period.

All traffic control procedures on State highways shall be undertaken in accordance with the standards in the latest edition of the *California Manual on Uniform Traffic Control Devices* (California Department of Transportation [Caltrans]), Caltrans Standard Plans (2010), and current standards and best practices of the reviewing and approving agencies. The General Contractor will be responsible for replacing any signs missing or damaged due to construction activities according to Caltrans and LA County specifications, where applicable. In addition, the General Contractor will be responsible for roadway striping (existing and proposed) to be visible and in good condition. Any faded existing striping would be repainted as directed by Caltrans and the County, where applicable.

Construction Access (Caltrans, DBH and CDPR)

Construction-related vehicular access to the Project area is provided via PCH or TCB. Ingress and egress movements to/from the staging areas on County (DBH) and State (CDPR) property during Project construction are shown on *Figures 1 through 3* for the three build alternatives for the bridge/lagoon portion of the Project.

Where necessary, flagmen with communication devices shall be used to coordinate hauling activities. The General Contractor will be responsible to submit the necessary documents to Caltrans and LA County in order to get an approved haul route to be used during construction. Additionally, if deemed necessary, permits will be obtained from Caltrans for any oversized or overweight load traveling on a State highway (e.g., SR-1 or SR-27). Such permit loads will be subject to the conditions of the permit and the time of issuance.

Any temporary speed limit reduction on PCH or TCB for any traffic detour approaches and exits will conform to safe highway design speeds. Directions will be provided to flagmen to coordinate north-south traffic during those limited times that only a single lane is open. Every effort will be made by the General Contractor and all construction contractors to minimize any potential detours and impacts to pedestrians and bicyclists during Project construction.

Construction Truck Hours

To the extent feasible, the arrival and departure of construction trucks shall occur outside of the weekday morning (7:00 AM to 9:00 AM) and afternoon (4:00 PM to 6:00 PM) peak commuter hours. Haul truck trips shall be scheduled within the hours of the permitted construction work period and avoid generating trips during the weekday morning and afternoon peak commuter periods, to the extent feasible.

Equipment and material deliveries and pick-ups shall be coordinated to reduce the potential for trucks to wait to load or unload on roadways for protracted periods of time to ensure that trucks are not impeding traffic flow on the surrounding streets while waiting to enter the Project area.

Construction Employee Parking and Material Staging (DBH and CDPR)

It shall be the responsibility of the General Contractor to minimize on-street employee parking during the construction periods. It is anticipated that construction-related vehicles will park at the identified staging areas on DBH and CDPR property. On average, 20 construction workers will be on-site on a daily basis. Employees will be encouraged to carpool to minimize vehicle trips generated to and from the Project area. All material staging will occur within the Project area at the staging areas. If required, the General Contractor can provide the desired parking and staging information to the satisfaction of LA County, CDPR and Caltrans prior to the issuance of any permits.

The General Contractor shall provide all construction contractors with written information on where their workers and subcontractors are permitted to park, including identification of clear consequences to violators for failure to comply with these regulations.

The General Contractor shall be responsible for informing subcontractors and construction workers of these requirements and will monitor the compliance of the subcontractors.

Intersection and Roadway Operations

As summarized in the *Transportation Assessment*[3] prepared for the Topanga Lagoon Restoration Project, the SR-1/SR-27 study intersection is presently operating at LOS B during both the weekday PM peak hour and Saturday mid-day peak hour under existing conditions. Vehicle trips related to construction of the Project – including trips generated by construction workers, trucks and other commercial vehicles – are forecast to be fewer than 100 trips per day. Since no adverse effects are anticipated related to vehicle trips generated by construction of the Project, an acceptable level of traffic flow throughout the surrounding roadway system (including the SR-1/SR-27 intersection, and the PCH and TCB corridors) will be maintained during project construction.

Emergency Response and Access

The County's Office of Emergency Management (OEM) has the responsibility of comprehensively planning for, responding to, and recovering from large-scale emergencies that impact Los Angeles County. Duties of the OEM include:

- Maintaining the County/Operational Area Emergency Operations Center (EOC) in a state of operational readiness.
- Staffing the Watch Center Duty Officer program to provide coverage to maintain situational awareness and provide support and coordination for incidents during the period between when an incident occurs and when the EOC can be formally activated.
- Issuing Emergency Alert and Warning messages to inform the public of a hazardous situation and provide guidance on protective actions being issued by Incident Commanders.
- Facilitating Unified Coordination Group (UCG) meetings and activities during incidents. UCGs are variable groups of senior County leaders, generally department heads or designee(s), who are assembled to provide strategic level guidance during an incident. Composition of a UCG is determined on a case-by-case basis.
- Deploying Agency Representatives to field Incident Command Posts to maintain situational awareness and enhance coordination efforts between the field and EOC, when activated; and

[3] *Topanga Lagoon Restoration Project – Transportation Assessment*, LLG Engineers, February 3, 2023.

- Managing the County/Operational Area EOC when activated in support of an incident(s) and staffing critical roles within the EOC organizational chart.

The Los Angeles County Operational Area includes the County of Los Angeles and all 88 cities within the County. The cities are divided into eight Disaster Management Areas that vary in size from one to 25 cities. The Project area is located in Disaster Management Area B. As of the preparation of this plan, it is noted that the County of Los Angeles Operational Area Emergency Operations Plan is currently being updated.

Topanga Coalition for Emergency Preparedness (TCEP) is an all-volunteer, non-profit public benefit corporation that provides emergency preparedness education and disaster status information to Topanga and other Santa Monica mountains communities. TCEP's mission is to gather, verify, and provide incident information to the public. Topanga Canyon is divided into nine zones (i.e., Zones 1 through 9). It is noted that although the Project area is technically located outside the nine Topanga zones, it's been included/added as part of Zone 10 (i.e., Zone SSM-U010 of TCEP) because this zone traverses over TCB which is the major southbound evacuation route out of the canyon. In an emergency, information will be posted in real time for the affected/impacted zone.

The City of Malibu is located just west of the Project area. The City of Malibu has developed the *Mass Evacuation Plan*[4] through a collaborative, multi-agency process. To maximize the efficiency of any evacuation and to minimize congestion, the City of Malibu has been divided into four evacuation zones (i.e., Zones 11, 12, 13, and 14). These zones provide clearly defined evacuation areas that can be activated quickly, and can also be used to implement phased evacuations. It is noted that the Project area is located near the easterly portion of Evacuation Zone 11 which covers the area from Malibu Pier on the west to Sunset Boulevard on the east, outside of the Malibu city limit. In addition, in the event of a mandatory evacuation, the nearest safe refuge area (as identified in the City's *Mass Evacuation Plan*) is the Topanga State Beach Parking Lot located on the south side of Pacific Coast Highway within the Project area, at 18700 Pacific Coast Highway, which is operated by the DBH. However, as noted above, the DBH parking lot will not be available during Project construction due to the need to construct the temporary bridge over the Topanga Lagoon. The Lead Agency/Project Sponsor and contractor will coordinate with the County and City of Malibu to identify an alternative refuge area in close proximity to the Project during the period of construction which causes the DBH parking lot to be unavailable.

Emergency access to the Project Site and adjacent areas shall be kept clear and unobstructed during all phases of construction. As required by the California Vehicle Code (Section 21806, authorized Emergency Vehicles), motorists are required to pull

[4] *City of Malibu Mass Evacuation Plan*, City of Malibu, August 2020.

to the right side of the highway and stop to allow an emergency vehicle to pass. If required, drivers of emergency vehicles are trained to utilize center turn lanes, or travel in opposing through lanes to pass through and traverse crowded or tight areas. Thus, the respect entitled to emergency vehicles and driver training allow emergency vehicles to negotiate typical as well as atypical street conditions. Emergency services for helipad and lifeguard, as well as ADA access will continue to be provided/maintained at all times. Operation of PCH for use as an emergency evacuation route will be maintained at all times during Project construction. Grading and hauling activities shall be discontinued during Red Flag days as determined by the Los Angeles County Fire Department (LACoFD). The Lead Agency/Project Sponsor and General Contractor will cooperate with LACoFD to ensure that the Project adheres to all fire safety measures and minimizes fire hazards during construction.

N

SOURCE: RCDSMM

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LINSCOTT LAW & GREENSPAN
engineers

ALT 2
CDPR
TCB/GATEWAY CORNER LOTS = 115
NE OF CREEK LOT = 20
CALTRANS TCB ON-STREET = 40
DBH = 70 to 100
TOTAL = 245 to 275

Figure 1
Potential Construction Sequence
Alternative 2

Topanga Lagoon Restoration Project

SOURCE: RCDSMM

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LINSCOTT LAW & GREENSPAN
engineers

ALT 3
CDPR
TCB/GATEWAY CORNER LOTS = 115
NE OF CREEK LOT = 20
CALTRANS TCB ON-STREET = 40
DBH = 70 to 100
TOTAL = 245 to 275

Figure 2
Potential Construction Sequence
Alternative 3

Topanga Lagoon Restoration Project

N

SOURCE: RCDSMM

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LINSCOTT LAW & GREENSPAN
engineers

ALT 4
CDPR
TCB/GATEWAY CORNER LOTS = 115
CALTRANS TCB ON-STREET = 40
DBH = 70
TOTAL = 225

Figure 3
Potential Construction Sequence
Alternative 4

Topanga Lagoon Restoration Project

Appendix G

Sediment Beneficial Reuse Study (Moffatt & Nichol 2022), and Beneficial Reuse Soil Characterization (GeoPentech 2022)

The Appendices herein contain supporting information. These Appendices contain highly detailed figures and other graphic information, which are difficult to translate for screen reading software; therefore, the Appendices have not been translated into an auditory format. If you have a disability and/or have difficulty accessing any material in this document, please contact us by mail, email, or telephone, and we will work with you to make all reasonable accommodations. Please indicate 1) the nature of the accessibility need; 2) your preferred format; 3) the material you are trying to access and its location within this document; and 4) how to reach you if questions arise while fulfilling your request. You can direct your requests to:

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MEMORANDUM

To:	Resource Conservation District of the Santa Monica Mountains (RCDSMM)
Cc:	Chris Webb, Weixia Jin
From:	Chris O'Day, Matthew Taylor
Date:	10/5/2022
Subject:	Sediment Beneficial Reuse Study
M&N Job No.:	10812-01

Introduction

The restoration of Topanga Lagoon requires sediment removal to increase the footprint of the lagoon. The sediment excavated from this restoration can be used to benefit the surrounding coastal region by strategically placing it in the nearshore to naturally renourish the littoral cell. This memo summarizes the design alternatives proposed for the lagoon restoration and the sediment beneficial reuse options to consider for this project. The nearshore placement locations, equipment required, schematics, and logistics of each reuse option are discussed herein. Costs will be provided in a subsequent submittal.

Design Alternatives

Four lagoon design alternatives are currently under consideration for the Topanga Lagoon Restoration Project. These alternatives consider a variety of benefits and challenges of the differing restoration approaches and provide multiple options on how to manage the future of the lagoon. The four design alternatives are as follows:

- Alternative 1: No Action/Managed Decline
- Alternative 2: Maximum Lagoon Habitat
- Alternative 3: Limited Lagoon Habitat Expansion
- Alternative 4: Maximum Managed Retreat

The No Action/Managed Decline (No Build) Alternative identifies the consequences of what would occur if no action were taken and Topanga Lagoon was not restored. Alternatives 2-4 each provide a different course of action to restore the lagoon area and adjacent seasonally wetted and riparian habitats, buffering its resources from future sea level rise, providing visitor serving functions, and relocating surrounding facilities that are prone to damage from sea level rise in the future. Each of the action alternatives propose a unique lagoon footprint which requires a different quantity of sediment to be excavated. They also entail lengthening the Pacific Coast Highway (PCH) bridge that crosses over the lagoon in order to widen the wetted footprint of the lagoon. A final design that best meets the project's needs will be selected at the end of the environmental review process.

For this memo's purposes, the excavation volumes from Alternative 2 will be used as the basis of analysis because it generates the largest quantity of sediment, at 256,00 cubic yards (cy). As stated, a design has not yet been selected, but for scaling purposes the design with the largest volume will be used when discussing sediment beneficial reuse options. If another design is selected, the reuse options can be scaled down to meet the needs of the selected design.

Sediment Beneficial Reuse Options

Three beneficial sediment reuse options are discussed in this section. The sediment being removed from the lagoon will be mechanically removed using an excavator. The excavator will remove material from the project site while leaving the current lagoon habitat unaffected. Once the material is removed from the project site, it can either be placed in the nearshore (-16 to -26 feet mean lower low water, or MLLW), transported to an appropriate upland landfill, or a combination of these approaches. The proposed nearshore placement locations are discussed in the subsection below, followed by a discussion of associated construction logistics for excavation.

Nearshore Placement

Placing the material in the nearshore is considered environmentally beneficial as it allows for naturally-driven processes (wave activity, longshore drift, tidal currents, etc.) to disperse the sediment into the surrounding littoral zone and partially deposit it on adjacent beaches. This process acts to nourish these beaches with additional sand, while pebbles and cobbles remain in the nearshore, and silts and clays move out and settle farther offshore. In order for these natural processes to successfully sort and deposit the material as described above, it must be placed landward of the closure depth in this region (~30 feet). This is the depth at which waves and tidally driven currents are able to mobilize sediment and push them onshore under typical oceanic conditions. The beaches downcoast Topanga Lagoon are fairly narrow and experience regular seasonal and episodic erosion, and as such any additional sediment added to the respective littoral cell will beneficially provide erosional protection and add recreational space for the public.

The nearshore placement locations shown in Figure 1 were selected to minimize both the: 1) potential impact to nearby subtidal and intertidal habitat, and 2) the required transportation distance from the sediment source location(s) to the nearshore placement site. Additional factors that drove the selection of these locations were based on the nearshore bedform characteristics, proximity to the excavation area, impacts to tourism and recreational use, and potential protective benefits to the surrounding coastline from continued erosion. Diver surveys, side-scan sonar, and remote underwater video were taken in the surrounding nearshore area. Preliminary results of this survey, shown in Figure 2, show that the nearshore placement sites do not consist of any sensitive habitat. These placement locations may be relocated and reshaped as necessary to avoid impacting sensitive habitat that may be found nearby pending further analysis of the survey results. Avoiding negative impacts to the surf quality at Topanga Point, a well-known surf break that lies along the protruding point created by the lagoonal sediment deposition at the inlet over time, was also an important consideration when selecting potential placement locations. The nearshore placement locations proposed within this memo have no impacts on the quality of the surf break at Topanga Point because they are all downdrift according to the literature (USACE 2009).

A Sampling and Analysis Plan (Moffatt & Nichol 2022) in under review by the USACE to direct grain size, chemical and biological testing of the potential sediment to be excavated. The SAP summarized all soil characterization data to date and identifies where additional boreholes are needed in order to complete evaluation of sediment suitability for nearshore placement and beneficial reuse. Results of that testing will be summarized in a Sampling and Analysis Investigation Report (SAIR) available in early 2023.

Figure 1: Proposed nearshore placement locations centered around the -20 foot NAVD contour (left) and the -24 foot NAVD contour (right).

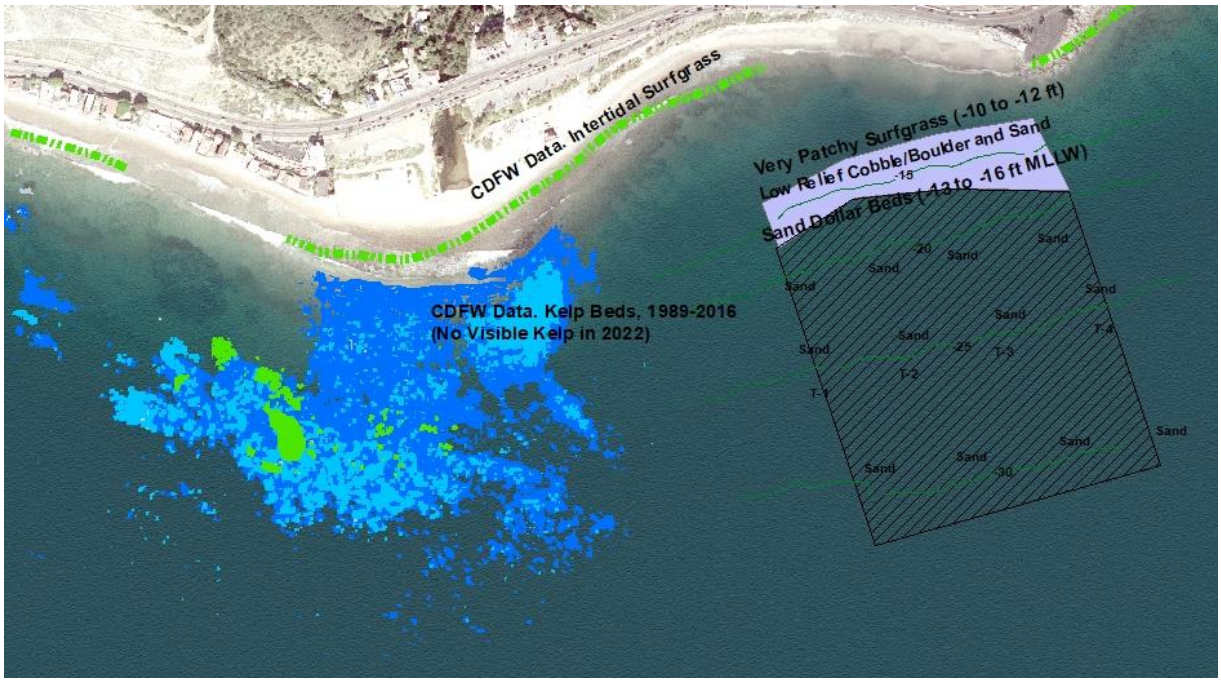


Figure 2: Results of diver survey (CRM, 2022).

The wave climate and local coastal processes are also important to understand when trying to forecast what areas will most benefit from the sediment placed in the nearshore. Historical wave data from the Coastal Data Information Plan (CDIP) buoy located approximately one mile offshore of Topanga Lagoon are shown in Figure 3.

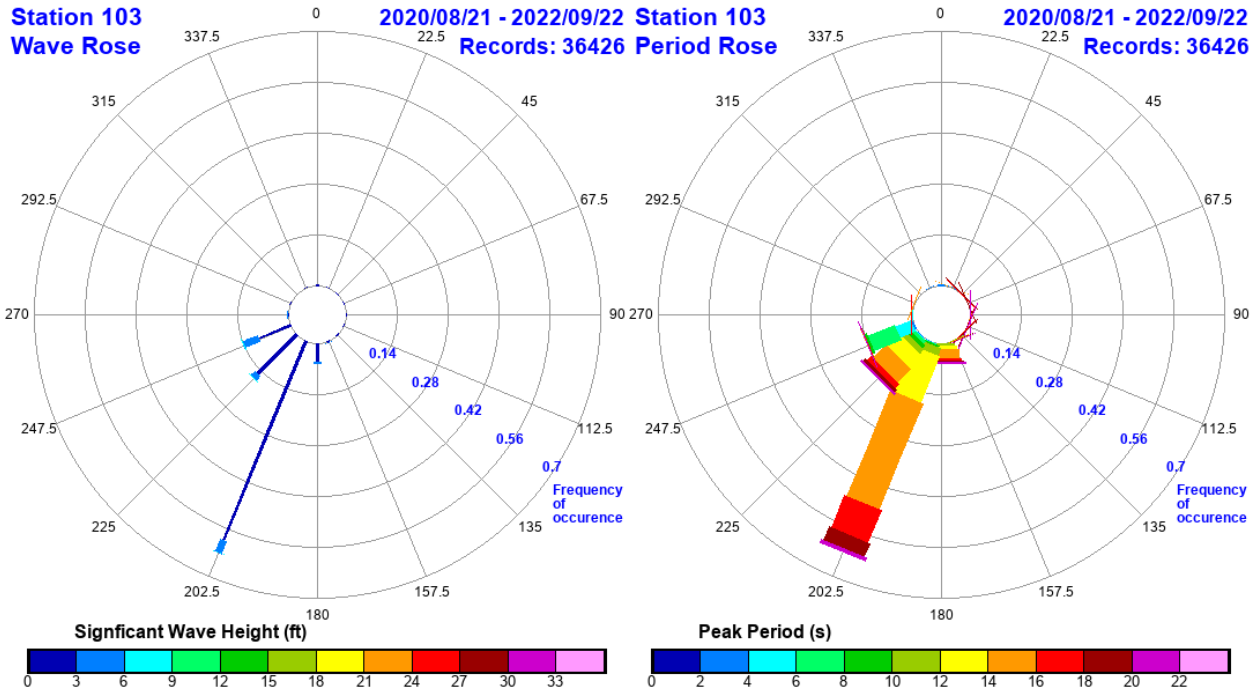


Figure 3: Wave and period rose for Topanga Beach Nearshore CDIP Buoy (http://cdip.ucsd.edu)

The wave height and period roses show that the predominant wave climate impacting the proposed nearshore placement areas are from the south to west-southwest direction. These conditions will typically generate alongshore currents traveling from west to east in the nearshore zone due to the waves' oblique angle of approach to the shoreline. Figure 4 confirms this assumption by showing zero alongshore sediment transport to the west. This Figure shows modeled alongshore sediment transport for Topanga Beach using historic wave data which was performed for the Coast of California Storm and Tidal Waves Study by the U.S. Army Corps of Engineers (2009). The Topanga Beach shoreline faces due south, and waves refract around Topanga Point generating a longshore drift direction to the east. Although periods of localized westward net transport may occur, these results suggest that the vast majority of the sediment placed within the proposed nearshore locations will only effect beaches to the east of the placement location, away from the Topanga Point surf break. Figure 5 shows the estimated annual net alongshore sediment transport rates of the surrounding beaches in the area. This confirms that sediment placed in the nearshore of Topanga Beach will be transported to beaches to the east.

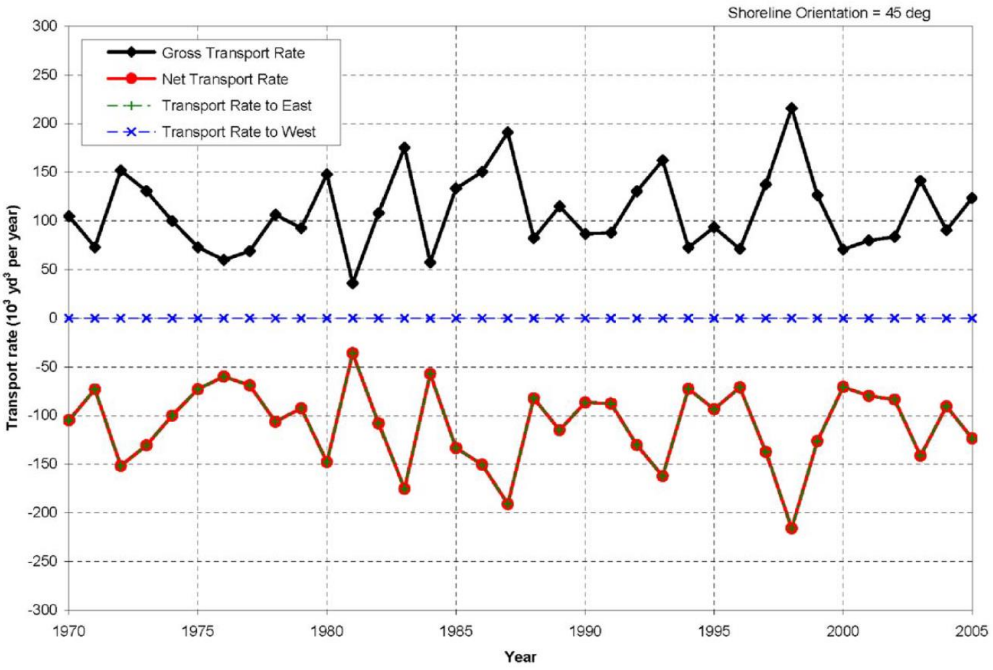


Figure 4: Modeled net alongshore sediment transport at Topanga Beach (USACE, 2009)

Figure 5: Estimated annual net alongshore sediment transport rates of surrounding beaches (USACE, 2009)

Cross-shore sediment transport may also occur, bringing naturally sorted sediment on to Topanga Beach. Due to wave refraction around Topanga Point, the majority of the sand that may end up on Topanga Beach would likely be on the eastern portion of the beach closer to Mastro's Ocean Club, and beaches farther east. The amount of sand that would be transported to this area would be greatly dependent on the wave climate during nearshore placement and is difficult to estimate without more extensive nearshore numerical modeling. Any sand added to this portion of beach would greatly benefit this fairly narrow stretch of shoreline by adding locally sourced sediments for additional erosion protection.

Construction Logistics

The project site is broken into four different working quadrants separated east and west by the existing lagoon and north and south by the Pacific Coast Highway (PCH), as shown in Figure 6**Error! Reference source not found.**. This

is useful when discussing the logistics of each sediment reuse option and is also useful when discussing the order in which they will be excavated. The excavation will start in the southwestern quadrant (Quadrant 1) and end in the southeastern quadrant (Quadrant 3).

Figure 6: Topanga Lagoon quadrants.

Depending on the placement site selected and how the sediment is transported, temporary haul routes will need to be constructed to allow trucks to transport sediment around the project site. If the material is being transported to an upland landfill, then highway access from the current working quadrant accompanied with a traffic control flagman will be necessary. If material is being placed in the nearshore, then haul routes that do not affect the current lagoon and limit the obstruction of beach use will be built. The haul routes will be located above mean higher high water (MHHW) and greater than 50 feet away from the current lagoon area so that important habitat areas will be left unaffected. Sheet pile walls will be erected along the 50-foot boundary of the lagoon as a hard boundary between construction and the lagoon so that construction will not affect the lagoon's current wetted area. Tides will not affect the routes since they are above MHHW. In the case of the lagoon mouth naturally breaching and connecting into the ocean, all construction on the western half of the lagoon will be halted so that it is not necessary to drive over the newly formed breached section of the lagoon. Excavated materials can be utilized to construct haul routes that will allow trucks to move from the excavator to the placement site selected. These may need to be altered by the contractor during different phases of the excavation, but general locations and sequencing of the haul routes is shown in Figure 7 and outlined below.

Figure 7: Haul routes sequencing with Alternative 2 bridge design layout.

Excavation of the project site will begin once the new PCH bridge is completed and coordinated with relocation of the County Lifeguard Headquarters Building and Helipad that need to remain operational throughout construction. During excavation of Quadrant 1, a haul route will be built that bypasses the current lagoon to the south. The route will then turn north until it reaches the existing or realigned lifeguard beach access road. This road will be utilized for the route as long as possible until turning on to the beach east of Topanga Point. A traffic control flagman may be required on the lifeguard road to maintain emergency access to the beach and lifeguard headquarters building. The haul route will then follow the back edge of the beach to the selected unloading area. Multiple trucks will transport sediment along the beach to the placement site. The haul road must be approximately 15 feet wide and will be located at the back of the beach as far landward as possible. In narrower areas of the beach, excavated sediments could be used to create a wide enough space for the route. If these areas are prone to wave impact, cobbles and larger excavated sediments could be used for temporary shoring of the seaward edge of the road. The haul route along this section of the beach will only be used for sediment transportation. Public access may be temporarily limited in this area, but crossings may

be coordinated to allow safe access to the portion of the beach outside of construction. Fencing may need to be used as a buffer from the public beach area. Once Quadrant 1 is excavated, the area under the western side of the newly constructed bridge will be excavated. The haul route will then be able to access Quadrant 2 under the bridge. The existing haul route for Quadrant 1 can be used for the remainder of the route. As previously stated, if a natural lagoon breach occurs construction on the western portion of the project site (Quadrants 1 & 2) will be halted and all efforts will be moved to the eastern portion of the lagoon (Quadrants 3 & 4) so that the newly formed lagoon breach area will not be traversed. Once excavation in the western quadrants is complete, the portion of the haul route bypassing the lagoon can be demolished. The area under the eastern portion of the newly constructed bridge will be excavated and the haul route will be extended to access Quadrant 4 underneath the bridge. Then the route for Quadrant 3 will simply use the lifeguard beach access road and the existing portion of the haul route on the beach.

The construction timeline for excavation is dependent on which lagoon restoration and material reuse options are selected, but public beach access and emergency access will need to be accommodated uniquely for each option. If temporary haul routes are required, then public and emergency access can be maintained through the use of the lifeguard access road on the east side of the lagoon. A flagman will likely be required to assist with this access during truck hauling. Once the western quadrants are excavated then the west side of the lagoon can be used as public access to the beach and surf break.

Option 1: Mechanical Removal and Hydraulic Nearshore Placement

The first sediment reuse option is mechanically removing the material from the lagoon and hydraulically placing it in the nearshore. A sediment analysis study (Attachment A) of the project site revealed that the material is made up of approximately 25% small cobbles and rocks (<3 inches), 45% sandy material, and 30% clays and silts. The excavated material can be transformed into a slurry with the addition of seawater and hydraulically pumped through dredge discharge lines to the desired nearshore location. The lagoon basin is a protected habitat area and therefore cannot be used for this process, so a large sump pit or a hopper must be used for material mixing. A sump pit would be dug on the back edge of the beach. A hopper is a metal sediment containment box that would be roughly 40 feet by 15 feet and placed on the beach. Seawater would be pumped directly into the container or pit using a small submersible pump on the end of an intake line. This intake line would be screened so that debris and/or additional sediment or other materials are not pumped in from the ocean. Based on construction production rates, an estimated 5,000 gallons per minute of seawater intake would be required. A crawler crane would adjust the position of the pump within the sump pit or hopper to pump the slurry through a submerged discharge line to the nearshore placement site. A small Derrick barge and support tug would adjust the seaward end of the line as needed to prevent line burial and clogs The end of the discharge line would be moved throughout the excavation process to spread the sediment in an area of roughly 9 acres, creating a 10 ft high submerged berm that would be naturally dispersed by waves and currents.

The proposed nearshore placement locations were determined by considering areas with a minimum pump distance that avoid the surf break and any sensitive habitat areas. Two nearshore locations are being considered for this option, one centered around the 20-foot depth contour of the adjacent beach on the east end of Topanga Beach, the other slightly deeper with the shallowest area of site at the 20-foot contour in this area. Aerial images were used to target sandy areas, but field dive studies were conducted by Coastal Resources Management to confirm the location's seabed condition. Initial results are that the areas are devoid of sensitive habitat and consist of sand and low relief unvegetated reef. As an environmental constraint, aerial images show some exposed rock at times near the proposed placement location, and a complete sand cover at other times. This suggests seasonally buried ephemeral reef, which typically does not host kelp or vegetated subtidal habitat. This is consistent with the initial diver survey results (CRM, 2022). Other local experts may be consulted on the sensitivity of this area and additional diver observations may be needed.

Construction would close portions of the beach in the pathway of truck travel for the 7 or 8 months of construction, with certain areas remaining open to use and temporary accessways out to the available beach and surf site. Construction can take place during the offseason to avoid high tourism and reduce recreational impacts.

This concept carries with it a major risk of plugged or damaged pipelines due to gravels within the excavated material. A rough production estimate for this method is 1,760 cy/day with the working duration for a 256,000 cy footprint estimated at 144 working days.

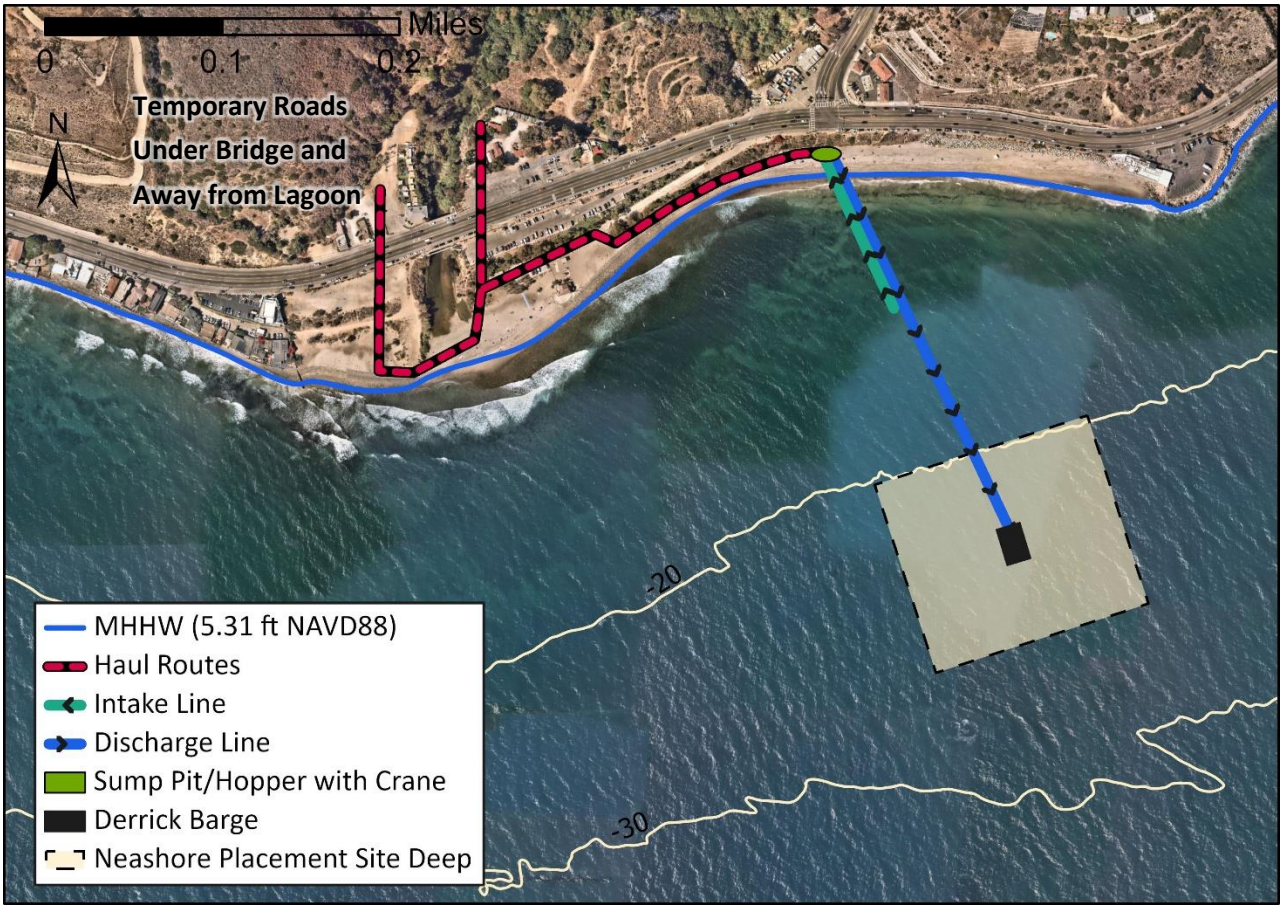


Figure 8: Hydraulic nearshore placement schematic.

Equipment Required:

- 1 Excavator (CAT 365 or similar)
- 4- ten cy Dump Trucks
- 1-18" Damen Pump (or similar)
- 1-8" Submersible Pump (or similar)
- 1 Crawler Crane (~50-100 ton)
- 1 Hopper or Sump Pit dug into the beach (40 ft x 15 ft)
- 1 Small Derrick Barge
- 1 Small Support Tug
- Combination of sunken discharge line (steel) and "float" hose anchored to the bed
  - ~ 1,400 ft of 18-inch diameter discharge line
  - ~ 500 ft of 6-inch diameter intake line
- 1 Grader (CAT 12 or similar) to maintain haul road

- 1 Water Truck to reduce dust

Option 2: Mechanical Removal and Nearshore Placement with Barge

Another sediment reuse option is to place the excavated sediment in the nearshore using a barge. The sediment would be loaded onto a scow or barge, towed to the nearshore placement site, then dumped out of the bottom of the barge. In order to load the barge, material would need to be trucked from the project site to the nearest usable pier offloading facility (e.g. Port Hueneme, Port of Los Angeles, Port of Long Beach) where the material would then be stockpiled for an excavator to load the scow or barge. The haul routes from Topanga Lagoon to these Ports are shown in Figure 9 and Figure 10. Loaded scows or barges would then be towed by tug to the placement site where the material would be dumped through bottom dump doors.

To increase the production rate, 2 scows or barges could be used to transport sediment. A rough production estimate is 4,220 cy/day with the work duration for a 256,000 cy footprint estimated at 61 working days. Twenty-four hour working days are required for the ocean-going work aboard the scows and tugs. If the number of trucks is not feasible at the time of the project due to availability, the equipment quantities could be cut in half. This would also double the amount of working days to 122.

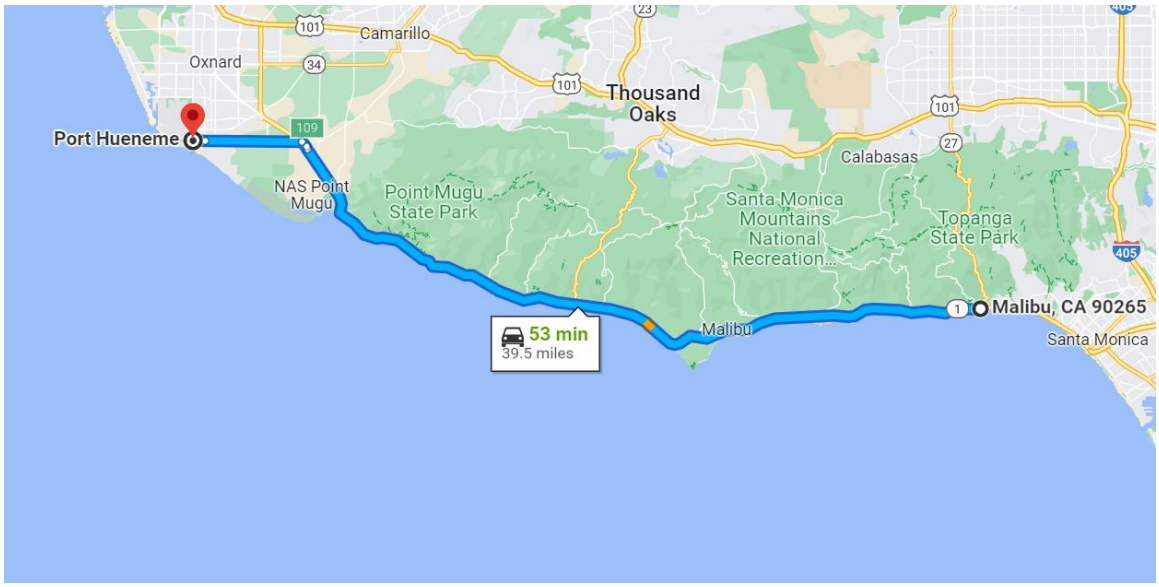


Figure 9: Navigation route from Topanga Lagoon to Port Hueneme.

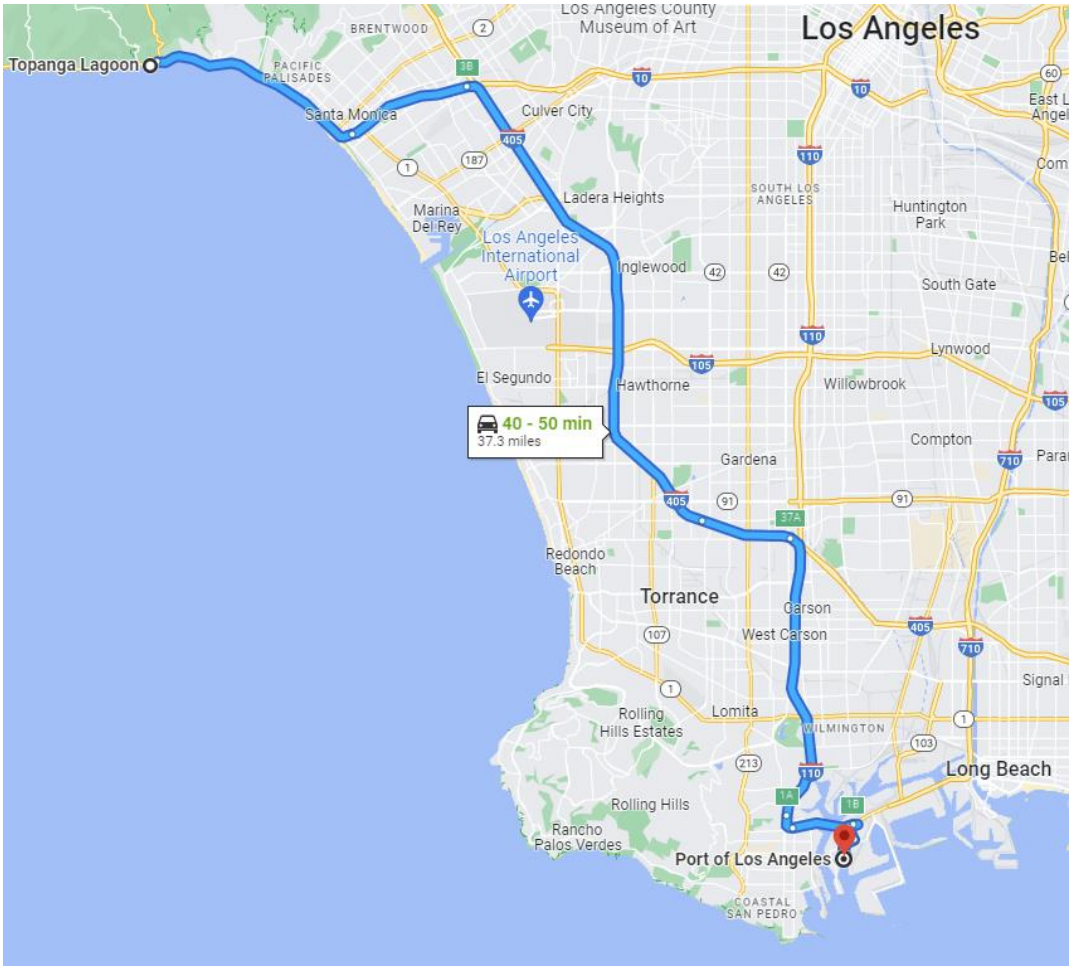


Figure 10: Navigation route from Topanga Lagoon to Ports of LA/LB.

Equipment Required:

- 4 Excavators (CAT 365 or similar)
- 132- ten cy Dump Trucks
- 2 Loaders (CAT 955 or similar)/2 Dozers (D6/D8)
- 2 Split Hull Dump Scows (2,500 cy minimum)
- 2 Tugs (1,500 hp minimum)
- 1 Grader (CAT 12 or similar) to maintain haul road
- 1 Water Truck to reduce dust

Option 3: Mechanical Removal and Upland Landfill Disposal

The final option is to transport the excavated material to the either the Calabasas, Sunshine Canyon, or Scholl Canyon Landfill in trucks. This is the least desirable option both environmentally and economically, but it may be partially or fully required depending on the composition of the excavated sediment.

Two different haul routes would be used for the Calabasas Landfill, with the quadrants located South of PCH (1 & 3) feeding traffic southbound on PCH and using either Topanga Canyon Blvd. or PCH to the 10, to the 405, to the 101, and the quadrants North of PCH (2 & 4) feeding traffic northbound using Malibu Canyon Rd. in order to decrease traffic

congestion and the need for turning movements (Figure 11). Calabasas Landfill charges a $52.32 per ton (2022) tipping fee for uncontaminated dirt. This material typically weighs roughly 1.35 tons per cy giving a total of 345,600 tons of material. This means the total tipping fee would be approximately $18M, making this option the highest cost. The Scholl Canyon Landfill is twice the distance from Topanga Lagoon but charges $10 per ton for uncontaminated dirt, making the total tipping fee costs $3.5M. There is one viable navigation route to Scholl Canyon, shown in Figure 12. The tipping fee for Sunshine Canyon varies depending on the results of sediment grain size and chemistry testing and cannot yet be estimated. The navigation route to Sunshine Canyon is shown in Figure 13.

A rough production estimate is 2,110 cy/day with the working duration for a 256,000 cy footprint estimated at 122 working days.

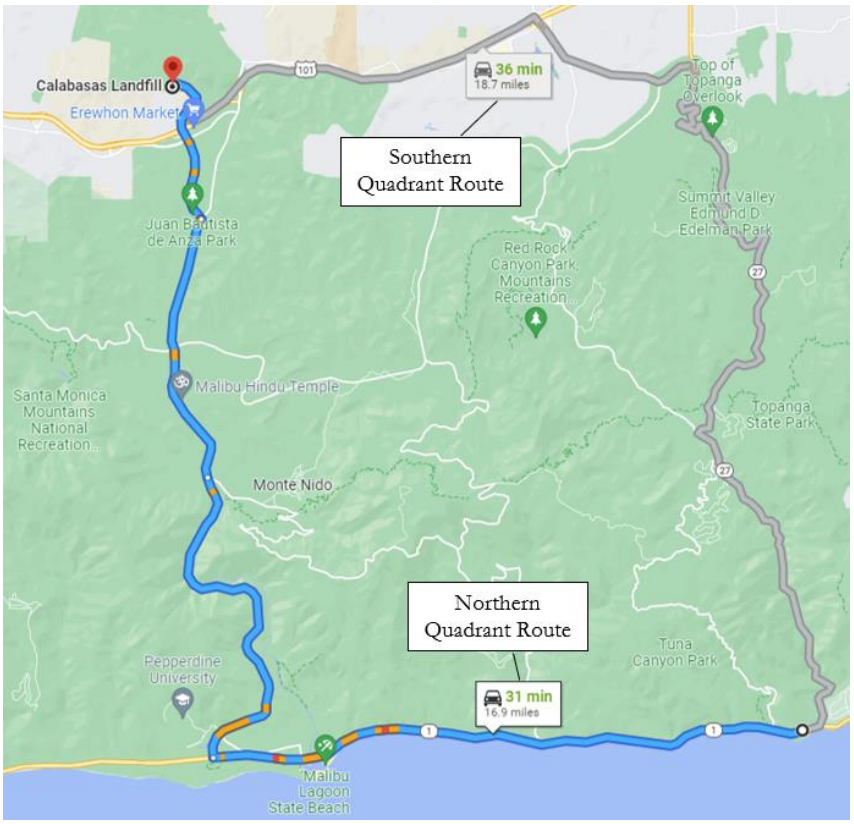


Figure 11: Navigation routes for upland landfill disposal at Calabasas Landfill.

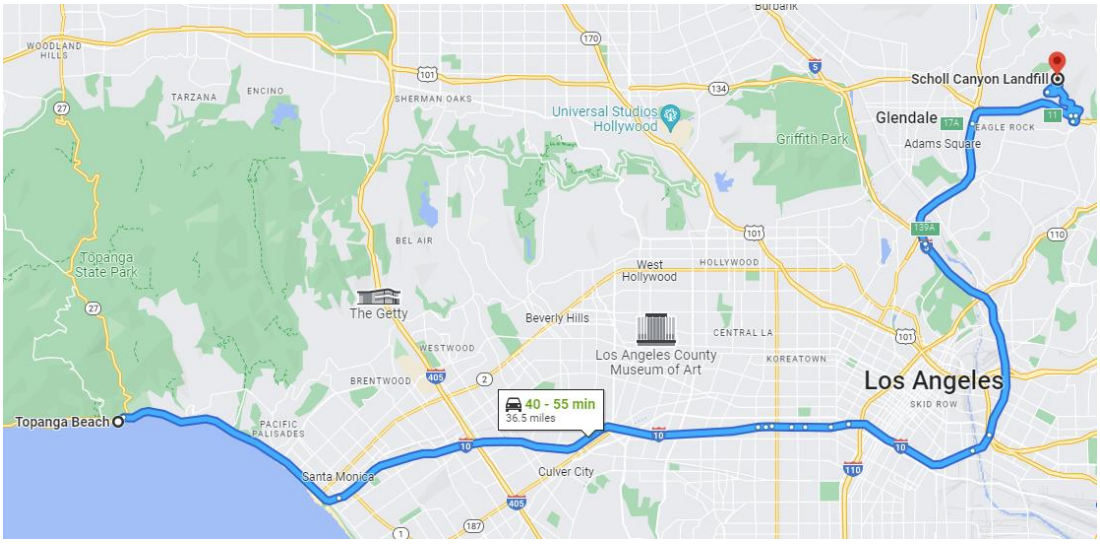


Figure 12: Navigation route for upland landfill disposal at Scholl Canyon Landfill.

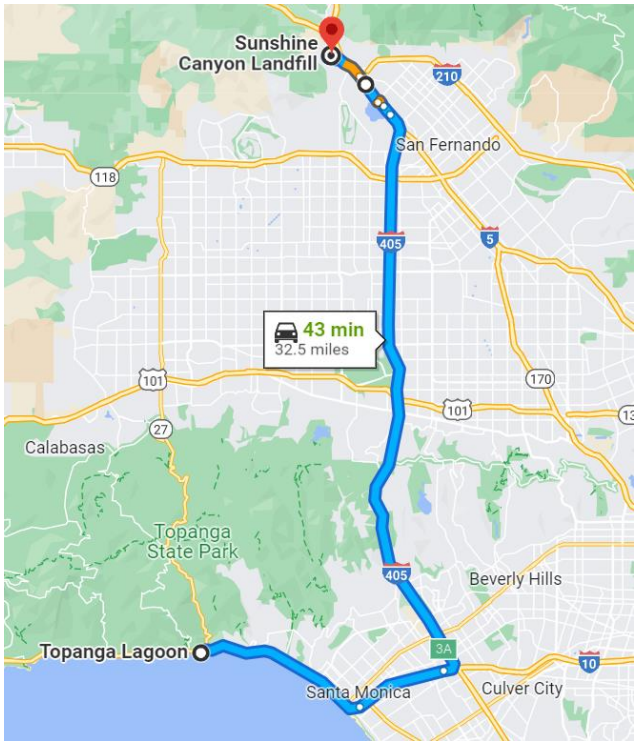
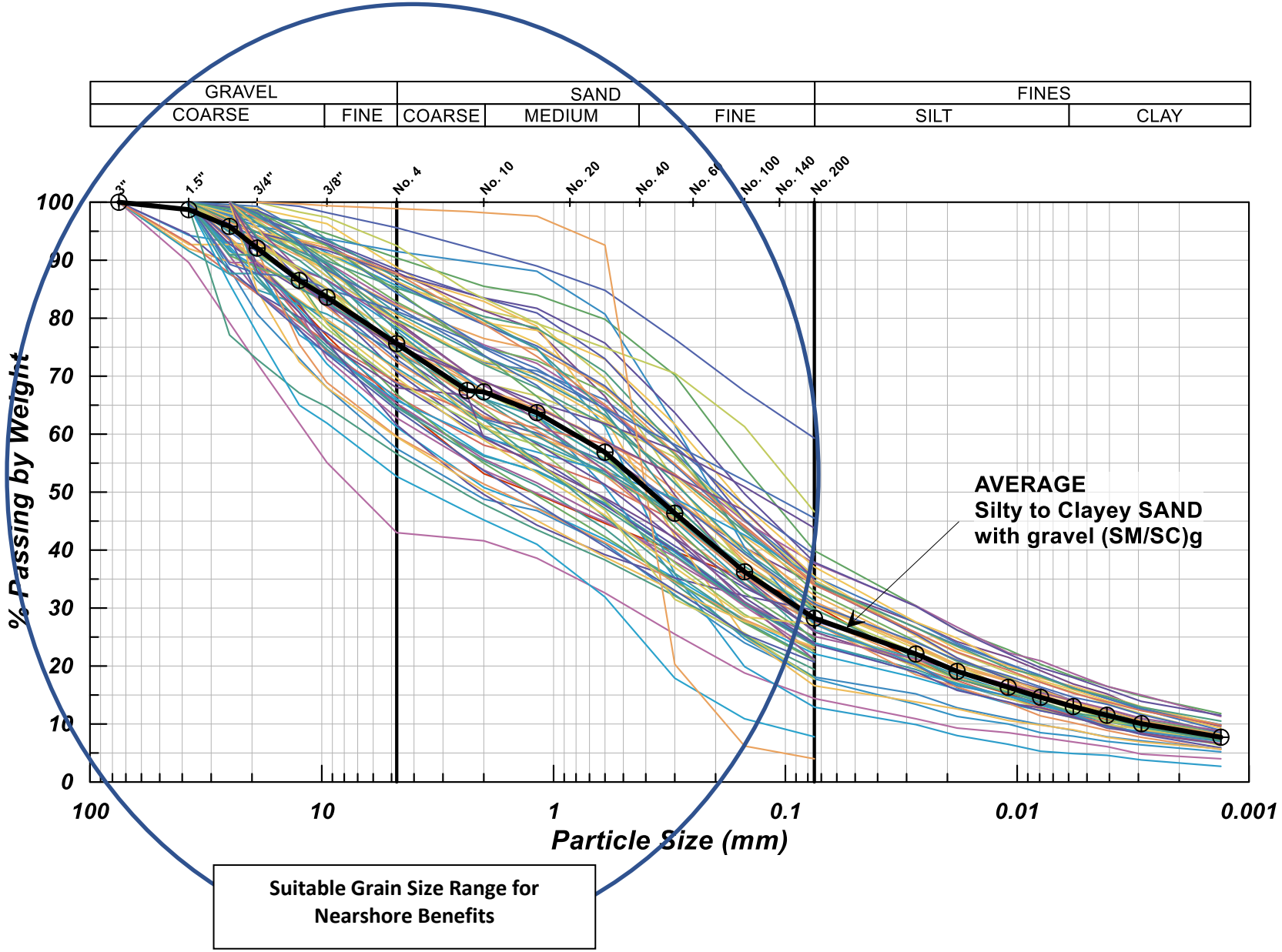


Figure 13: Navigation route for upland landfill disposal at Sunshine Canyon Landfill.

Equipment Required:

- 1 Excavator (CAT 365 or similar)
- 38 ten-cy Dump Trucks
- 1 Grader (CAT 12 or similar) to maintain haul road
- 1 Water Truck to reduce dust

Attachment A: Sediment Gradation Curves


GRAVEL
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3"
1.5"
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No. 4
No. 10
No. 20
No. 40
No. 60
No. 100
No. 140
No. 200
100
90
80
70
60
50
40
30
20
10
0
% Passing by Weight
100
10
1
0.1
0.01
0.001
Particle Size (mm)
AVERAGE
Silty to Clayey SAND
with gravel (SM/SC)g
Suitable Grain Size Range for
Nearshore Benefits

Beneficial Reuse Soil Characterization
Topanga Lagoon Restoration Project
Malibu, California

April 8, 2022

Prepared for

Resource Conservation District of the Santa Monica Mountains
540 South Topanga Canyon Boulevard
Topanga, California 90290

Prepared by

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TABLE OF CONTENTS

1 INTRODUCTION 2
1.1 General 2
1.2 Project Description 2
1.3 Purpose 2
2 SCOPE OF WORK 2
3 FIELD INVESTIGATION 3
3.1 Previous Field Investigation 3
3.2 Current Field Investigation 3
4 GEOLOGIC AND SUBSURFACE CONDITIONS 5
4.1 Regional Geology 5
4.2 Local Geologic Conditions 5
4.3 Groundwater 6
5 LABORATORY TEST RESULTS 6
5.1 Physical Laboratory Testing 6
5.2 Chemical Laboratory Testing 6
6 LIMITATIONS 7
7 REFERENCES 7

TABLES
1 Summary of Boring Geologic Data
2 Summary of Boring Groundwater Data

FIGURES
1 Project Location Map
2 Alternative 2 – Topanga Lagoon Configuration
3 Alternative 3 – Topanga Lagoon Configuration
4 Alternative 4 – Topanga Lagoon Configuration
5 Investigation Location Plan
6 Project Geologic Map (Dibblee, 1992)
7 Particle-Size Curves and Average Curve
8 Sieve Analysis Histograms for Fill Material

APPENDICES
A 2002 Field Investigation and Laboratory Tests (GeoPentech, 2003)
B 2021 Field Investigation
C 2021 Laboratory Tests

1 INTRODUCTION

1.1 General

This beneficial reuse soil characterization report was prepared by GeoPentech to support the planned Topanga Lagoon Restoration Project (Project) in Malibu, California. The Project location is shown on the map on Figure 1. This work was completed in accordance with the Agreement for Professional Services between the Resource Conservation District of the Santa Monica Mountains (RCDSMM) and GeoPentech dated October 7, 2021 and GeoPentech's proposal dated October 6, 2021.

1.2 Project Description

The Pacific Coast Highway Bridge (PCH Bridge) spans across Topanga Lagoon and was built in 1933 by partially filling in the lagoon at the time. The Topanga Lagoon Restoration Project is a coordinated multiagency plan that seeks to expand the existing lagoon footprint by removing the historically placed fill. As part of the Project, the existing PCH Bridge over Topanga Lagoon will be removed and replaced with a longer bridge span over a widened lagoon. If suitable, the removed soils would be used for beach restoration or would be disposed in the ocean.

The Project's Alternative 1 is the "No Project/Managed Decline" alternative. Alternatives 2, 3, and 4 include changes to the PCH Bridge configurations and grading plans for historic fill removal. The proposed Alternative 2, 3, and 4 bridge configurations and grading plans are presented on Figures 2 through 4, respectively.

1.3 Purpose

The purpose of this investigation was to review existing subsurface data and collect additional subsurface data to characterize the physical properties of the soils proposed to be removed, as indicated on the grading plans on Figures 2 through 4. The results of this study will assist with the evaluation of the soil's acceptability for beach replenishment or ocean disposal.

2 SCOPE OF WORK

GeoPentech's scope of work included the following:

- Reviewed relevant previous reports, including boring logs and laboratory test data.
- Performed a field investigation that included advancing hollow stem auger borings,
- Performed physical laboratory tests on soil samples collected during the field investigation,
- Developed a characterization of the site's soils to assist with the evaluation of the soil's suitability for beach restoration or ocean disposal,
- Prepared this report to present the results of the soil characterization.

3 FIELD INVESTIGATION

3.1 Previous Field Investigation

Boring logs and associated laboratory test results were available from a 2002 field investigation performed at the site by GeoPentech as part of a beneficial reuse soil evaluation for the proposed restoration of Topanga Lagoon (GeoPentech, 2003). The 2002 field investigation included a total of seven hollow stem auger borings (B-1 through B-7, B-7A, and B-8 through B-10). The locations of the 2002 borings are shown on Figure 5, and the existing boring logs and associated physical and chemical laboratory test results are included in Appendix A. Elevations referenced in previous investigations by GeoPentech (2003) are based on NGVD 29. Within this report, GeoPentech (2003) elevations were converted to North American Vertical Datum of 1988 (NAVD 88) using the topography shown on Figure 5. The remaining elevations referenced in this report are based on the NAVD 88. Additional details of the 2002 field investigation and laboratory testing are summarized below.

2002 Hollow Stem Auger Borings: The 2002 borings were drilled to total depths ranging between about 19½ and 35½ feet below ground surface (bgs) (about Elevation +18½ feet above mean sea level (MSL) to about -1½ feet below MSL). The borings were advanced using a truck-mounted CME 85 drill rig using an 8-inch outside diameter hollow-stem auger. During drilling, drive-samples were collected at 2-foot intervals using an 18-inch-long modified California sampler. The modified California sampler cutting shoe and barrel had nominal inside diameters of 2.38 and 2.50 inches, respectively, and a nominal outside diameter of 3 inches. The modified California sampler was driven 18 inches or to refusal into the bottom of the borehole by repeatedly dropping a 140-pound hammer 30 inches.

2002 Laboratory Testing: Selected soil samples collected during the 2002 field investigation were tested to evaluate their physical and chemical properties. Physical tests performed included 41 grain-size distribution (ASTM D422) and 12 specific gravity (ASTM D854) tests. Chemical tests were performed on a total of 5 samples, and these tests included total solids, ammonia, total sulfide, soluble sulfide, TRPH, metals, mercury, organochlorine, pesticides and PCBs, semi-volatile organics (marine sediment), pH, TOC, and TBT.

3.2 Current Field Investigation

Ten additional hollow stem auger boreholes (HSA-1 through HSA-8, HSA-M1, and HSA-M2) were completed by GeoPentech between December 20 and 22, 2021 to supplement the data collected from the previous 2002 field investigation. The approximate locations of the 2021 borings are shown on Figure 5. Additional details of the current field investigation are summarized below.

2021 Hollow Stem Auger Borings

The 2021 borings were spatially located to fill in gaps of the 2002 borings and to target areas of the planned deepest fill removal. The 2021 borings were drilled a few feet below the proposed base of fill removal at each boring location. The total depths of the 2021 borings ranged between about 14 and 51 feet below ground surface (bgs) (about Elevation +7½ feet above mean sea level (MSL) to about -13 feet below MSL). The 2021 borings were performed

under the supervision of a geologist who monitored the drilling operations and prepared a field record of soils observed and drilling conditions. Prior to drilling, the boring sites were cleared of utilities by searches performed by Underground Services Alert (USA) member agencies. The borings were advanced using 8-inch outside diameter hollow-stem auger drilling equipment. The drilling was subcontracted to Martini Drilling, who provided a truck mounted CME-75 Diesel HT rig, crew, and supplies.

During drilling of HSA-1 through HSA-8, drive-samples were collected at 2½-foot intervals using an 18-inch-long Standard Penetration Test (SPT) sampler. During drilling of HSA-M1 and HSA-M2, drive samples were collected at 5-foot intervals using either an SPT sampler or a Modified California (ModCal) sampler. SPT and ModCal samples were taken by driving a sampler approximately 18 inches into the soil at the bottom of the boring using a 140-pound automatic-trip hammer falling approximately 30 inches.

The modified California sampler cutting shoe and barrel have nominal inside diameters of 2.38 and 2.50 inches, respectively, and a nominal outside diameter of 3 inches. The modified California sampler was driven 18 inches or to refusal into the bottom of the borehole by repeatedly dropping a 140-pound hammer 30 inches. The SPT sampler cutting shoe and barrel have nominal inside diameters of 1.375 and 1.50 inches, respectively, and a nominal outside diameter of 2.00 inches. Liners were not used. The SPT samples were placed in plastic bags, labeled, and sealed. The ModCal sampler cutting shoe and barrel have nominal inside diameters of 2.38 and 2.50 inches, respectively, and a nominal outside diameter of 3 inches. Nominal 1-inch long, 2.4-inch diameter steel rings were used to line the barrel. The ModCal rings were slid into storage tubes and sealed with tape to help preserve the moisture content of the samples.

After recovering the sample, the geologist recorded sample characteristics (depth interval, sample type, and description of the recovered material) on a field log and sealed and labeled the sample for transport to NMG or AP Engineering and Testing for laboratory testing. The soil descriptions noted on the field logs were visually classified in accordance with the Unified Soil Classification System. Field observations were later updated with laboratory test results as appropriate. A key to the log of boring and the boring logs are included in Appendix B.

Upon completion of drilling, logging, and sampling, all borings were immediately backfilled with cement-bentonite grout. After the borings were backfilled, the ground surface at each location was restored to its original condition.

2021 Laboratory Testing

Laboratory tests were performed on selected samples obtained from the 2021 borings to evaluate pertinent physical properties of the soils proposed to be removed as part of the lagoon restoration. The physical laboratory testing program included moisture content (6 total), dry density (6 total), Atterberg limits (2 total), No. 200 sieve wash (5 total), and grain size distribution (32 total). The geotechnical testing was conducted at the laboratory facilities of NMG and AP Engineering and Testing, Inc. in Irvine and Pomona, California, respectively. The tests were performed in general accordance with applicable procedures of ASTM International (ASTM). The results of laboratory tests are summarized on the laboratory data

sheets in Appendix C. The tests and a portion of the results are noted on the boring logs in Appendix B for convenience.

4 GEOLOGIC AND SUBSURFACE CONDITIONS

4.1 Regional Geology

The Topanga Lagoon Restoration Project is in California's Transverse Ranges geomorphic province, which is characterized by east-west trending mountains, oblique to the northwesterly-trending coastline and mountains of the adjacent Coast Ranges and Peninsular Ranges geomorphic provinces. The Project is located at the southern base of the Santa Monica Mountains along the shoreline adjacent to the Pacific Ocean. The PCH Bridge spans Topanga Lagoon at the mouth of Topanga Creek. Up to about 35 vertical feet of fill material was placed across the historic 30-acre Topanga Lagoon in the early 1930s to construct PCH.

Figure 6 shows the Project on a geologic map of the area by Dibblee (1992). As indicated on Figure 6, the site area is underlain by Holocene-age surficial sediments, including active stream channel deposits (Qg), beach sand (Qs), and alluvium (Qa). As described by Dibblee (1992), the surficial sediments generally consist of sand, gravel, silt, and clay. As noted above, fill is also currently present at the site; however, this fill was not mapped separately on Figure 6. The project alternatives include removing on-site soils and constructing a new PCH Bridge over a widened Topanga Lagoon. The surficial sediments at the site are underlain by upper Cretaceous-age sedimentary rocks of the Tuna Canyon formation (Kss, Ksh, and Kcg). The Tuna Canyon Formation consists of marine and nonmarine sandstone with shale and conglomerate beds. Miocene-age intrusive rocks (db) generally consisting of diabase and basalt have also been mapped in the site area.

4.2 Local Geologic Conditions

Current and previous investigations completed in the vicinity of the Project encountered artificial fill and Beach Deposits (see Figure 5 for boring locations). Descriptions of the artificial fill and Beach Deposits are summarized in Table 1 and discussed below.

Artificial Fill: Man-placed artificial fill was encountered within the current and previous borings from the ground surface to depths between about 8 and 30 feet bgs (about Elevation +12 to +3½ feet MSL). A portion of this fill is planned to be removed in the project area as part of the Topanga Lagoon restoration. The fill is undocumented, and we are unaware of any construction records indicating how the fill was placed. The fill generally consisted of medium dense to very dense, moist, silty sand with gravel (SM) to silty/clayey sand with gravel (SM/SC) The observed gravel predominantly consisted of fine to coarse fragments of sandstone and shale. Occasional sandy gravel (GM) and stiff to hard, silt (ML) and clay (CL, CH) zones generally a few feet thick were observed.

Beach Deposits: Beach Deposits were encountered below the fill to a maximum depth of about 51 feet bgs or Elevation -13 feet MSL. The Beach Deposits predominantly consisted of medium dense to dense, sand (SM, SC, SP-SC, SP) with occasional silt (ML) and gravel layers (GM, GC). An approximately 2-foot-thick layer of loose, silty sand (SM) was encountered at the top of the Beach Deposits within B-5.

Bedrock: Bedrock was encountered below the fill within HSA-1 at a depth of approximately 30 feet bgs or Elevation +8 feet MSL. The bedrock consisted of hard shale.

4.3 Groundwater

During the current and previous field investigations, the groundwater surface was observed at the time of drilling within all boreholes except HSA-1, HSA-3a, HSA-4, HSA-7, HSA-8, B-4, B-6, and B-9. Generally, the groundwater surface was encountered in the Beach Deposits between about Elevation +10 to +3½ feet MSL. Groundwater observations within borings completed at the site are summarized in Table 2.

5 LABORATORY TEST RESULTS

5.1 Physical Laboratory Testing

Figure 7 shows an overlay of the combined particle-size curves for all 73 grain-size distribution tests that were performed during the current and previous field investigations within the proposed zone of soil removal. As shown on Figure 7, the lower bound of the particle-size curves is approximately defined as a silty, clayey gravel with sand (GC-GM) and the upper bound curve is approximately defined by a silty/clayey sand (SM/SC). Figure 7 also shows the average particle-size curve for all 73 tests. The average particle-size curve is a silty/clayey sand with gravel, (SM/SC)g.

Figure 8 shows 3 sieve analysis histograms (No. 4 sieve, No. 30 sieve, and No. 200 sieve) and corresponding cumulative distribution plots for test performed within the fill material (70 tests total). A statistical summary of the fill sieve results (percent passing) shown on Figure 8 is presented in the table below.

Sieve Statistical Summary of Fill Material

Sieve Size	Percent Passing		
	Minimum	Maximum	Mean
No. 4 (4.75 mm)	56.6%	95.6%	75.8%
No. 30 (0.60 mm)	38.3%	84.8%	56.9%
No. 200 (0.075 mm)	17.7%	59.3%	29.5%

5.2 Chemical Laboratory Testing

Chemical laboratory testing was not performed as part of the current investigation; however, chemical testing was performed on 5 samples (B-1, B-4, B-6, B-7, and B-10) as part of the previous 2002 investigation. A summary of the previous chemical testing results is presented in GeoPentech (2003).

6 LIMITATIONS

The characterization of materials presented in this report are based upon our understanding of the project and the assumptions that the subsurface conditions do not deviate appreciably from what was observed in the boreholes. However, the possibility of different subsurface conditions cannot be discounted. If the locations, configurations, layout, or features of the proposed Topanga Lagoon Restoration Project are changed, or more site-specific geologic data is retrieved, then the characterization of materials presented in this report may not be applicable. It is the responsibility of the Owner to bring any such changes of the proposed project and any deviations of the known subsurface conditions to the attention of GeoPentech. In this way, a supplemental characterization of materials, if required, can be made without delay to the project.

Professional judgments presented in this report are based on an evaluation of the technical information gathered and GeoPentech's general experience in the fields of geology and geotechnical engineering. GeoPentech does not guarantee the performance of the project in any respect, only that the engineering work and judgment rendered meet the standard of care of the geotechnical profession at this time.

7 REFERENCES

Dibblee, T.W, 1992, "Geologic Map of the Topanga and South ½ Canoga Park Quadrangles, Los Angeles County, California", Scale = 1:24,000.

GeoPentech, 2003, "Technical Memorandum: Topanga Lagoon Restoration Project, Preliminary Soil Investigation, Los Angeles County, California", dated January 29.

Table 1: Summary of Boring Geologic Data

Boring ID	Ground Surface Elevation (feet) NAVD88	Geologic Unit	Depth Range (feet)	Elevation Range (feet) NAVD88	Predominant Lithology
HSA-1	38	Fill	0 to 30	+38 to +8	SM, SC, ML w/ gravel
		Bedrock	30 to 33	+8 to +5	Shale
HSA-2	36	Fill	0 to 30	+36 to +6	SM, SC w/ gravel
		Beach Dep.	30 to 31½	+6 to +4½	SM
HSA-3a/ HSA-3b	32	Fill	0 to 27½	+32 to +4½	SM, SC, ML w/ gravel
		Beach Dep.	27½ to 31½	+4½ to +½	SP-SC, SP
HSA-4	35	Fill	0 to 29	+35 to +6	SM, SC, ML, CL, CH w/ grav.
HSA-5	17	Fill	0 to 8	+17 to +9	CL
		Beach Dep.	8 to 14	+9 to +3	SP
HSA-6	37	Fill	0 to 30	+37 to +7	SM, SC w/ gravel
		Beach Dep.	30 to 31½	+7 to +5½	SP-SM
HSA-7	34	Fill	0 to 26½	+34 to +7½	SM, SC w/ gravel
HSA-8	33	Fill	0 to 26½	+33 to +6½	SC, SM
HSA-M1	38	Fill	0 to 30	+38 to +8	SC, CL, SM w/ gravel
		Beach Dep.	30 to 51	+8 to -13	SP, SP-SM
HSA-M2	38	Fill	0 to 26	+38 to +12	SC, CL w/ gravel
		Beach Dep.	26 to 51	+12 to -13	ML, SP-SM, SP
B-1	25	Fill	0 to 19	+25 to +6	GM, SC, SM w/ gravel
		Beach Dep.	19 to 25½	+6 to -½	GM, GC, SM
B-2	36	Fill	0 to 30	+36 to +6	SM, SC w/ gravel
		Beach Dep.	30 to 31½	+6 to +4½	SM
B-3	34	Fill	0 to 30	+34 to +4	SM w/ gravel
		Beach Dep.	30 to 31½	+4 to +2½	SC
B-4	33	Fill	0 to 29½	+33 to +3½	GM, SC, SM, CH w/gravel
B-5	35	Fill	0 to 28½	+35 to +6½	SM w/ gravel
		Beach Dep.	28½ to 33½	+6½ to +1½	SM
B-6	38	Fill	0 to 19½	+38 to +18½	SM, SC w/ gravel
B-7	32	Fill	0 to 24½	+32 to +7½	SM, SC, CL w/ gravel
		Beach Dep.	24½ to 31	+7½ to +1	SC, SM
B-7A	33	Fill	0 to 24½	+33 to +8½	SM, SC, CL w/ gravel
		Beach Dep.	24½ to 27½	+8½ to +5½	SP-SM, SC
B-8	34	Fill	0 to 26	+34 to +8	SM, SC w/ gravel
		Beach Dep.	26 to 35½	+8 to -1½	SM, SC
B-9	33	Fill	0 to 21½	+33 to +11½	SM, SC w/ gravel
B-10	38	Fill	0 to 30	+38 to +8	SM, SC w/ gravel
		Beach Dep.	30 to 33½	+8 to +4½	SM

Table 2: Summary of Boring Groundwater Data

Boring ID	Ground Surface Elevation (feet) NAVD88	Depth to Groundwater Observed During Drilling (feet)	Groundwater Elevation Observed During Drilling (feet MSL) NAVD88	Date Measured
HSA-1	38	Dry (>33)	Dry (< +5)	12/20/2021
HSA-2	36	30	+6	12/20/2021
HSA-3a	32	Dry (>16½)	Dry (< +15½)	12/20/2021
HSA-3b	32	27	+5	12/20/2021
HSA-4	35	Dry (>29)	Dry (< +6)	12/20/2021
HSA-5	17	7	+10	12/22/2021
HSA-6	37	30	+7	12/21/2021
HSA-7	34	Dry (>26½)	Dry (< +7½)	12/21/2021
HSA-8	33	Dry (>26½)	Dry (< +6½)	12/22/2021
HSA-M1	38	30	+8	12/21/2021
HSA-M2	38	30	+8	12/21/2021
B-1	25	19	+6	11/12/2002
B-2	36	30	+6	11/11/2002
B-3	34	30½	+3½	11/11/2002
B-4	33	Dry (>29½)	Dry (< +3½)	11/13/2002
B-5	35	27	+8	11/13/2002
B-6	38	Dry (>19½)	Dry (< +18½)	11/13/2002
B-7	32	25	+7	11/11/2002
B-7A	33	26	+7	11/11/2002
B-8	34	26	+7	11/12/2002
B-9	33	Dry (>21½)	Dry (< +11½)	11/12/2002
B-10	38	31½	+6½	11/12/2002

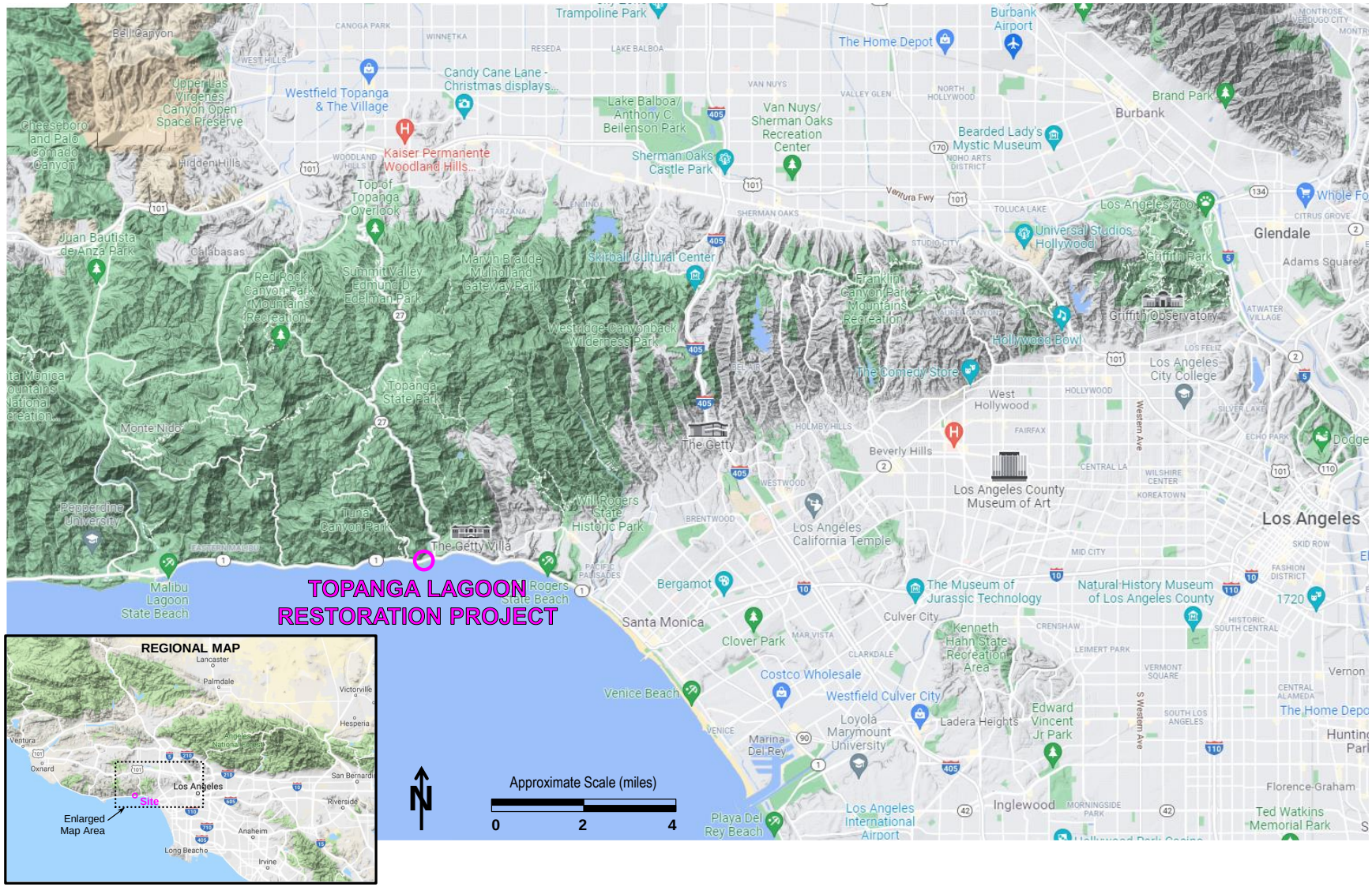

Figure 1: Project Location Map

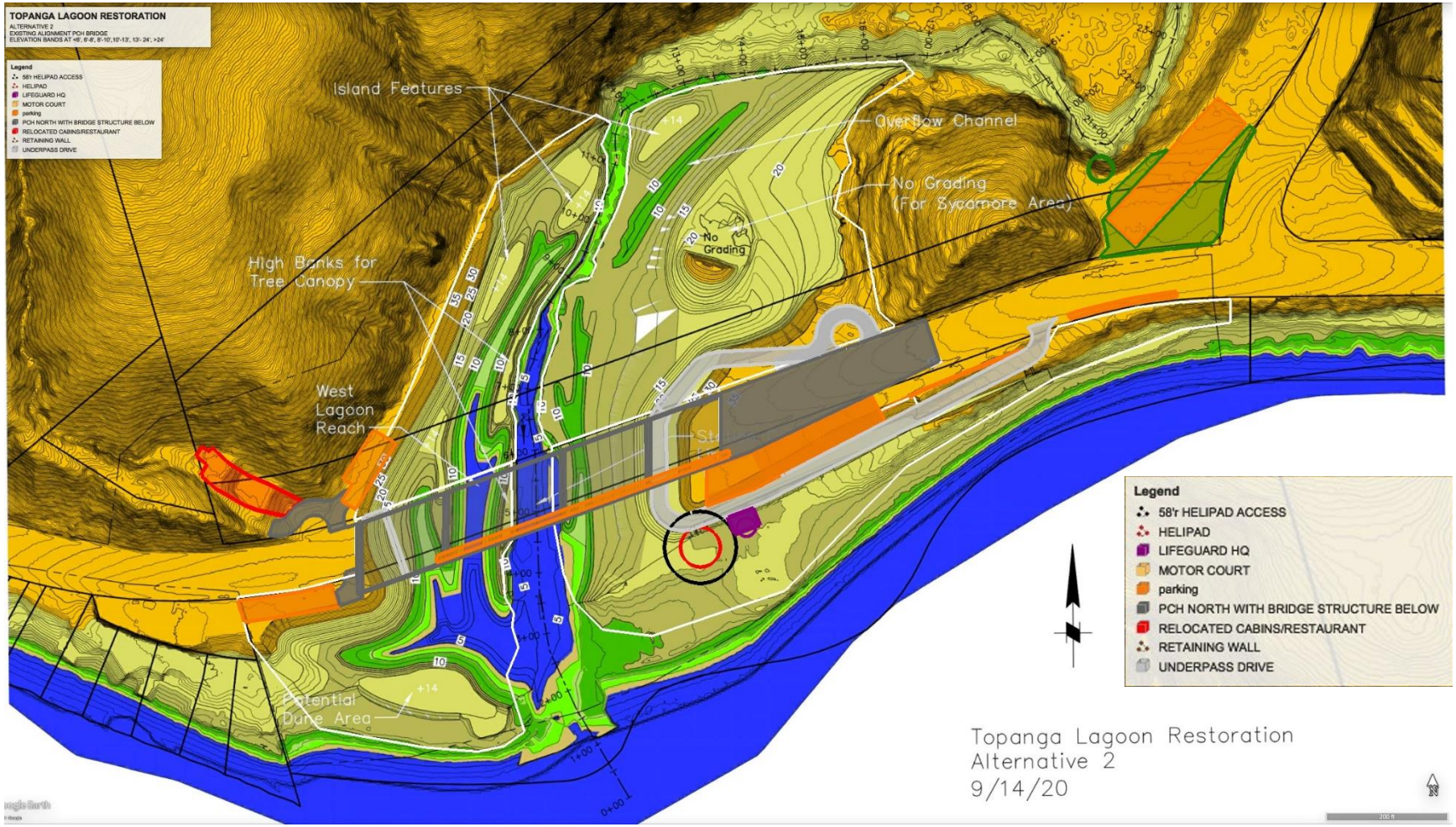

Figure 2: Alternative 2 – Topanga Lagoon Configuration

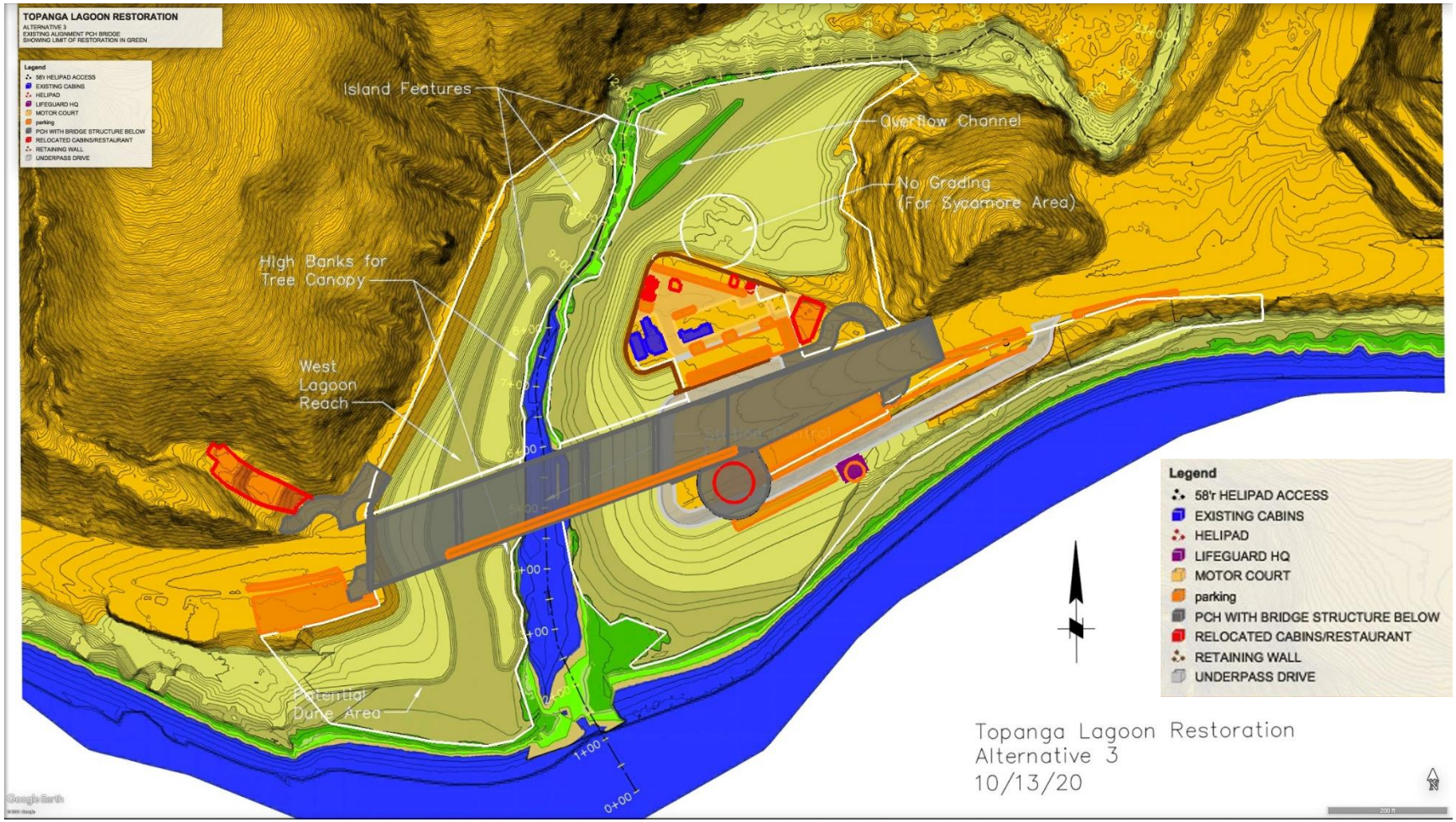

Figure 3: Alternative 3 – Topanga Lagoon Configuration

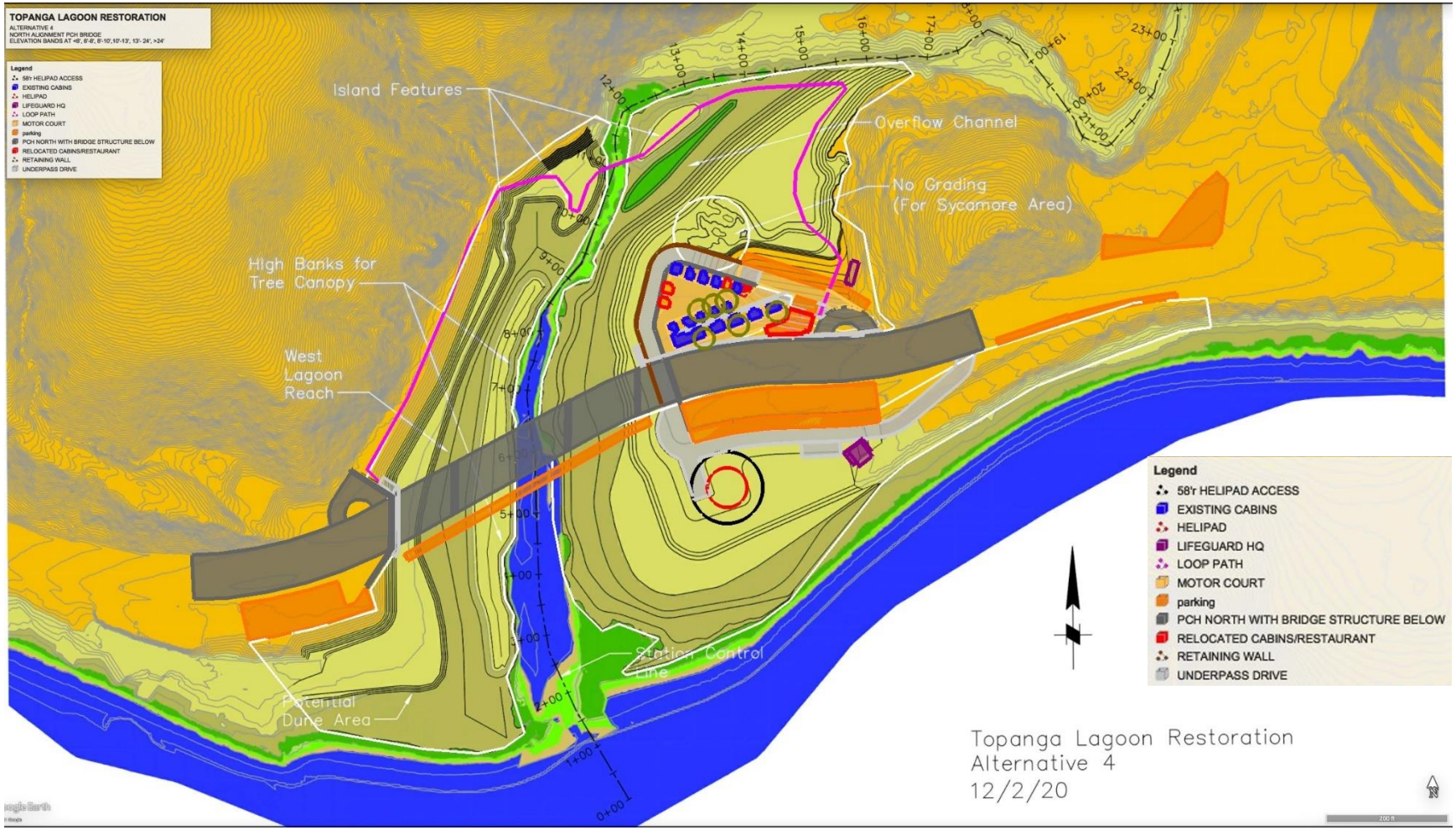

Figure 4: Alternative 4 – Topanga Lagoon Configuration

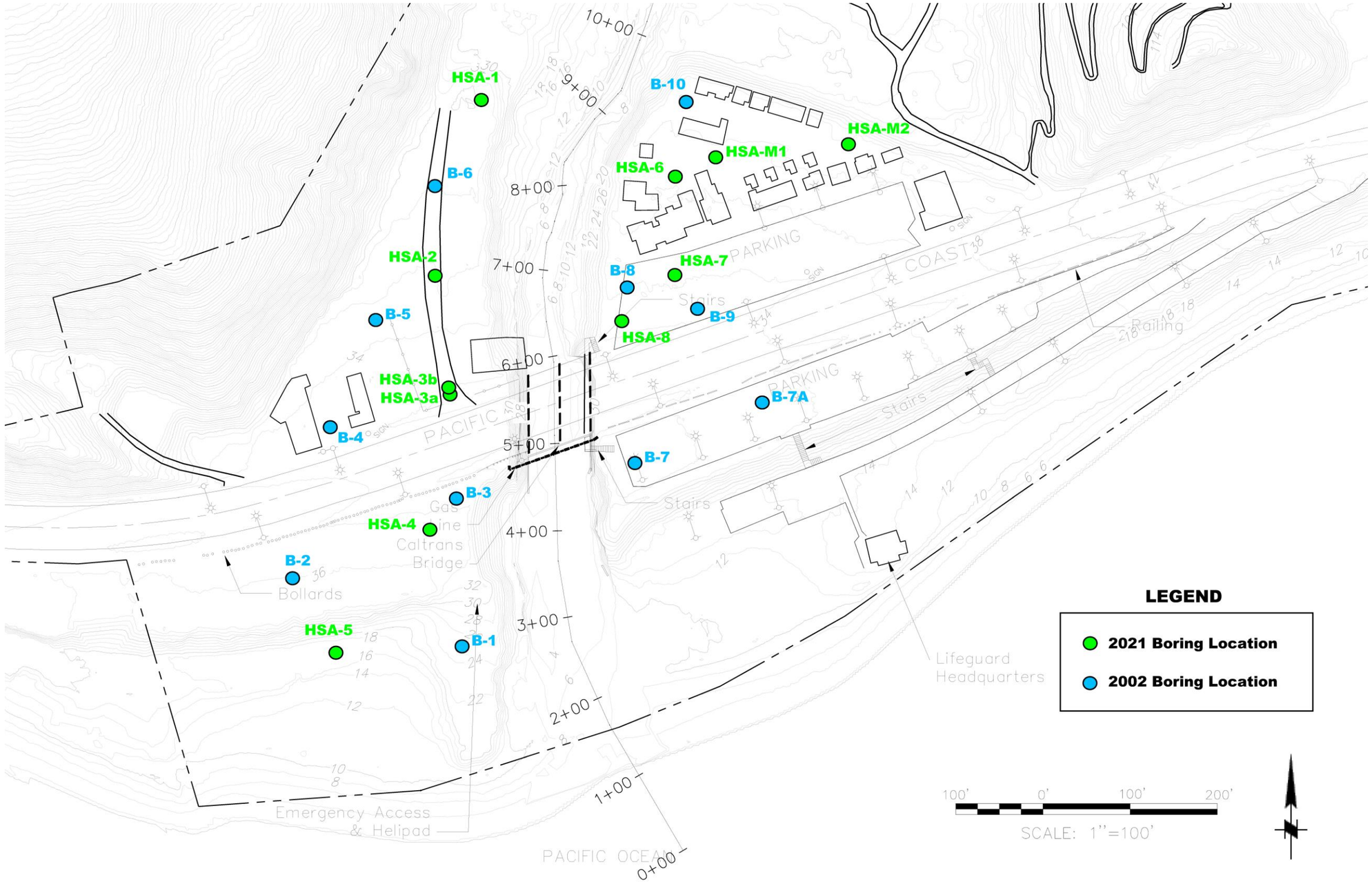

Figure 5: Investigation Location Plan

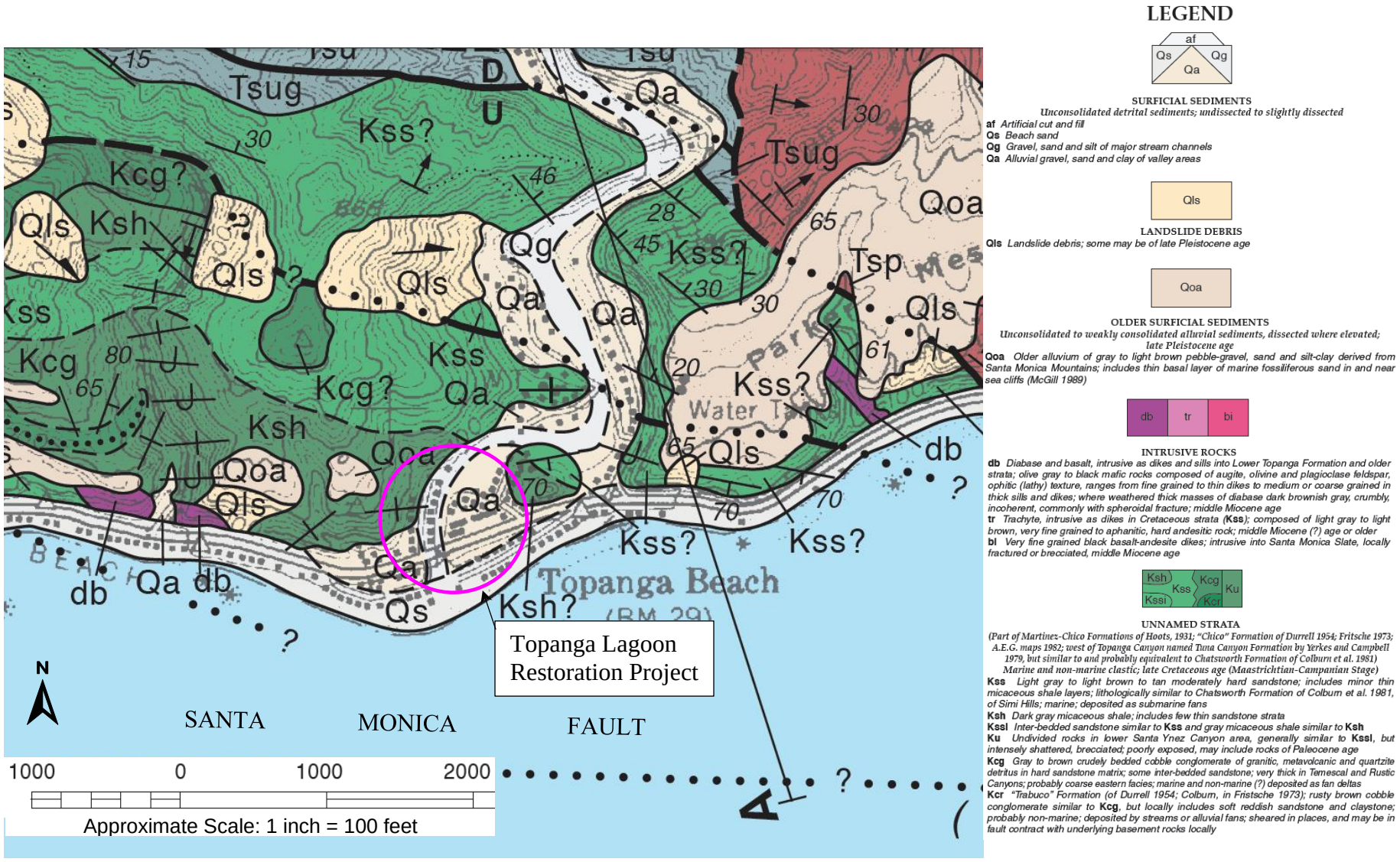

Figure 6: Project Geologic Map (Dibblee, 1992)

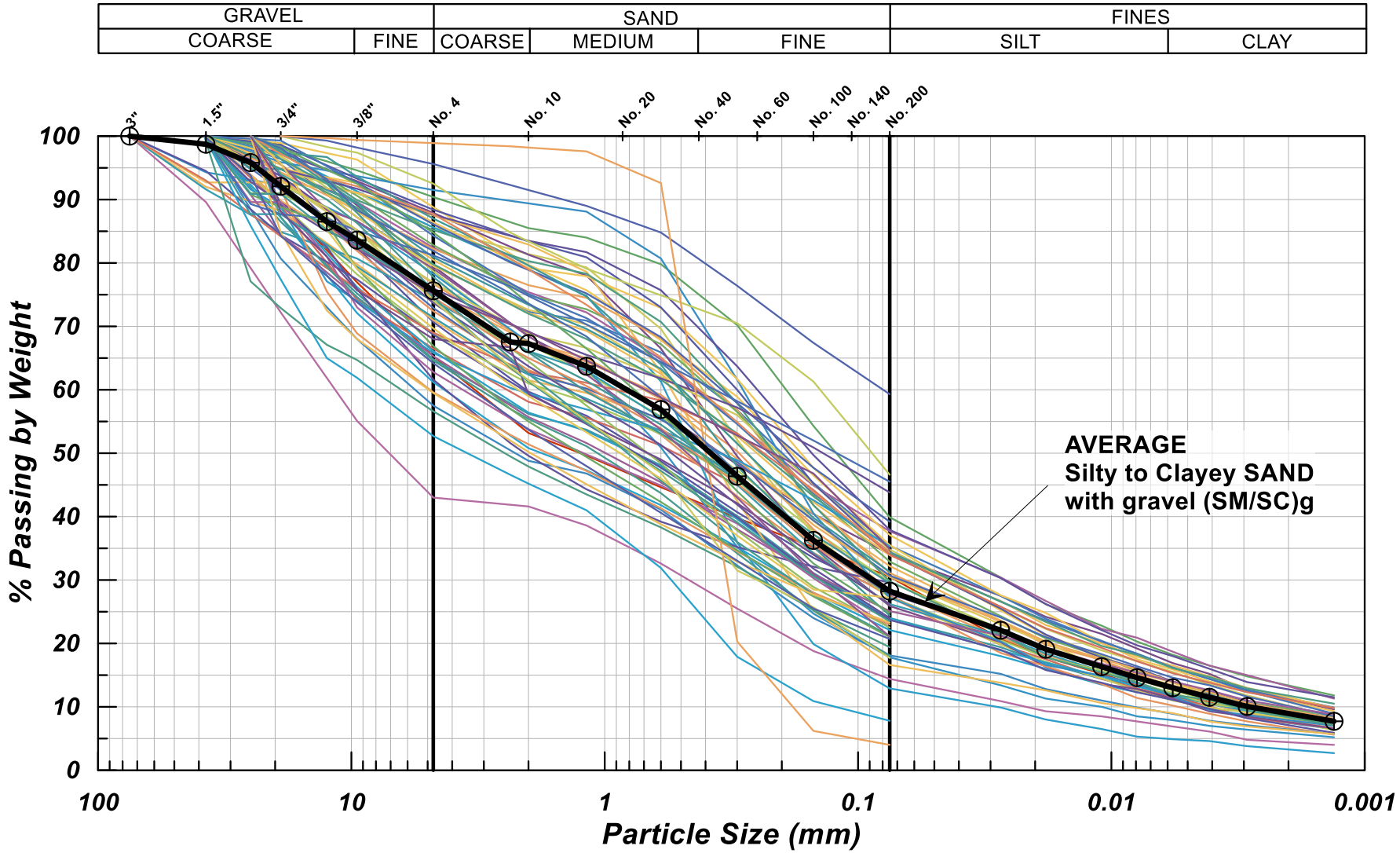

Figure 7 : Particle-Size Curves and Average Curve

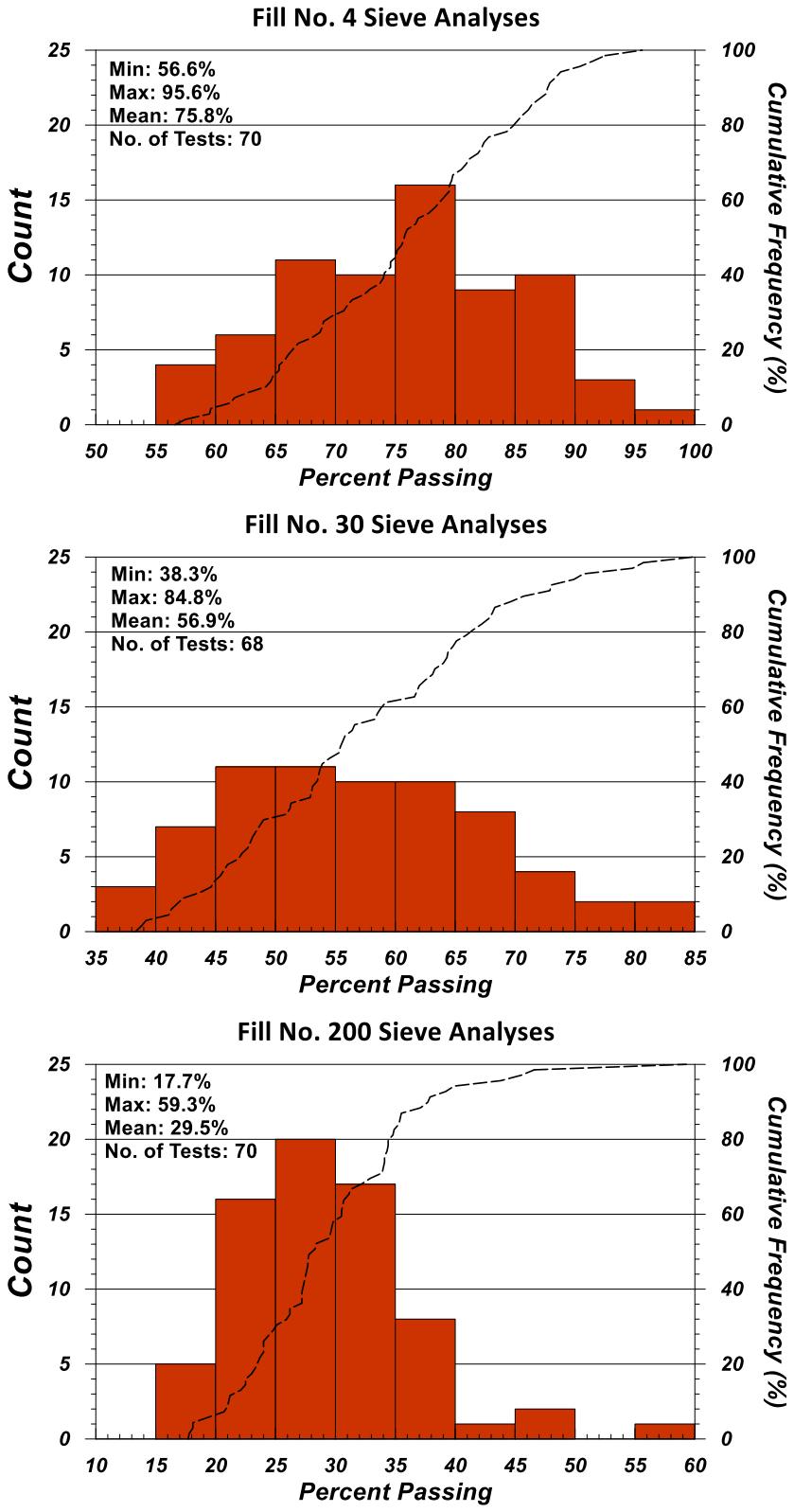

Figure 8: Sieve Analysis Histograms for Fill Material

APPENDIX A

2002 Field Investigation and Laboratory Tests

(GeoPentech, 2003)

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Key to Log of Boring

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Number	SAMPLES: Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
1	2	3	4	5	6	7	8	9	10

COLUMN DESCRIPTIONS

1 **Elevation:** Elevation in feet referenced to mean sea level (MSL) or site datum.

2 **Depth:** Depth in feet below the ground surface.

3 **Sample Type:** Type of soil sample collected at depth interval shown; sampler symbols are explained below.

4 **Sample Number:** Sample identification number.

5 **Sampling Resistance:** Number of blows required to advance driven sampler 12 inches beyond first 6-inch interval, or distance noted, using a 140-lb hammer with a 30-inch drop. Hydraulic down-pressure may be recorded for pushed samplers.

6 **Graphic Log:** Graphic depiction of subsurface material encountered; typical symbols are explained below.

7 **Material Description:** Description of material encountered; may include density/consistency, moisture, color, and grain size.

8 **Water Content:** Water content of sample, as percentage of dry weight of soil, measured in lab according to ASTM D2216.

9 **Dry Unit Weight:** Dry weight per unit volume of soil sample, in pounds per cubic foot, measured in lab according to ASTM D2937.

10 **Remarks and Other Tests:** Comments and observations regarding drilling or sampling made by driller or field personnel. Other lab tests are indicated using abbreviations explained below.

TYPICAL MATERIAL GRAPHIC SYMBOLS

- POORLY GRADED SAND (SP)
- POORLY GRADED SAND with SILT (SP-SM)
- SILTY SAND (SM)
- SILT (ML)
- ELASTIC SILT (MH)
- SILTY to CLAYEY SAND (SM/SC)
- LEAN CLAY (CL)
- FAT CLAY (CH)
- CLAYEY SAND (SC)
- SILTY CLAY (CL or CL-ML)
- CLAYEY SILT (ML)
- GRAVEL (GP/GW)

TYPICAL SAMPLER GRAPHIC SYMBOLS

- Modified California tube-lined split barrel (2.5-inch-OD)
- Standard Penetration Test (SPT) split spoon
- Shelby tube (thin-wall, fixed-head undisturbed)
- California ring-lined split barrel (3-inch-OD)
- Bulk sample
- Grab sample

OTHER LABORATORY TEST ABBREVIATIONS

AL	Atterberg Limits test (ASTM D4318)
LL	Liquid Limit from Atterberg Limits test
PI	Plasticity Index from Atterberg Limits test
Gs	Specific Gravity (ASTM D854)
GR	Gravel content from sieve analysis (ASTM D422), %>4 sieve
SA	Sand content from sieve analysis, %<#4 and >#200 sieve
FI	Fines content from sieve analysis, %<#200 sieve
UC	Unconfined compressive strength test (ASTM D2166), q_u in ksf

OTHER GRAPHIC SYMBOLS

- First water encountered at time of drilling and sampling
- Static water level measured at specified time after drilling
- Change in material properties within a lithologic stratum
- Inferred contact between soil strata or gradational lithologic change

Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive; field descriptions may have been modified to reflect lab test results. Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced; they are not warranted to be representative of subsurface conditions at other locations or times.

Figure A-1

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 1

Sheet 1 of 1

Date(s) Drilled	**11/12/02**	Logged By	**S. Duke**	Checked By	**S.T. Freeman**
Drilling Method	**Hollow-Stem Auger**	Drill Bit Size/Type	**4-1/4-inch-ID, 8-inch-OD auger**	Total Depth of Borehole	**25.5 feet**
Drill Rig Type	**CME 85**	Drilling Contractor	**A & R Drilling**	Approximate Surface Elevation	**17 feet MSL**
Groundwater Level(s)	**19 feet bgs ATD**	Sampling Method	**Modified California lined with 2-inch-dia. brass tubes**	Hammer Data	**Downhole hammer; 140 lbs / 30-inch drop**
Borehole Backfill	**Drill cuttings (tamped)**	Location	**Refer to site plan**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
	0					**FILL** Medium dense, moist, brown, SILTY GRAVEL with SAND (GM), gravel consists mostly of yellowish brown sandstone fragments, fine- to medium-grained sand, trace clay			
15			1	28					Composite of 1 and 2: GR = 35% SA = 34% FI = 31%
						Increasing shale fragments			
	5		2	22					
						Medium dense, moist, brown, SILTY to CLAYEY SAND with GRAVEL (SM/SC), fine- to medium-grained sand, fine gravel consists mostly of sandstone and shale fragments			
10			3	22					
						Becomes reddish brown			
			4	35					
	10					Increasing shale and sandstone fragments			
			5	28					Composite of 5 and 6: GR = 20% SA = 46% FI = 34% Gs = 2.80
5						Becomes medium dense to dense, dark gray with dark gray shale fragments			
			6	39					
	15		7	32					
						Dense, moist, dark brown, CLAYEY SAND with GRAVEL (SC), gravel consists of sandstone and shale fragments			
0			8	39					Composite of 8 and 9: GR = 29% SA = 43% FI = 28%
			9	25		▽			
	20					**BEACH DEPOSITS** Medium dense to dense, wet, brown, SILTY to CLAYEY GRAVEL with SAND (GM/GC), fine to coarse gravel			
			10	40					Composite of 10 and 11: GR = 57% SA = 29% FI = 14% Gs = 2.73
-5			11	41					
						Dense, wet, bluish gray, SILTY SAND (SM)			
	25		12	45					
-10						**Bottom of boring at 25.5 feet**			
	30								
-15									
	35								

Report: GP SOIL LOG; File: TLAGOON.GPJ; 12/20/2002

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Figure A-2

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 2

Sheet 1 of 1

Date(s) Drilled	**11/11/02**	Logged By	**S. Duke**	Checked By	**S.T. Freeman**
Drilling Method	**Hollow-Stem Auger**	Drill Bit Size/Type	**4-1/4-inch-ID, 8-inch-OD auger**	Total Depth of Borehole	**31.5 feet**
Drill Rig Type	**CME 85**	Drilling Contractor	**A & R Drilling**	Approximate Surface Elevation	**28 feet MSL**
Groundwater Level(s)	**30 feet bgs ATD**	Sampling Method	**Modified California lined with 2-inch-dia. brass tubes**	Hammer Data	**Downhole hammer; 140 lbs / 30-inch drop**
Borehole Backfill	**Drill cuttings (tamped)**	Location	**Refer to site plan**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
	0					Asphalt			
						FILL			
			1	58		Dense, moist, brown, SILTY to CLAYEY SAND with GRAVEL (SM/SC), fine- to medium-grained sand, fine to coarse gravel consists of sandstone and shale fragments			Composite of 1 and 2: GR = 21% SA = 49% FI = 30% Gs = 2.72
25			2	52					
	5		3	53		Becomes reddish brown			
20			4	59					
						Becomes light brown (in sampler tip)			
	10		5	58		Becomes dark reddish brown			Composite of 5 and 6: GR = 23% SA = 49% FI = 28%
			6	50/2"		Concreted sandstone cobble in sampler shoe			
15									
			7	50/3"		Becomes very dense, dark gray			
	15								
			8	65		Becomes dark reddish brown; increase in clay content			Composite of 8 and 9: GR = 33% SA = 39% FI = 28%
10			9	68					
	20		10	47		Medium dense to dense, moist, dark brown, SILTY SAND (SM), fine-grained sand, few fine to coarse gravel-size fragments of sandstone and shale			
5			11	34					Composite of 11 and 12: GR = 11% SA = 53% FI = 36% Gs = 2.72
	25		12	33					
			13	40					
0			14	28		Medium dense, moist, gray, CLAYEY SAND (SC), fine- to medium-grained sand			
	30					▽			
			15	48		**BEACH DEPOSITS** Dense, wet, brown, SILTY SAND (SM), fine- to medium-grained sand			
						Bottom of boring at 31.5 feet			
-5									
	35								

Report: GP SOIL LOG; File: TLAGOON.GPJ; 12/20/2002

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Figure A-3

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 3

Sheet 1 of 1

Date(s) Drilled	**11/11/02**	Logged By	**S. Duke**	Checked By	**S.T. Freeman**
Drilling Method	**Hollow-Stem Auger**	Drill Bit Size/Type	**4-1/4-inch-ID, 8-inch-OD auger**	Total Depth of Borehole	**31.5 feet**
Drill Rig Type	**CME 85**	Drilling Contractor	**A & R Drilling**	Approximate Surface Elevation	**26 feet MSL**
Groundwater Level(s)	**30.5 feet bgs ATD**	Sampling Method	**Modified California lined with 2-inch-dia. brass tubes**	Hammer Data	**Downhole hammer; 140 lbs / 30-inch drop**
Borehole Backfill	**Drill cuttings (tamped)**	Location	**Refer to site plan**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
	0					**FILL** Dense, moist, brown, SILTY SAND (SM), fine- to medium-grained sand, some clay			
25			1	50					Composite of 1 and 2: GR = 14% SA = 59% FI = 27%
	5		2	39		Becomes dark reddish brown, with fine to coarse gravel-size fragments of sandstone and shale			
20			3	34		Coarse gravel-size sandstone fragment in sampler shoe Becomes medium dense			
			4	64		Becomes very dense			Composite of 4 and 5: GR = 12% SA = 62% FI = 26%
	10								
15			5	44		Becomes dense			
			6	37		Concreted sandstone cobble in sampler shoe			
	15		7	30		Medium dense to dense, moist, yellowish brown, SILTY SAND with GRAVEL (SM), fine gravel consists of sandstone and shale fragments			
10			8	40		Becomes brown, with some clay			Composite of 8 and 9: GR = 22% SA = 60% FI = 18% Gs = 2.73
			9	33					
	20					Cobble in sampler shoe Becomes dense, dark brown; increase in clay content			
5			10	60					
			11	48					
	25		12	43		Becomes light brown (in sampler tip)			
0			13	33		Becomes medium dense, dark brown			Composite of 13 and 14: GR = 18% SA = 44% FI = 38%
			14	35					
	30					▽			
-5			15	36		**BEACH DEPOSITS** Medium dense, wet, dark gray, CLAYEY SAND (SC), fine-grained sand			
	35					**Bottom of boring at 31.5 feet**			

Report: GP SOIL LOG; File: TLAGOON.GPJ; 12/20/2002

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Figure A-4

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 4

Sheet 1 of 1

Date(s) Drilled	**11/13/02**	Logged By	**S. Duke**	Checked By	**S.T. Freeman**
Drilling Method	**Hollow-Stem Auger**	Drill Bit Size/Type	**4-1/4-inch-ID, 8-inch-OD auger**	Total Depth of Borehole	**29.5 feet**
Drill Rig Type	**CME 85**	Drilling Contractor	**A & R Drilling**	Approximate Surface Elevation	**30 feet MSL**
Groundwater Level(s)	**Not encountered**	Sampling Method	**Modified California lined with 2-inch-dia. brass tubes**	Hammer Data	**Downhole hammer; 140 lbs / 30-inch drop**
Borehole Backfill	**Drill cuttings (tamped)**	Location	**Refer to site plan**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
30	0					Asphalt over gravel base course			
			1	50/5"		**FILL** Very dense, wet, dark bluish gray, SILTY GRAVEL with SAND (GM), fine to coarse gravel consists of sandstone fragments, fine- to medium-grained sand, sewage odor [Leach Field?]			Rig grinding.
25	5		2	67					Discrete Sample 2: GR = 42% SA = 40% FI = 18%
			3	50/4"		Very dense, wet, dark bluish gray, CLAYEY SAND with GRAVEL (SC), fine- to medium-grained sand, fine to coarse gravel consists of sandstone fragments; sewage odor [Leach Field?]			
			4	83		Increase in moisture content, decrease in fines content; becomes brownish red			
20	10		5	36		Becomes medium dense, dark bluish gray; increase in moisture content			
			6	50/1"		Bluish gray sandstone cobble in sampler shoe			
			7	36		Decrease in moisture content; decrease in sewage odor (possibly bottom edge of leach field)			Drill rig kicked to the side; may have encountered a boulder.
15	15		8	69		Becomes very dense, moist, dark yellowish brown; gravel consists of shale and sandstone fragments			
			9	28		Medium dense, moist, dark yellowish brown, SILTY SAND with GRAVEL (SM), fine to coarse gravel consists of sandstone and shale fragments			Discrete Sample 9: GR = 29% SA = 39% FI = 32% Gs = 2.68
10	20		10	50		Becomes dense; increase in gravel content			
			11	43		Becomes dark reddish brown to dark brown; decrease in fines and gravel content			Discrete Sample 11: GR = 28% SA = 45% FI = 27%
5	25		12	27		Medium dense, moist, dark yellowish brown, SILTY SAND (SM), fine-grained sand, few gravel-size sandstone fragments			
			13	32		Very stiff, moist, dark gray, FAT CLAY (CH)			
			14	30					
0	30					**Bottom of boring at 29.5 feet**			
-5	35								

Report: GP SOIL LOG; File: TLAGOON.GPJ; 12/20/2002

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Figure A-5

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 5

Sheet 1 of 1

Date(s) Drilled	**11/13/02**	Logged By	**S. Duke**	Checked By	**S.T. Freeman**
Drilling Method	**Hollow-Stem Auger**	Drill Bit Size/Type	**4-1/4-inch-ID, 8-inch-OD auger**	Total Depth of Borehole	**33.5 feet**
Drill Rig Type	**CME 85**	Drilling Contractor	**A & R Drilling**	Approximate Surface Elevation	**30 feet MSL**
Groundwater Level(s)	**27 feet bgs ATD**	Sampling Method	**Modified California lined with 2-inch-dia. brass tubes**	Hammer Data	**Downhole hammer; 140 lbs / 30-inch drop**
Borehole Backfill	**Drill cuttings (tamped)**	Location	**Refer to site plan**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
30	0					Asphalt over gravel base course			
						FILL Dense, moist, dark brown, SILTY SAND with GRAVEL (SM), fine- to medium-grained sand, fine to coarse gravel consists of sandstone and shale fragments			
			1	53					Discrete Sample 1: GR = 26% SA = 48% FI = 26%
						Becomes dense to very dense			
25	5		2	90					
			3	60					Composite of 3 and 4: GR = 18% SA = 51% FI = 31%
			4	80					
20	10					Increase in gravel content			
			5	50					
			6	69					Composite of 6 and 7: GR = 31% SA = 42% FI = 27% Gs = 2.73
15	15		7	42					
			8	50/3"		Strong, yellowish brown sandstone cobble in sampler shoe			
			9	51					
10	20					Becomes medium dense to dense; increase in gravel content			
			10	30					
			11	59					Composite of 11 and 12: GR = 34% SA = 42% FI = 24%
5	25		12	29					
			13	15		Becomes wet ▽			
			14	10		**BEACH DEPOSITS** Loose, wet, dark bluish gray, SILTY SAND (SM), fine- to medium-grained sand			
0	30					Becomes medium dense			
			15	22					
						Becomes dense, with some gravel			
			16	41					
-5	35					**Bottom of boring at 33.5 feet**			

Report: GP SOIL LOG; File: TLAGOON.GPJ; 12/20/2002

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Figure A-6

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 6

Sheet 1 of 1

Date(s) Drilled	**11/13/02**	Logged By	**S. Duke**	Checked By	**S.T. Freeman**
Drilling Method	**Hollow-Stem Auger**	Drill Bit Size/Type	**4-1/4-inch-ID, 8-inch-OD auger**	Total Depth of Borehole	**19.5 feet**
Drill Rig Type	**CME 85**	Drilling Contractor	**A & R Drilling**	Approximate Surface Elevation	**34 feet MSL**
Groundwater Level(s)	**Not encountered**	Sampling Method	**Modified California lined with 2-inch-dia. brass tubes**	Hammer Data	**Downhole hammer; 140 lbs / 30-inch drop**
Borehole Backfill	**Drill cuttings (tamped)**	Location	**Refer to site plan**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
	0					Asphalt over gravel base course			
						FILL Dense to very dense, moist, dark brown, SILTY SAND with GRAVEL (SM), fine- to medium-grained sand, fine to coarse gravel consists of shale and sandstone fragments			Composite of 1 and 2: GR = 17% SA = 50% FI = 33% Gs = 2.74
30			1	60					
	5		2	50/4"					
			3	50/3"		←Strong, yellowish brown sandstone cobble in sampler shoe			
25			4	90					
	10		5	50/5"					
			6	74					
20			7	41		Dense, moist, reddish brown, SILTY SAND (SM), fine- to medium-grained sand, some clay, few gravel			Discrete Sample 7: GR = 8% SA = 65% FI = 27%
	15		8	40		Dense, moist, brown, CLAYEY SAND with GRAVEL (SC), fine- to medium-grained sand, fine to coarse gravel consists of shale and sandstone fragments			
15			9	36					
	20					**Bottom of boring at 19.5 feet**			
10	25								
5	30								
0	35								

Report: GP SOIL LOG; File: TLAGOON.GPJ; 12/20/2002

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Figure A-7

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 7

Sheet 1 of 1

Date(s) Drilled	**11/11/02**	Logged By	**S. Duke**	Checked By	**S.T. Freeman**
Drilling Method	**Hollow-Stem Auger**	Drill Bit Size/Type	**4-1/4-inch-ID, 8-inch-OD auger**	Total Depth of Borehole	**30.9 feet**
Drill Rig Type	**CME 85**	Drilling Contractor	**A & R Drilling**	Approximate Surface Elevation	**30 feet MSL**
Groundwater Level(s)	**25 feet bgs ATD**	Sampling Method	**Modified California lined with 2-inch-dia. brass tubes**	Hammer Data	**Downhole hammer; 140 lbs / 30-inch drop**
Borehole Backfill	**Drill cuttings (tamped)**	Location	**Refer to site plan**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
30	0					Asphalt over gravel base course			
						FILL Medium dense, moist, brown, SILTY to CLAYEY SAND (SM/SC), fine- to medium-grained sand			
			1	38					
						Becomes dark brown; increase in fines content, with few fine gravel-size fragments of shale/claystone and sandstone			
25	5		2	37					
						Becomes dense to very dense			
			3	66					No recovery at 6 ft. Start using catcher on samplers.
			4	50					Composite of 4 and 5: GR = 14% SA = 49% FI = 37%
20	10					Becomes very dense; decrease in fines content			
			5	76					
			6	83/10"		Hard, moist, dark reddish brown, SILTY CLAY (CL), trace fine-grained sand			
			7	50/4"		Dense to very dense, moist, yellowish brown, SILTY to CLAYEY SAND with GRAVEL (SM/SC), fine- to medium-grained sand, fine to coarse gravel consists of hard sandstone			Composite of 7 and 8: GR = 19% SA = 47% FI = 34%
15	15					With fine to coarse gravel-size fragments of shale and sandstone			
			8	65					
						Becomes dark brown; increase in clay content			
			9	57					Composite of 9 and 10: GR = 23% SA = 42% FI = 35% Gs = 2.73
10	20					Becomes brown; decrease in fines content			
			10	69					
						Becomes dense			
			11	42		Sandstone cobble in sampler shoe			
			12	54		**BEACH DEPOSITS** ▽ Dense, wet, dark gray, CLAYEY SAND (SC), fine-grained sand			
5	25					Dense, wet, gray, SILTY SAND (SM), fine- to medium-grained sand, few gravel			Composite of 13 and 14: GR = 14% SA = 73% FI = 13%
			13	50					
						Becomes medium dense			
			14	25					
0	30					Increase in gravel content			
			15	50/4"					
						Bottom of boring at 30.9 feet			
-5	35								

Report: GP SOIL LOG; File: TLAGOON.GPJ; 12/20/2002

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Figure A-8

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 7A

Sheet 1 of 1

Date(s) Drilled	**11/11/02**	Logged By	**S. Duke**	Checked By	**S.T. Freeman**
Drilling Method	**Hollow-Stem Auger**	Drill Bit Size/Type	**4-1/4-inch-ID, 8-inch-OD auger**	Total Depth of Borehole	**27.5 feet**
Drill Rig Type	**CME 85**	Drilling Contractor	**A & R Drilling**	Approximate Surface Elevation	**30 feet MSL**
Groundwater Level(s)	**26 feet bgs ATD**	Sampling Method	**Modified California lined with 2-inch-dia. brass tubes**	Hammer Data	**Downhole hammer; 140 lbs / 30-inch drop**
Borehole Backfill	**Drill cuttings (tamped)**	Location	**Refer to site plan**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
30	0					Asphalt over gravel base course			
						FILL Dense to very dense, moist, dark brown, SILTY to CLAYEY SAND (SM/SC), fine- to medium-grained sand, few fine to coarse gravel-size fragments of shale/claystone and sandstone			
			1	72					Composite of 1 and 2: GR = 12% SA = 54% FI = 34%
25	5		2	60					
						Increase in gravel content			
			3	73					Composite of 3 and 4: GR = 16% SA = 50% FI = 34%
			4	57					
20	10					Hard, moist, dark reddish brown, SILTY CLAY (CL), some fine gravel-size fragments of shale and sandstone			
			5	46					
						Very dense, moist, yellowish brown, SILTY to CLAYEY SAND with GRAVEL (SM/SC), fine- to medium-grained sand, fine to coarse sandstone gravel			
			6	79					Composite of 6 and 7: GR = 20% SA = 49% FI = 31% Gs = 2.72
						Very strong sandstone cobble in sampler shoe			
15	15		7	91					
						Becomes dense, dark brown; increase in clay content			
			8	47					Drilling becomes more difficult; possibly binding on siltstone/claystone.
			9	38					
10	20		10	48					Composite of 10 and 11: GR = 31% SA = 45% FI = 24%
			11	42					
5	25		12	38		**BEACH DEPOSITS** Medium dense, moist, gray, POORLY GRADED SAND with SILT (SP-SM), fine- to medium-grained sand ▽			
			13	29		Medium dense, wet, dark gray, CLAYEY SAND (SC), fine-grained sand			
0	30					**Bottom of boring at 27.5 feet**			
-5	35								

Report: GP SOIL LOG; File: TLAGOON.GPJ; 12/20/2002

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Figure A-9

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 8

Sheet 1 of 2

Date(s) Drilled	**11/12/02**	Logged By	**S. Duke**	Checked By	**S.T. Freeman**
Drilling Method	**Hollow-Stem Auger**	Drill Bit Size/Type	**4-1/4-inch-ID, 8-inch-OD auger**	Total Depth of Borehole	**35.5 feet**
Drill Rig Type	**CME 85**	Drilling Contractor	**A & R Drilling**	Approximate Surface Elevation	**31 feet MSL**
Groundwater Level(s)	**26 feet bgs ATD**	Sampling Method	**Modified California lined with 2-inch-dia. brass tubes**	Hammer Data	**Downhole hammer; 140 lbs / 30-inch drop**
Borehole Backfill	**Drill cuttings (tamped)**	Location	**Refer to site plan**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
	0					Asphalt over gravel base course			
30						**FILL** Dense to very dense, moist, dark brown, SILTY to CLAYEY SAND with GRAVEL (SM/SC), fine- to medium-grained sand, fine gravel consists of sandstone and shale fragments			Composite of 1 and 2: GR = 24% SA = 45% FI = 31%
			1	61					
	5		2	67					
25			3	23		Medium dense, moist, yellowish brown, SILTY SAND with GRAVEL (SM), fine to coarse gravel consists of sandstone fragments			
			4	42		Dense, moist, dark reddish brown, SILTY to CLAYEY SAND (SM/SC), fine-grained sand, few fine gravel-size shale fragments			Composite of 4 and 5: GR = 12% SA = 50% FI = 38%
	10					Becomes very dense			
20			5	78					
			6	50/2"		Very dense, moist, yellowish brown, SILTY SAND with GRAVEL (SM), fine-grained sand, fine to coarse gravel consists of sandstone fragments			
			7	50/5"		Dense to very dense, moist, brown, SILTY to CLAYEY SAND with GRAVEL (SM/SC), fine-grained sand, fine to coarse gravel consists of shale and sandstone fragments			
	15					Decrease in gravel size and content			
15			8	44					Discrete Sample 8: GR = 27% SA = 42% FI = 31% Driller skipped sample at 18 ft.
	20					Increase in gravel size and content			
10			9	69/11"					
			10	50/4"					
						Becomes medium dense, dark brown; decrease in gravel content			
	25		11	37					
5						▽			
			12	46		**BEACH DEPOSITS** Dense, wet, bluish gray, SILTY to CLAYEY SAND (SM/SC), fine- to medium-grained sand, few fine gravel			Discrete Sample 12: GR = 12% SA = 71% FI = 17% Gs = 2.71
			13	45		Increase in gravel content			
	30					Becomes dense to very dense			
0			14	80					
			15	49		Coarse gravel in sampler shoe			
	35		16	44					

Report: GP SOIL LOG; File: TLAGOON.GPJ; 12/20/2002

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Figure A-10

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 8

Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
	35		16	44		**BEACH DEPOSITS** (continued) Dense, wet, bluish gray, SILTY to CLAYEY SAND with GRAVEL (SM/SC) **Bottom of boring at 35.5 feet**			
-5									
	40								
-10									
	45								
-15									
	50								
-20									
	55								
-25									
	60								
-30									
	65								
-35									
	70								
-40									
	75								

Report: GP SOIL LOG; File: TLAGOON.GPJ; 12/20/2002

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Figure A-10

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 9

Sheet 1 of 1

Date(s) Drilled	**11/12/02**	Logged By	**S. Duke**	Checked By	**S.T. Freeman**
Drilling Method	**Hollow-Stem Auger**	Drill Bit Size/Type	**4-1/4-inch-ID, 8-inch-OD auger**	Total Depth of Borehole	**21.5 feet**
Drill Rig Type	**CME 85**	Drilling Contractor	**A & R Drilling**	Approximate Surface Elevation	**31 feet MSL**
Groundwater Level(s)	**Not encountered**	Sampling Method	**Modified California lined with 2-inch-dia. brass tubes**	Hammer Data	**Downhole hammer; 140 lbs / 30-inch drop**
Borehole Backfill	**Drill cuttings (tamped)**	Location	**Refer to site plan**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
	0					Asphalt over gravel base course			
30						**FILL** Dense, moist, dark brown, SILTY to CLAYEY SAND with GRAVEL (SM/SC), fine- to medium-grained sand, fine to coarse gravel consists of shale and sandstone fragments			
			1	46					Composite of 1 and 2: GR = 20% SA = 46% FI = 34% Gs = 2.73
	5		2	48					
25			3	63		Becomes dark yellowish brown; decrease in clay content			
			4	28		Becomes medium dense, dark brown; increase in clay content			Discrete Sample 4: GR = 15% SA = 55% FI = 30%
	10					Becomes dense, light brown; decrease in clay content			
20			5	62					Composite of 5 and 6: GR = 31% SA = 35% FI = 34%
			6	55					
			7	50/3"		Becomes very dense; increase in gravel content			Drilling becomes more difficult.
	15								
15			8	50/5"		Very strong, bluish gray sandstone cobble in sampler shoe			
			9	50/3"		Becomes dark brown			Composite of 9 and 10: GR = 35% SA = 40% FI = 25%
	20								
10			10	76					
						Bottom of boring at 21.5 feet			
	25								
5									
	30								
0									
	35								

Report: GP SOIL LOG; File: TLAGOON.GPJ; 12/20/2002

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 10

Sheet 1 of 1

Date(s) Drilled	**11/12/02**	Logged By	**S. Duke**	Checked By	**S.T. Freeman**
Drilling Method	**Hollow-Stem Auger**	Drill Bit Size/Type	**4-1/4-inch-ID, 8-inch-OD auger**	Total Depth of Borehole	**33.5 feet**
Drill Rig Type	**CME 85**	Drilling Contractor	**A & R Drilling**	Approximate Surface Elevation	**35 feet MSL**
Groundwater Level(s)	**31.5 feet bgs ATD**	Sampling Method	**Modified California lined with 2-inch-dia. brass tubes**	Hammer Data	**Downhole hammer; 140 lbs / 30-inch drop**
Borehole Backfill	**Drill cuttings (tamped)**	Location	**Refer to site plan**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
35	0					Coarse gravel road fill			
						FILL Very dense, moist, dark brown, SILTY to CLAYEY SAND with GRAVEL (SM/SC), fine- to medium-grained sand, fine to coarse gravel consists of sandstone and shale fragments			
			1	73					Composite of 1 and 2: GR = 20% SA = 45% FI = 35%
30	5		2	50/5"		← Very strong, bluish gray cobble in sampler shoe			
			3	50/4"					No recovery at 6 ft.
			4	82					
25	10		5	50/5"					
						Dense, moist, yellowish brown, SILTY to CLAYEY SAND (SM/SC), fine- to medium-grained sand, few fine to coarse gravel-size fragments of sandstone and shale			
			6	60					Composite of 6 and 7: GR = 10% SA = 50% FI = 40%
						← Shell fragments (in sampler tip) Becomes mostly reddish brown			
20	15		7	40					
						Becomes dark brown; increase in fines content			
			8	60					
						Becomes medium dense			
			9	38					
15	20					Medium dense to dense, moist, dark brown, SILTY to CLAYEY SAND with GRAVEL (SM/SC), fine- to medium-grained sand, fine to coarse gravel consists of shale and sandstone fragments			Composite of 10 and 11: GR = 39% SA = 39% FI = 22%
			10	30					
			11	42					
						Becomes dense to very dense, dark gray, with dark gray shale fragments			
10	25		12	53					
						Becomes dark brown			
			13	50/3"					Composite of 13 and 14: GR = 35% SA = 41% FI = 24%
						Becomes medium dense, yellowish brown, with yellowish brown sandstone fragments			
			14	38					
5	30					**BEACH DEPOSITS** Dense, moist, brown, SILTY SAND (SM), fine- to medium-grained sand, few fine gravel-size shale fragments; wet below 31.5 feet ▽			
			15	50					
			16	53					
						Bottom of boring at 33.5 feet			
0	35								

Report: GP SOIL LOG; File: TLAGOON.GPJ; 12/20/2002

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Figure A-12

17781 Cowan , Suite 150, Irvine, CA 92614 Tel.No. (949) 253-5922 Fax. No. (949) 724-1557

Project Name: Topanga Lagoon **Teratest No.:** 015297

Project No.: 02006A **Tabulated By:** LF

Client: GeoPentech **Date:** 12/06/02

TABLE 1

SUMMARY of LABORATORY TEST RESULTS

Boring No.	Sample No.	Depth (ft)	Particle-Size Distribution ASTM D 422 GR:SA:FI² (%)	Specific Gravity³ ASTM D 854	Soil Classification ASTM D 2487 (group symbol)
1	1 & 2	2 - 5.5	35:34:31		(GM)s
1	5 & 6	10 - 13.5	20:46:34	2.80	(SM/SC)g
1	8 & 9	16 - 19	29:43:28		(SC)g
1	10 & 11	20 - 23.5	57:29:14	2.73	(GM/GC)s
2	1 & 2	2 - 5.5	21:49:30	2.72	(SM/SC)g
2	5 & 6	10 - 13.5	23:49:28		(SM/SC)g
2	8 & 9	16 - 19.5	33:39:28		(SM/SC)g
2	11 & 12	22 - 25.5	11:53:36	2.72	SM
3	1 & 2	2 - 5.5	14:59:27		SM
3	4 & 5	8 - 11.5	12:62:26		SM
3	8 & 9	16 - 19.5	22:60:18	2.73	(SM)g
3	13 & 14	26 - 29.5	18:44:38		(SM)g
4	2	4 - 5.5	42:40:18		(GM)s
4	9	18 - 19.5	29:39:32	2.68	(SM)g
4	11	22 - 23.5	28:45:27		(SM)g
5	1	2 - 3.5	26:48:26		(SM)g
5	3 & 4	6 - 9.5	18:51:31		(SM)g
5	6 & 7	12 - 15.5	31:42:27	2.73	(SM)g
5	11 & 12	22 - 25.5	34:42:24		(SM)g
6	1 & 2	2 - 5	17:50:33	2.74	(SM)g
6	7	14 - 15.5	8:65:27		SM

² GR:SA:FI = Gravel: Sand: Fines (Percent Passing #200 Sieve)

³ Material Passing the #4 Sieve

17781 Cowan , Suite 150, Irvine, CA 92614 Tel.No. (949) 253-5922 Fax. No. (949) 724-1557

Project Name: Topanga Lagoon **Teratest No.:** 015297

Project No.: 02006A **Tabulated By:** LF

Client: GeoPentech **Date:** 12/06/02

TABLE 1 cont'd

SUMMARY of LABORATORY TEST RESULTS

Boring No.	Sample No.	Depth (ft)	Particle-Size Distribution ASTM D 422 GR:SA:FI[2] (%)	Specific Gravity[3] ASTM D 854	Soil Classification ASTM D 2487 (group symbol)
7	4 & 5	8 - 11.5	14:49:37		SM/SC
7	7 & 8	14 - 17.5	19:47:34		(SM/SC)g
7	9 & 10	18 - 21.5	23:42:35	2.73	(SM/SC)g
7	13 & 14	26 - 29.5	14:73:13		SM
7a	1 & 2	2 - 5.5	12:54:34		SM/SC
7a	3 & 4	6 - 9.5	16:50:34		(SM/SC)g
7a	6 & 7	12 - 15.5	20:49:31	2.72	(SM/SC)g
7a	10 & 11	20 - 23.5	31:45:24		(SM/SC)g
8	1 & 2	2 - 5.5	24:45:31		(SM/SC)g
8	4 & 5	8 - 11.5	12:50:38		SM/SC
8	8	16 - 17.5	27:42:31		(SM/SC)g
8	12	26 - 27.5	12:71:17	2.71	SM/SC
9	1 & 2	2 - 5.5	20:46:34	2.73	(SM/SC)g
9	4	8 - 9.5	15:55:30		(SM/SC)g
9	5 & 6	10 - 13.5	31:35:34		(SM/SC)g
9	9 & 10	18 - 21.5	35:40:25		(SM/SC)g
10	1 & 2	2 - 5	20:45:35		(SM/SC)g
10	6 & 7	12 - 15.5	10:50:40		SM/SC
10	10 & 11	20 - 23.5	39:39:22		(SM/SC)g
10	13 & 14	26 - 29.5	35:41:24		(SM/SC)g

[2] GR:SA:FI = Gravel: Sand: Fines (Percent Passing #200 Sieve)

[3] Material Passing the #4 Sieve

Teratest Labs, Inc.

Calscience
Environmental
Laboratories, Inc.

December 6, 2002
S0212330

Steve Duke
Geopentech
601 N. Parkcenter Dr., Ste. 110
Santa Ana, CA 92705-3552

Subject: Topanga Lagoon
Calscience Work Order No. 02-11-1018

Dear Mr. Duke:

Calscience Environmental Laboratories, Inc. (Calscience) is pleased to submit this analytical report for the subject project. I have provided below a narrative of our effort, indicating any unique features or anomalies encountered as part of the analysis of the marine sediment samples.

Sample Condition on Receipt

Five marine sediment samples were received for this project on November 18, 2002. Each sample was comprised of three or four brass sleeves, which required compositing prior to analysis.

All samples were transferred to the laboratory in an ice-chest with wet ice, following strict chain-of-custody procedures. The temperature of the samples upon receipt at the laboratory was 2°C. The samples were logged into the Laboratory Information Management System (LIMS), given laboratory identification numbers, and stored in refrigeration units pending analysis. Testing was performed in accordance with the chain-of-custody instructions. An aliquot of each sample was forwarded to CRG Marine Laboratories for tributyltin analysis.

Data Summary

Holding times

All holding time requirements were met.

Calibration

Frequency and control criteria for initial and continuing calibration verifications were met.

Blanks

Concentrations of target analytes in the method blanks were found to be below detection limits for all analyses.

Laboratory Control Samples

Laboratory Control Sample analyses were performed for each applicable method at the required frequencies. All parameters were within control limits for each method.

Matrix Spikes

Matrix spike analyses were performed at required frequencies. All recoveries were within acceptable limits, with the exception of metals. For the metals, the matrix spike (MS) recoveries were out-of-control slightly high for cadmium, lead, and silver, and matrix spike duplicate (MSD) recoveries were slightly low for copper, selenium, and zinc. However, the LCS/LCSD recoveries were within control limits, and thus a matrix interference effect is apparent. Therefore, the data is released with no further corrective action.

Surrogates

Surrogate recoveries for all samples were within acceptable control limits.

Please contact the undersigned if there are any questions regarding this report.

Sincerely,

Calscience Environmental
Laboratories, Inc.
Robert J. Stearns
Director

Michael J. Crisostomo
Quality Assurance Manager

Calscience
Environmental
Laboratories, Inc.

Project Number: 02-11-1018

Geopentech
Topanga Lagoon

Summary Data Sheet
(All values based on dry weight unless noted otherwise)

Parameter	Method	1(14' to 15.5')	4(8' to 11.5')	6(12' to 13.5')
Physical/Conventional Tests				
Total Solids (TS), % [1]	EPA 160.3	89.7	89.2	92.0
Total Sulfides, mg/kg	EPA 376.2M	ND<0.11	ND<0.11	ND<0.11
Soluble Sulfides, mg/kg	EPA 376.2M	ND<0.11	ND<0.11	ND<0.11
Ammonia-N, mg/kg	EPA 350.2M	ND<0.56	55	0.98
TRPH, mg/kg	EPA 418.1	82	32	62
Total Organic Carbon, mg/kg	EPA 9060	620	100	290
pH, pH units	EPA 9045C	7.59	8.51	8.55
Metals, mg/kg				
Arsenic	EPA 6020	16.0	3.57	5.84
Cadmium	EPA 6020	0.175	ND<0.112	0.169
Chromium (total)	EPA 6020	43.4	5.88	25.4
Copper	EPA 6020	21.6	16.9	16.9
Lead	EPA 6020	15.4	4.52	8.64
Nickel	EPA 6020	44.7	5.95	18.8
Selenium	EPA 6020	0.971	ND<0.561	ND<0.543
Silver	EPA 6020	0.286	0.118	0.123
Zinc	EPA 6020	70.9	30.7	47.9
Mercury	EPA 7471A	0.876	ND<0.023	0.324
Pesticides, ug/kg				
4,4'-DDD	EPA 8081A	ND<1.1	ND<1.1	ND<1.1
4,4'-DDE	EPA 8081A	ND<1.1	ND<1.1	ND<1.1
4,4'-DDT	EPA 8081A	ND<1.1	ND<1.1	ND<1.1
Aldrin	EPA 8081A	ND<1.1	ND<1.1	ND<1.1
Alpha-BHC	EPA 8081A	ND<1.1	ND<1.1	ND<1.1
Beta-BHC	EPA 8081A	ND<1.1	ND<1.1	ND<1.1
Chlordane	EPA 8081A	ND<11	ND<11	ND<11
Delta-BHC	EPA 8081A	ND<1.1	ND<1.1	ND<1.1
Dieldrin	EPA 8081A	ND<1.1	ND<1.1	ND<1.1
Endosulfan I	EPA 8081A	ND<1.1	ND<1.1	ND<1.1
Endosulfan II	EPA 8081A	ND<1.1	ND<1.1	ND<1.1
Endosulfan Sulfate	EPA 8081A	ND<1.1	ND<1.1	ND<1.1
Endrin	EPA 8081A	ND<1.1	ND<1.1	ND<1.1
Endrin Aldehyde	EPA 8081A	ND<1.1	ND<1.1	ND<1.1
Endrin Ketone	EPA 8081A	ND<1.1	ND<1.1	ND<1.1
Gamma-BHC	EPA 8081A	ND<1.1	ND<1.1	ND<1.1
Heptachlor	EPA 8081A	ND<1.1	ND<1.1	ND<1.1
Heptachlor Epoxide	EPA 8081A	ND<1.1	ND<1.1	ND<1.1
Methoxychlor	EPA 8081A	ND<1.1	ND<1.1	ND<1.1
Toxaphene	EPA 8081A	ND<22	ND<22	ND<22
Total Pesticides	EPA 8081A	ND<22	ND<22	ND<22

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Geopentech
Topanga Lagoon

Summary Data Sheet
(All values based on dry weight unless noted otherwise)

Parameter	Method	1(14' to 15.5')	4(8' to 11.5')	6(12' to 13.5')
PCBs, ug/kg				
Aroclor 1016	EPA 8082	ND<11	ND<11	ND<11
Aroclor 1221	EPA 8082	ND<11	ND<11	ND<11
Aroclor 1232	EPA 8082	ND<11	ND<11	ND<11
Aroclor 1242	EPA 8082	ND<11	ND<11	ND<11
Aroclor 1248	EPA 8082	ND<11	ND<11	ND<11
Aroclor 1254	EPA 8082	ND<11	ND<11	ND<11
Aroclor 1260	EPA 8082	ND<11	ND<11	ND<11
Aroclor 1262	EPA 8082	ND<11	ND<11	ND<11
Semi-Volatile Organics, ug/kg				
2,4,5-Trichlorophenol	EPA 8270C	ND<22	ND<11	ND<11
2,4,6-Trichlorophenol	EPA 8270C	ND<22	ND<11	ND<11
2,4-Dichlorophenol	EPA 8270C	ND<22	ND<11	ND<11
2,4-Dimethylphenol	EPA 8270C	ND<22	ND<11	ND<11
2,4-Dinitrophenol	EPA 8270C	ND<110	ND<56	ND<54
2-Chlorophenol	EPA 8270C	ND<22	ND<11	ND<11
2-Methylphenol	EPA 8270C	ND<22	ND<11	ND<11
2-Nitrophenol	EPA 8270C	ND<22	ND<11	ND<11
3/4-Methylphenol	EPA 8270C	ND<22	ND<11	ND<11
4-Chloro-3-Methylphenol	EPA 8270C	ND<22	ND<11	ND<11
4-Nitrophenol	EPA 8270C	ND<22	ND<11	ND<11
4,6-Dinitro-2-Methylphenol	EPA 8270C	ND<110	ND<56	ND<54
Pentachlorophenol	EPA 8270C	ND<110	ND<56	ND<54
Phenol	EPA 8270C	ND<22	ND<11	ND<11
Total Phenols	EPA 8270C	ND<110	ND<56	ND<54
Dimethyl Phthalate	EPA 8270C	ND<22	ND<11	ND<11
Diethyl Phthalate	EPA 8270C	ND<22	ND<11	ND<11
Di-n-Butyl Phthalate	EPA 8270C	ND<22	ND<11	ND<11
Butyl Benzyl Phthalate	EPA 8270C	ND<22	ND<11	ND<11
Bis(2-Ethylhexyl) Phthalate	EPA 8270C	ND<22	14	ND<11
Di-n-Octyl-Phthalate	EPA 8270C	ND<22	ND<11	ND<11
Total Phthalates	EPA 8270C	ND<22	14	ND<11

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Geopentech
Topanga Lagoon

Summary Data Sheet
(All values based on dry weight unless noted otherwise)

Parameter	Method	1(14' to 15.5')	4(8' to 11.5')	6(12' to 13.5')
Semi-Volatile Organics, ug/kg				
Napththalene	EPA 8270C	ND<18	ND<9.0	ND<8.6
Acenaphthylene	EPA 8270C	ND<18	ND<9.0	ND<8.6
Acenaphthene	EPA 8270C	ND<18	ND<9.0	ND<8.6
Fluorene	EPA 8270C	ND<18	ND<9.0	ND<8.6
Phenanthrene	EPA 8270C	120	ND<9.0	ND<8.6
Anthracene	EPA 8270C	ND<18	ND<9.0	ND<8.6
Fluoranthene	EPA 8270C	22	ND<9.0	ND<8.6
Pyrene	EPA 8270C	62	ND<9.0	ND<8.6
Benzo(a)anthracene	EPA 8270C	23	ND<9.0	ND<8.6
Chrysene	EPA 8270C	110	ND<9.0	ND<8.6
Benzo(b)fluoranthene	EPA 8270C	38	ND<9.0	ND<8.6
Benzo(k)fluoranthene	EPA 8270C	ND<18	ND<9.0	ND<8.6
Benzo(a)pyrene	EPA 8270C	ND<16	ND<7.9	ND<7.5
Indeno(1,2,3-cd)pyrene	EPA 8270C	ND<18	ND<9.0	ND<8.6
Dibenz(a,h)anthracene	EPA 8270C	ND<18	ND<9.0	ND<8.6
Benzo(g,h,i) perylene	EPA 8270C	21	ND<9.0	ND<8.6
Total PAHs	EPA 8270C	396	ND<9.0	ND<8.6

Notes:
NA = Not applicable
ND = Not detected at indicated reporting limit.
1. Reporting limit is based on wet weight.

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Geopentech
Topanga Lagoon

Summary Data Sheet

(All values based on dry weight unless noted otherwise)

Parameter	Method	7(2' to 5.5')	10(16' to 17.5')	Method Blank [1]
Physical/Conventional Tests				
Total Solids (TS), % [1]	EPA 160.3	94.4	92.5	NA
Total Sulfides, mg/kg	EPA 376.2M	ND<0.11	ND<0.11	ND<0.10
Soluble Sulfides, mg/kg	EPA 376.2M	ND<0.11	ND<0.11	ND<0.10
Ammonia-N, mg/kg	EPA 350.2M	ND<0.53	ND<0.54	ND<0.50
TRPH, mg/kg	EPA 418.1	62	47	ND<10
Total Organic Carbon, mg/kg	EPA 9060	480	190	ND<40
pH, pH units	EPA 9045C	7.92	7.83	NA
Metals, mg/kg				
Arsenic	EPA 6020	4.1	4.13	ND<0.200
Cadmium	EPA 6020	0.339	ND<0.108	ND<0.100
Chromium (total)	EPA 6020	25.9	15.6	ND<0.100
Copper	EPA 6020	23.2	13.2	ND<0.100
Lead	EPA 6020	10.8	7.42	ND<0.100
Nickel	EPA 6020	28.2	12.3	ND<0.100
Selenium	EPA 6020	ND<0.530	ND<0.541	ND<0.500
Silver	EPA 6020	0.132	0.148	ND<0.100
Zinc	EPA 6020	47.9	46.1	ND<1.00
Mercury	EPA 7471A	0.172	0.245	ND<0.020
Pesticides, ug/kg				
4,4'-DDD	EPA 8081A	ND<1.1	ND<1.1	ND<1.0
4,4'-DDE	EPA 8081A	ND<1.1	ND<1.1	ND<1.0
4,4'-DDT	EPA 8081A	ND<1.1	ND<1.1	ND<1.0
Aldrin	EPA 8081A	ND<1.1	ND<1.1	ND<1.0
Alpha-BHC	EPA 8081A	ND<1.1	ND<1.1	ND<1.0
Beta-BHC	EPA 8081A	ND<1.1	ND<1.1	ND<1.0
Chlordane	EPA 8081A	ND<11	ND<11	ND<10
Delta-BHC	EPA 8081A	ND<1.1	ND<1.1	ND<1.0
Dieldrin	EPA 8081A	ND<1.1	ND<1.1	ND<1.0
Endosulfan I	EPA 8081A	ND<1.1	ND<1.1	ND<1.0
Endosulfan II	EPA 8081A	ND<1.1	ND<1.1	ND<1.0
Endosulfan Sulfate	EPA 8081A	ND<1.1	ND<1.1	ND<1.0
Endrin	EPA 8081A	ND<1.1	ND<1.1	ND<1.0
Endrin Aldehyde	EPA 8081A	ND<1.1	ND<1.1	ND<1.0
Endrin Ketone	EPA 8081A	ND<1.1	ND<1.1	ND<1.0
Gamma-BHC	EPA 8081A	ND<1.1	ND<1.1	ND<1.0
Heptachlor	EPA 8081A	ND<1.1	ND<1.1	ND<1.0
Heptachlor Epoxide	EPA 8081A	ND<1.1	ND<1.1	ND<1.0
Methoxychlor	EPA 8081A	ND<1.1	ND<1.1	ND<1.0
Toxaphene	EPA 8081A	ND<22	ND<22	ND<20
Total Pesticides	EPA 8081A	ND<22	ND<22	ND<20

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Geopentech
Topanga Lagoon

Summary Data Sheet
(All values based on dry weight unless noted otherwise)

Parameter	Method	7(2' to 5.5')	10(16' to 17.5')	Method Blank [1]
PCBs, ug/kg				
Aroclor 1016	EPA 8082	ND<11	ND<11	ND<11
Aroclor 1221	EPA 8082	ND<11	ND<11	ND<11
Aroclor 1232	EPA 8082	ND<11	ND<11	ND<11
Aroclor 1242	EPA 8082	ND<11	ND<11	ND<11
Aroclor 1248	EPA 8082	ND<11	ND<11	ND<11
Aroclor 1254	EPA 8082	ND<11	ND<11	ND<11
Aroclor 1260	EPA 8082	ND<11	ND<11	ND<11
Aroclor 1262	EPA 8082	ND<11	ND<11	ND<11
Semi-Volatile Organics, ug/kg				
2,4,5-Trichlorophenol	EPA 8270C	ND<21	ND<11	ND<10
2,4,6-Trichlorophenol	EPA 8270C	ND<21	ND<11	ND<10
2,4-Dichlorophenol	EPA 8270C	ND<21	ND<11	ND<10
2,4-Dimethylphenol	EPA 8270C	ND<21	ND<11	ND<10
2,4-Dinitrophenol	EPA 8270C	ND<110	ND<54	ND<50
2-Chlorophenol	EPA 8270C	ND<21	ND<11	ND<10
2-Methylphenol	EPA 8270C	ND<21	ND<11	ND<10
2-Nitrophenol	EPA 8270C	ND<21	ND<11	ND<10
3/4-Methylphenol	EPA 8270C	ND<21	ND<11	ND<10
4-Chloro-3-Methylphenol	EPA 8270C	ND<21	ND<11	ND<10
4-Nitrophenol	EPA 8270C	ND<21	ND<11	ND<10
4,6-Dinitro-2-Methylphenol	EPA 8270C	ND<110	ND<54	ND<50
Pentachlorophenol	EPA 8270C	ND<110	ND<54	ND<50
Phenol	EPA 8270C	ND<21	ND<11	ND<10
Total Phenols	EPA 8270C	ND<110	ND<54	ND<50
Dimethyl Phthalate	EPA 8270C	ND<21	ND<11	ND<10
Diethyl Phthalate	EPA 8270C	ND<21	ND<11	ND<10
Di-n-Butyl Phthalate	EPA 8270C	ND<21	ND<11	ND<10
Butyl Benzyl Phthalate	EPA 8270C	ND<21	ND<11	ND<10
Bis(2-Ethylhexyl) Phthalate	EPA 8270C	ND<21	16	ND<10
Di-n-Octyl-Phthalate	EPA 8270C	ND<21	ND<11	ND<10
Total Phthalates	EPA 8270C	ND<21	16	ND<10

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Geopentech
Topanga Lagoon

Summary Data Sheet
(All values based on dry weight unless noted otherwise)

Parameter	Method	7(2' to 5.5')	10(16' to 17.5')	Method Blank [1]
Semi-Volatile Organics, ug/kg				
Napththalene	EPA 8270C	ND<17	ND<8.6	ND<8.0
Acenaphthylene	EPA 8270C	ND<17	ND<8.6	ND<8.0
Acenaphthene	EPA 8270C	ND<17	ND<8.6	ND<8.0
Fluorene	EPA 8270C	ND<17	ND<8.6	ND<8.0
Phenanthrene	EPA 8270C	ND<17	20	ND<8.0
Anthracene	EPA 8270C	ND<17	ND<8.6	ND<8.0
Fluoranthene	EPA 8270C	ND<17	ND<8.6	ND<8.0
Pyrene	EPA 8270C	ND<17	ND<8.6	ND<8.0
Benzo(a)anthracene	EPA 8270C	ND<17	ND<8.6	ND<8.0
Chrysene	EPA 8270C	ND<17	9	ND<8.0
Benzo(b)fluoranthene	EPA 8270C	ND<17	ND<8.6	ND<8.0
Benzo(k)fluoranthene	EPA 8270C	ND<17	ND<8.6	ND<8.0
Benzo(a)pyrene	EPA 8270C	ND<15	ND<7.5	ND<7.0
Indeno(1,2,3-cd)pyrene	EPA 8270C	ND<17	ND<8.6	ND<8.0
Dibenz(a,h)anthracene	EPA 8270C	ND<17	ND<8.6	ND<8.0
Benzo(g,h,i) perylene	EPA 8270C	ND<17	ND<8.6	ND<8.0
Total PAHs	EPA 8270C	ND<17	29	ND<8.0

Notes:
NA = Not applicable
ND = Not detected at indicated reporting limit.
1. Reporting limit is based on wet weight.

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Calscience Environmental Laboratories, Inc.

Quality Control - Duplicate

Geopentech
601 N Parkcenter Dr., Ste 110
Santa Ana, CA 92705-3552

Project: Tapanga Lagoon

Date Received: 11/18/2002
Work Order No: 02-11-1018
Preparation: N/A
Method: EPA 9045C

Quality Control Sample ID	Matrix	Instrument	Date Prepared:	Date Analyzed:	Duplicate Batch Number
02-11-1041-1	Oil	PH 1	11/19/02	11/19/02	21119PHD2

Parameter	Sample Conc	DUP Conc	RPD	RPD CL	Qualifiers
pH	7.35	7.33	0	0-25	

Calscience Environmental Laboratories, Inc.

Quality Control - Duplicate

Geopentech
601 N Parkcenter Dr., Ste 110
Santa Ana, CA 92705-3552

Project: Tapanga Lagoon

Date Received: 11/18/2002
Work Order No: 02-11-1018
Preparation: N/A
Method: EPA 160.3

Quality Control Sample ID	Matrix	Instrument	Date Prepared:	Date Analyzed:	Duplicate Batch Number
7 (2' to 5.5')	Solid	NA	N/A	11/20/02	21120TSD1

Parameter	Sample Conc	DUP Conc	RPD	RPD CL	Qualifiers
Total Solids	94.4	92.4	2	0-25	

Calscience Environmental Laboratories, Inc.

Quality Control - Duplicate

Geopentech
601 N Parkcenter Dr., Ste 110
Santa Ana, CA 92705-3552

Project: Tapanga Lagoon

Date Received: 11/18/2002
Work Order No: 02-11-1018
Preparation: N/A
Method: EPA 350.2M

Quality Control Sample ID	Matrix	Instrument	Date Prepared:	Date Analyzed:	Duplicate Batch Number
7 (2' to 5.5')	Solid	NA	N/A	11/22/02	21122NH3D2

Parameter	Sample Conc	DUP Conc	RPD	RPD CL	Qualifiers
Ammonia	ND	ND	NA	0-25	

Calscience Environmental Laboratories, Inc.

Quality Control - Duplicate

Geopentech
601 N Parkcenter Dr., Ste 110
Santa Ana, CA 92705-3552

Project: Tapanga Lagoon

Date Received: 11/18/2002
Work Order No: 02-11-1018
Preparation: N/A
Method: EPA 376.2M

Quality Control Sample ID	Matrix	Instrument	Date Prepared:	Date Analyzed:	Duplicate Batch Number
7 (2' to 5.5')	Solid	NA	N/A	11/22/02	2112SD1

Parameter	Sample Conc	DUP Conc	RPD	RPD CL	Qualifiers
Total Sulfide	ND	ND	NA	0-25	

Calscience Environmental Laboratories, Inc.

Quality Control - Duplicate

Geopentech
601 N Parkcenter Dr., Ste 110
Santa Ana, CA 92705-3552

Project: Tapanga Lagoon

Date Received: 11/18/2002
Work Order No: 02-11-1018
Preparation: N/A
Method: EPA 376.2M

Quality Control Sample ID	Matrix	Instrument	Date Prepared:	Date Analyzed:	Duplicate Batch Number
7 (2' to 5.5')	Solid	Mercury	N/A	11/22/02	21122DSD1

Parameter	Sample Conc	DUP Conc	RPD	RPD CL	Qualifiers
Sulfide, Dissolved	ND	ND	NA	0-25	

Calscience Environmental Laboratories, Inc.

Quality Control - Spike/Spike Duplicate

Geopentech
601 N Parkcenter Dr., Ste 110
Santa Ana, Ca 92705-3552

Date Received: 11/18/02
Work Order No.: 02-11-1018
Preparation: N/A
Method: EPA 9060

Project: Tapanga Lagoon

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
7 (2' to 5.5')	Solid	TOC 1	N/A	11/21/02	21121TOCS1

Parameter	MS %REC	MSD %REC	%REC CL	RPD	RPD CL	Qualifier
Total Organic Carbon	106	107	70-130	1	0-25	

Calscience Environmental Laboratories, Inc.

Quality Control - Laboratory Control Sample

Geopentech
601 N Parkcenter Dr., Ste 110
Santa Ana, CA 92705-3552

Project: Tapanga Lagoon

Date Received: 11/18/02
Work Order No: 02-11-1018
Preparation: N/A
Method: EPA 9060

Quality Control Sample ID	Matrix	Instrument	Date Analyzed	Lab File ID	LCS Batch Number
099-05-036-1,055	Solid	TOC 1	11/21/02	NONE	21121TOCL1

Parameter	Conc Added	Conc Recovered	%Rec	%Rec CL	Qualifiers
Total Organic Carbon	800	780	97	80-120	

Calscience Environmental Laboratories, Inc.

Quality Control - Spike/Spike Duplicate

Geopentech
601 N Parkcenter Dr., Ste 110
Santa Ana, CA 92705-3552

Project: Tapanga Lagoon

Date Received: 11/18/02
Work Order No: 02-11-1018
Preparation: Extraction
Method: EPA 418.1M

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
6 (12' to 13.5')	Solid	IR #1	11/21/02	11/21/02	021121S01

Parameter	MS %REC	MSD %REC	%REC CL	RPD	RPD CL	Qualifiers
TRPH	91	95	55-135	3	0-30	

Calscience Environmental Laboratories, Inc.

Quality Control - Laboratory Control Sample

Geopentech
601 N Parkcenter Dr., Ste 110
Santa Ana, CA 92705-3552

Project: Tapanga Lagoon

Date Received: 11/18/02
Work Order No: 02-11-1018
Preparation: Extraction
Method: EPA 418.1M

Quality Control Sample ID	Matrix	Instrument	Date Analyzed	Lab File ID	LCS Batch Number
099-07-015-285	Solid	IR #1	11/21/02	NONE	021121L01

Parameter	Conc Added	Conc Recovered	%Rec	%Rec CL	Qualifiers
TRPH	100	110	109	70-130	

Calscience Environmental Laboratories, Inc.

Quality Control - Spike/Spike Duplicate

Geopentech
601 N Parkcenter Dr., Ste 110
Santa Ana, CA 92705-3552

Project: Tapanga Lagoon

Date Received: 11/18/02
Work Order No: 02-11-1018
Preparation: Total Digestion
Method: EPA 6020

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
7 (2' to 5.5')	Solid	ICP/MS A	11/19/02	11/21/02	021119S01

Parameter	MS %REC	MSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Arsenic	91	81	80-120	10	0-20	
Cadmium	121	108	80-120	11	0-20	3
Chromium (Total)	104	98	80-120	4	0-20	
Copper	83	76	80-120	6	0-20	3
Lead	129	121	80-120	5	0-20	3
Nickel	92	85	80-120	5	0-20	
Selenium	85	73	80-120	15	0-20	3
Silver	121	110	80-120	9	0-20	3
Zinc	85	69	80-120	9	0-20	3

Calscience Environmental Laboratories, Inc.

Quality Control - LCS/LCS Duplicate

Geopentech
601 N Parkcenter Dr., Ste 110
Santa Ana, CA 92705-3552

Project: Tapanga Lagoon

Date Received: 11/18/02
Work Order No: 02-11-1018
Preparation: Total Digestion
Method: EPA 6020

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
096-10-002-177	Solid	ICP/MS A	11/19/02	11/21/02	021119L01

Parameter	LCS %REC	LCSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Arsenic	102	102	80-120	0	0-20	
Cadmium	99	99	80-120	0	0-20	
Chromium (Total)	101	102	80-120	1	0-20	
Copper	101	99	80-120	2	0-20	
Lead	99	100	80-120	0	0-20	
Nickel	98	101	80-120	3	0-20	
Selenium	98	96	80-120	2	0-20	
Silver	99	98	80-120	0	0-20	
Zinc	101	98	80-120	2	0-20	

Calscience Environmental Laboratories, Inc.

Quality Control - Spike/Spike Duplicate

Geopentech
601 N Parkcenter Dr., Ste 110
Santa Ana, CA 92705-3552

Project: Tapanga Lagoon

Date Received: 11/18/02
Work Order No: 02-11-1018
Preparation: Total Digestion
Method: EPA 7471A

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
7 (2' to 5.5')	Solid	Mercury	11/19/02	11/19/02	021119S03

Parameter	MS %REC	MSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Mercury	116	111	76-136	4	0-16	

Calscience Environmental Laboratories, Inc.

Quality Control - Laboratory Control Sample

Geopentech
601 N Parkcenter Dr., Ste 110
Santa Ana, CA 92705-3552

Project: Tapanga Lagoon

Date Received: 11/18/02
Work Order No: 02-11-1018
Preparation: Total Digestion
Method: EPA 7471A

Quality Control Sample ID	Matrix	Instrument	Date Analyzed	Lab File ID	LCS Batch Number
099-04-007-1,729	Solid	Mercury	11/19/02	021119-L03	021119L03

Parameter	Conc Added	Conc Recovered	%Rec	%Rec CL	Qualifiers
Mercury	0.835	0.792	95	82-124	

Calscience Environmental Laboratories, Inc.

QUALITY ASSURANCE SUMMARY

Method EPA 8081A/8082

Geopentech		Work Order No.:	02-11-1018
Page 1 of 1		Date Analyzed:	11/22/02

Surrogate Recoveries (in %)

Sample Number	S1	S2
1 (14' to 15.5')	94	87
4 (8 to 11.5')	88	67
6 (12' to 13.5')	86	77
7 (2' to 5.5')	89	78
10 (16' to 17.5')	90	86
Method Blank	96	87

Surrogate Compound	%REC Acceptable Limits
S1 > Decachlorobiphenyl (DCB)	50 - 130
S2 > 2,4,5,6-Tetrachloro-m-Xylene	50 - 130

Calscience Environmental Laboratories, Inc.

Quality Control - Spike/Spike Duplicate

Geopentech
601 N Parkcenter Dr., Ste 110
Santa Ana, CA 92705-3552

Project: Tapanga Lagoon

Date Received: 11/18/02
Work Order No: 02-11-1018
Preparation: EPA 3545
Method: EPA 8081A/8082

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
10 (16' to 17.5')	Solid	GC 16	11/21/02	11/22/02	021121S04

Parameter	MS %REC	MSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Gamma-BHC	87	100	50-135	15	0-25	
Heptachlor	89	93	50-135	4	0-25	
Endosulfan I	88	79	50-135	11	0-25	
Dieldrin	90	75	50-135	17	0-25	
Endrin	89	71	50-135	22	0-25	
4,4'-DDT	111	102	50-135	8	0-25	
Aroclor-1260	86	88	50-135	2	0-25	

Calscience Environmental Laboratories, Inc.

Quality Control - LCS/LCS Duplicate

Geopentech
601 N Parkcenter Dr., Ste 110
Santa Ana, CA 92705-3552

Project: Tapanga Lagoon

Date Received: 11/18/02
Work Order No: 02-11-1018
Preparation: EPA 3545
Method: EPA 8081A/8082

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
095-01-014-2,432	Solid	GC 16	11/21/02	11/22/02	021121L04

Parameter	LCS %REC	LCSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Gamma-BHC	113	113	50-135	0	0-25	
Heptachlor	96	100	50-135	3	0-25	
Endosulfan I	134	127	50-135	5	0-25	
Dieldrin	116	117	50-135	1	0-25	
Endrin	113	112	50-135	1	0-25	
4,4'-DDT	110	109	50-135	1	0-25	
Aroclor-1260	124	120	50-135	3	0-25	

Calscience Environmental Laboratories, Inc.

QUALITY ASSURANCE SUMMARY

Method EPA 8270C

Geopentech
Page 1 of 1

Work Order No.: 02-11-1018
Date Analyzed: 11/22/02

Surrogate Recoveries (in %)

Sample Number	S1	S2	S3	S4	S5	S6
1 (14' to 15.5')	41	42	46	48	41	58
4 (8 to 11.5')	67	68	73	76	67	81
6 (12' to 13.5')	66	68	71	71	63	76
7 (2' to 5.5')	41	41	45	44	37	51
10 (16' to 17.5')	67	61	66	67	59	78
Method Blank	68	70	72	71	57	64

Surrogate Compound	Soil %REC Acceptable Limits
S1 > 2-Fluorophenol	31 - 142
S2 > Phenol-d_6	30 - 136
S3 > Nitrobenzene-d_5	28 - 139
S4 > 2-Fluorobiphenyl	33 - 144
S5 > 2,4,6-Tribromophenol	24 - 152
S6 > p-Terphenyl-d14	23 - 160

Calscience Environmental Laboratories, Inc.

Quality Control - Spike/Spike Duplicate

Geopentech
601 N Parkcenter Dr., Ste 110
Santa Ana, CA 92705-3552

Project: Tapanga Lagoon

Date Received: 11/18/02
Work Order No: 02-11-1018
Preparation: EPA 3545
Method: EPA 8270C

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
6 (12' to 13.5')	Solid	GC/MS P	11/21/02	11/23/02	021121S03

Parameter	MS %REC	MSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Phenol	65	65	53-118	1	0-19	
2-Chlorophenol	63	63	60-119	0	0-18	
1,4-Dichlorobenzene	63	62	56-131	1	0-18	
N-Nitroso-di-n-propylamine	68	68	64-123	1	0-18	
1,2,4-Trichlorobenzene	67	66	52-144	1	0-17	
4-Chloro-3-Methylphenol	71	68	45-135	5	0-20	
Acenaphthene	69	68	45-152	1	0-18	
4-Nitrophenol	55	51	45-135	6	0-20	
2,4-Dinitrotoluene	76	75	42-128	2	0-23	
Pentachlorophenol	46	46	45-135	1	0-20	
Pyrene	78	77	45-135	1	0-20	

Calscience Environmental Laboratories, Inc.

Quality Control - LCS/LCS Duplicate

Geopentech
601 N Parkcenter Dr., Ste 110
Santa Ana, CA 92705-3552

Project: Tapanga Lagoon

Date Received: 11/18/02
Work Order No: 02-11-1018
Preparation: EPA 3545
Method: EPA 8270C

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
095-01-002-534	Solid	GC/MS P	11/21/02	11/22/02	021121L03

Parameter	LCS %REC	LCSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Phenol	69	76	67-118	10	0-24	
2-Chlorophenol	75	83	72-119	11	0-24	
1,4-Dichlorobenzene	73	80	69-118	9	0-27	
N-Nitroso-di-n-propylamine	79	89	70-112	12	0-24	
1,2,4-Trichlorobenzene	67	73	65-135	9	0-25	
4-Chloro-3-Methylphenol	68	76	45-135	10	0-20	
Acenaphthene	67	73	61-142	8	0-25	
4-Nitrophenol	54	59	45-135	10	0-20	
2,4-Dinitrotoluene	80	86	47-137	7	0-24	
Pentachlorophenol	65	74	45-135	13	0-20	
Pyrene	58	64	45-135	9	0-20	

Calscience Environmental Laboratories, Inc.

GLOSSARY OF TERMS AND QUALIFIERS

Work Order Number: 02-11-1018

Qualifier	Definition
3	Spike or Spike Duplicate compound was out of control due to matrix interference. The associated LCS and/or LCSD was in control and, therefore, the sample data was reported without further clarification.
ND	Not detected at indicated reporting limit.

7440 Lincoln Way, Garden Grove, CA 92841-1432 • TEL: (714) 895-5494 • FAX: (714) 894-7501

Calscience Environmental Laboratories, Inc.

WORK ORDER #: 02-[1][1]-[1][0][1][8]

Cooler 1 of 1

SAMPLE RECEIPT FORM

CLIENT: Geopentech DATE: 11/18/02

TEMPERATURE – SAMPLES RECEIVED BY:

CALSCIENCE COURIER:

_____ Chilled, cooler with temperature blank provided.
_____ Chilled, cooler without temperature blank.
✓ Chilled and placed in cooler with wet ice.
_____ Ambient and placed in cooler with wet ice.
_____ Ambient temperature.

2 °C Temperature blank.

LABORATORY (Other than Calscience Courier):

_____ °C Temperature blank.
_____ °C IR thermometer.
_____ Ambient temperature.

Initial: NC

CUSTODY SEAL INTACT:

Sample(s): _____ Cooler: _____ No (Not Intact): _____ Not Applicable (N/A): ✓

Initial: NC

SAMPLE CONDITION:

	Yes	No	N/A
Chain-Of-Custody document(s) received with samples	✓		
Sample container label(s) consistent with custody papers	✓		
Sample container(s) intact and good condition	✓		
Correct containers for analyses requested	✓		
Proper preservation noted on sample label(s)			✓
VOA vial(s) free of headspace			✓
Tedlar bag(s) free of condensation			✓

Initial: NC

COMMENTS:

CALSCIENCE ENVIRONMENTAL LABORATORIES, INC.
7440 LINCOLN WAY
GARDEN GROVE, CA 92841-1432
TEL: (714) 895-5494 • FAX: (714) 894-7501

CHAIN OF CUSTODY RECORD

Date 11/18/02

Page 1 of 1

LABORATORY CLIENT: Geopentech
ADDRESS: 601 N. Parkcenter Drive, Suite 110
CITY: Santa Ana STATE: CA ZIP: 92614
TEL: (714) 796-9100 FAX: (714) 796-9191 E-MAIL:
TURNAROUND TIME: ☐ SAME DAY ☐ 24 HR ☐ 48 HR ☐ 72 HR ☐ 5 DAYS ☐ 10 DAYS
SPECIAL REQUIREMENTS (ADDITIONAL COSTS MAY APPLY)
☐ RWQCB REPORTING ☐ COELT REPORTING
SPECIAL INSTRUCTIONS:
Composite cores.

CLIENT PROJECT NAME / NUMBER: Topanga Lagoon
PROJECT CONTACT: Steve Duke
SAMPLER(S): (SIGNATURE) Steven Duke
COELT LOG CODE ☐☐☐☐
P.O. NO.: 020066A
LAB USE ONLY 11-1018
COOLER RECEIPT TEMP = °C

REQUESTED ANALYSES

LAB USE ONLY	GEIMS ID	SAMPLE ID	SAMPLING DATE	SAMPLING TIME	MATRIX	NO. OF CONT.	TPH (G)	TPH (D) or	BTEX / MTBE (8021B)	HALOCARBONS (8021B)	VOCs (8260B)	VOCs (5035 / 8260B) EnCore	SVOCs (8270C)	PEST (8081A)	PCBs (8082)	EDB / DBCP (504.1) or (8011)	CAC, T22 METALS (6010B)	PNAs (8310)	VOCs (TO-14A) or (TO-15)
		1 (14' to 15½')	1/12/02	16:00	S	3	Various		(see			attached				list)			
		4 (8' to 11½')	1/13/02	9:00	S	4													
		6 (12' to 13½')	1/13/02	12:30	S	3													
		7 (2' to 5½')	1/11/02	13:00	S	4													
		10 (16' to 17½')	1/12/02	12:00	S	3													

Relinquished by: (Signature) Steven Duke	Received by: (Signature)	Date: 11/18/02	Time: 0920
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Received for Laboratory by: (Signature)	Date: 11/18/02	Time: 0950

DISTRIBUTION: White with final report, Green to File, Yellow and Pink to Client.
Please note that pages 1 and 2 of 2 of our T/Cs are printed on the reverse side of the Yellow and Pink copies respectively.

09/10/01 Revision

Q&Q Graphic (714) 898-9702

Calscience Environmental Laboratories, Inc.

Analytical Services Quotation

Quote No. 946804 **Prepared** 01/09/2002 **By** Robert Stearns

Client Information

Name: John Waggoner
Client: Geopentech
Address: 601 N Parkcenter Dr., Ste 110
Santa Ana, CA 92705-3552

Phone: 714-796-9100
Fax: 714-796-9191
E-mail:

Project Information

Project ID: Topanga
Location:
Expected Start Date: Not indicated
Quote Valid Until: March 31, 2002

Analytical Fees Include :

☐ Courier Services
☐ Sample Disposal
☐ EDD _____

5 Business Day Turnaround Time (TAT), except as noted.

Matrix	Test	Quantity	TAT	Unit Cost	Subtotal 1	Rush Surcharge	Subtotal 2
Soil	EPA 160.3 Total Solids	1	5	$15.00	$15.00	$0.00	$15.00
Soil	EPA 350.2M Ammonia	1	10	$35.00	$35.00	$0.00	$35.00
Soil	EPA 376.2M Soluble Sulfide	1	10	$25.00	$25.00	$0.00	$25.00
Soil	EPA 376.2M Total Sulfide	1	10	$25.00	$25.00	$0.00	$25.00
Soil	EPA 418.1M TRPH	1	10	$50.00	$50.00	$0.00	$50.00
Soil	Zn, Se, Pb, Ni, Cu, Cr, Cd, As, Ag	1	10	$170.00	$170.00	$0.00	$170.00
Soil	EPA 7471A Mercury	1	10	$30.00	$30.00	$0.00	$30.00
Soil	EPA 8081A/8082 Organochlorine Pesticides and PCBs	1	10	$140.00	$140.00	$0.00	$140.00
Soil	EPA 8270C Semi-Volatile Organics - Marine Sediment	1	10	$275.00	$275.00	$0.00	$275.00
Soil	EPA 9045B pH	1	10	$10.00	$10.00	$0.00	$10.00
Soil	EPA 9060 Total Organic Carbon	1	10	$70.00	$70.00	$0.00	$70.00
Soil	Subcontract Services, TBT	1	10	$201.25	$201.25	$0.00	$201.25

Total for Testcodes : **$1,046.25**

Quote total: **$1,046.25**

Deliverables: Level II ☑ (Standard) Level III ☐ (20%) Level IV ☐ (Check availability)

Comments: Matrix is sediment. Semi-volatile constituents include PAHs, phenols, and phthalates. PCBs are aroclors. Price includes standard Level II data package.

Your Project Manager will be : Robert Stearns , bstearns@calscience.com . Please Contact him/her to order sampling supplies (e.g. bottles, coolers) . Unless otherwise stated, all analytical work conducted by Calscience is subject to its standard terms and conditions, a copy of which is available upon request.

7440 Lincoln Way, Garden Grove, CA 92841-1432 • TEL: (714) 895-5494 • FAX: (714) 894-7501

CRG
Marine Laboratories, Inc.
2020 Del Amo Blvd., Torrance, CA 90501 • (310) 533-5190 • FAX (310) 533-5003 • CRGLABS@SBCGLOBAL.NET

December 11, 2002

CalScience
7440 Lincoln Way
Garden Grove, CA 92841-1432

Re: CRG Marine Laboratories, Inc. Project ID# 22113

ATTN: Mr. Stearns

CRG Marine Laboratories is pleased to provide you with the enclosed analytical data report for your project. According to the chain-of-custody, 5 sediment samples were received intact and cool at CRG on November 19, 2002. Per your instructions, the samples were analyzed for:

- Organotins By Rice et al Using GCMS

Please don't hesitate to call if you have any questions and thank you very much for using our laboratory for your analytical needs.

Sincerely,
Rich Gossett

Reviewed and Approved

CRG Marine Laboratories, Inc.

2020 Del Amo Blvd., Suite 200, Torrance, CA 90501-1206 (310) 533-5190 FAX (310) 533-5003 crglabs@sbcglobal.net

Organotins By Rice et al. 1987
GC/MS #1: HP6890/5972

CRG ID#: 7415 **Replicate #:** R1 **Project ID:** 22113 **Batch ID:** 22113-6052 **Matrix:** Sediment

Sample Description: PO# 02-11-1018
1

Client Name: Calscience Environmental Lab
Bob Stearns

Date Sampled: 12-Nov-02
Date Received: 19-Nov-02

Date Processed: 05-Dec-02
Date Analyzed: 10-Dec-02

CONSTITUENT	RESULT	UNITS	MDL	ML	DILUTION FACTOR
(Tripentyltin)	96	% Recovery			1
Dibutyltin	ND	ng/dry g	1	2	1
Monobutyltin	ND	ng/dry g	1	2	1
Tetrabutyltin	ND	ng/dry g	1	2	1
Tributyltin	ND	ng/dry g	1	2	1

MDL= Method Detection Limit (CFR40 Part 136); ML= Minimum Level (SWQCB); ND= Not Detected
California ELAP Certificate # 2261

CRG Marine Laboratories, Inc.

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Organotins By Rice et al. 1987
GC/MS #1: HP6890/5972

CRG ID#: 7416 **Replicate #:** R1 **Project ID:** 22113 **Batch ID:** 22113-6052 **Matrix:** Sediment

Sample Description: PO# 02-11-1018
4

Client Name: Calscience Environmental Lab
Bob Stearns

Date Sampled: 13-Nov-02
Date Received: 19-Nov-02

Date Processed: 05-Dec-02
Date Analyzed: 10-Dec-02

CONSTITUENT	RESULT	UNITS	MDL	ML	DILUTION FACTOR
(Tripentyltin)	89	% Recovery			1
Dibutyltin	ND	ng/dry g	1	2	1
Monobutyltin	ND	ng/dry g	1	2	1
Tetrabutyltin	ND	ng/dry g	1	2	1
Tributyltin	ND	ng/dry g	1	2	1

MDL= Method Detection Limit (CFR40 Part 136); ML= Minimum Level (SWQCB); ND= Not Detected
California ELAP Certificate # 2261

CRG Marine Laboratories, Inc.

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Organotins By Rice et al. 1987
GC/MS #1: HP6890/5972

CRG ID#: 7416 **Replicate #:** R2 **Project ID:** 22113 **Batch ID:** 22113-6052 **Matrix:** Sediment

Sample Description: PO# 02-11-1018
4

Client Name: Calscience Environmental Lab
Bob Stearns

Date Sampled: 13-Nov-02
Date Received: 19-Nov-02

Date Processed: 05-Dec-02
Date Analyzed: 10-Dec-02

CONSTITUENT	RESULT	UNITS	MDL	ML	DILUTION FACTOR
(Tripentyltin)	94	% Recovery			1
Dibutyltin	ND	ng/dry g	1	2	1
Monobutyltin	ND	ng/dry g	1	2	1
Tetrabutyltin	ND	ng/dry g	1	2	1
Tributyltin	ND	ng/dry g	1	2	1

MDL= Method Detection Limit (CFR40 Part 136); ML= Minimum Level (SWQCB); ND= Not Detected
California ELAP Certificate # 2261

CRG Marine Laboratories, Inc.

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Organotins By Rice et al. 1987
GC/MS #1: HP6890/5972

CRG ID#: 7417 **Replicate #:** R1 **Project ID:** 22113 **Batch ID:** 22113-6052 **Matrix:** Sediment

Sample Description: PO# 02-11-1018
6

Client Name: Calscience Environmental Lab
Bob Stearns

Date Sampled: 13-Nov-02
Date Received: 19-Nov-02

Date Processed: 05-Dec-02
Date Analyzed: 10-Dec-02

CONSTITUENT	RESULT	UNITS	MDL	ML	DILUTION FACTOR
(Tripentyltin)	97	% Recovery			1
Dibutyltin	ND	ng/dry g	1	2	1
Monobutyltin	ND	ng/dry g	1	2	1
Tetrabutyltin	ND	ng/dry g	1	2	1
Tributyltin	ND	ng/dry g	1	2	1

MDL= Method Detection Limit (CFR40 Part 136); ML= Minimum Level (SWQCB); ND= Not Detected
California ELAP Certificate # 2261

CRG Marine Laboratories, Inc.

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Organotins By Rice et al. 1987
GC/MS #1: HP6890/5972

CRG ID#: 7418 **Replicate #:** R1 **Project ID:** 22113 **Batch ID:** 22113-6052 **Matrix:** Sediment

Sample Description: PO# 02-11-1018
7

Client Name: Calscience Environmental Lab
Bob Stearns

Date Sampled: 11-Nov-02
Date Received: 19-Nov-02

Date Processed: 05-Dec-02
Date Analyzed: 10-Dec-02

CONSTITUENT	RESULT	UNITS	MDL	ML	DILUTION FACTOR
(Tripentyltin)	92	% Recovery			1
Dibutyltin	ND	ng/dry g	1	2	1
Monobutyltin	ND	ng/dry g	1	2	1
Tetrabutyltin	ND	ng/dry g	1	2	1
Tributyltin	ND	ng/dry g	1	2	1

MDL= Method Detection Limit (CFR40 Part 136); ML= Minimum Level (SWQCB); ND= Not Detected
California ELAP Certificate # 2261

CRG Marine Laboratories, Inc.

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Organotins By Rice et al. 1987
GC/MS #1: HP6890/5972

CRG ID#: 7419 **Replicate #:** R1 **Project ID:** 22113 **Batch ID:** 22113-6052 **Matrix:** Sediment

Sample Description: PO# 02-11-1018
10

Client Name: Calscience Environmental Lab
Bob Stearns

Date Sampled: 12-Nov-02
Date Received: 19-Nov-02

Date Processed: 05-Dec-02
Date Analyzed: 10-Dec-02

CONSTITUENT	RESULT	UNITS	MDL	ML	DILUTION FACTOR
(Tripentyltin)	93	% Recovery			1
Dibutyltin	ND	ng/dry g	1	2	1
Monobutyltin	ND	ng/dry g	1	2	1
Tetrabutyltin	ND	ng/dry g	1	2	1
Tributyltin	ND	ng/dry g	1	2	1

MDL= Method Detection Limit (CFR40 Part 136); ML= Minimum Level (SWQCB); ND= Not Detected
California ELAP Certificate # 2261

CRG Marine Laboratories, Inc.

2020 Del Amo Blvd., Suite 200, Torrance, CA 90501-1206 (310) 533-5190 FAX (310) 533-5003 crglabs@sbcglobal.net

QA/QC REPORT
Organotins Using GCMS#1: HP6890/5972

CRG ID#: 7416 **Replicate #:** MS1 **Project ID:** 22113 **Batch ID:** 22113-6052 **Matrix:** Sediment

Sample Description: PO# 02-11-1018 4

Client Name: Calscience Environmental Lab

Project Officer: Bob Stearns

Date Sampled: 13-Nov-02
Date Received: 19-Nov-02

Date Processed: 05-Dec-02
Date Analyzed: 10-Dec-02

CONSTITUENT	% RECOVERY	TRUE VALUE	ACCEPTANCE RANGE	COMMENT
(Tripentyltin)	97	516 % Recovery	34 - 134%	PASS
Dibutyltin	89	216 % Recovery	42 - 126%	PASS
Tetrabutyltin	83	200 % Recovery	17 - 173%	PASS
Tributyltin	90	200 % Recovery	69 - 129%	PASS

CRG Marine Laboratories, Inc.

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QA/QC REPORT
Organotins Using GCMS#1: HP6890/5972

CRG ID#: 7416 **Replicate #:** MS2 **Project ID:** 22113 **Batch ID:** 22113-6052 **Matrix:** Sediment

Sample Description: PO# 02-11-1018 4

Client Name: Calscience Environmental Lab

Project Officer: Bob Stearns

Date Sampled: 13-Nov-02
Date Received: 19-Nov-02

Date Processed: 05-Dec-02
Date Analyzed: 10-Dec-02

CONSTITUENT	% RECOVERY	TRUE VALUE	ACCEPTANCE RANGE	COMMENT
(Tripentyltin)	94	516 % Recovery	34 - 134%	PASS
Dibutyltin	81	216 % Recovery	42 - 126%	PASS
Tetrabutyltin	86	200 % Recovery	17 - 173%	PASS
Tributyltin	87	200 % Recovery	69 - 129%	PASS

CRG Marine Laboratories, Inc.

2020 Del Amo Blvd., Suite 200, Torrance, CA 90501-1206 (310) 533-5190 FAX (310) 533-5003 crglabs@sbcglobal.net

Organotins By Rice et al. 1987
GC/MS #1: HP6890/5972

CRG ID#: 7410 **Replicate #:** B1 **Project ID:** 22113 **Batch ID:** 22113-6052 **Matrix:** DI Water

Sample Description: QAQC, Procedural Blank

Client Name: Calscience Environmental Laborator, Bob Stearns

Date Sampled:

Date Received:

Date Processed: 05-Dec-02

Date Analyzed: 10-Dec-02

CONSTITUENT	RESULT	UNITS	MDL	ML	DILUTION FACTOR
(Tripentyltin)	98	% Recovery			1
Dibutyltin	ND	ng/dry g	1	2	1
Monobutyltin	ND	ng/dry g	1	2	1
Tetrabutyltin	ND	ng/dry g	1	2	1
Tributyltin	ND	ng/dry g	1	2	1

MDL= Method Detection Limit (CFR40 Part 136); ML= Minimum Level (SWQCB); ND= Not Detected

California ELAP Certificate # 2261

TEL: (714) 895-5494 • FAX: (714) 894-7501

Page 1 of 1

LABORATORY CLIENT:

ADDRESS: X

CITY STATE ZIP

TEL: FAX: E-MAIL:

CLIENT PROJECT NAME / NUMBER: 02-11-1018

PROJECT CONTACT: Bob Stearns

SAMPLER(S): (SIGNATURE)

COELT LOG CODE ☐☐☐☐

P.O. NO.:

LAB USE ONLY ☐☐-☐☐☐☐

COOLER RECEIPT TEMP = ____ °C

TURNAROUND TIME:
☐ SAME DAY ☐ 24 HR ☐ 48 HR ☐ 72 HR ☐ 5 DAYS ☐ 10 DAYS

SPECIAL REQUIREMENTS (ADDITIONAL COSTS MAY APPLY)
☐ RWQCB REPORTING ☐ COELT REPORTING

SPECIAL INSTRUCTIONS:
Normal TAT
Calscience to provide dry wt. data.

REQUESTED ANALYSES

LAB USE ONLY	GEIMS ID	SAMPLE ID	SAMPLING DATE	SAMPLING TIME	MATRIX	NO. OF CONT.	TPH (G)	TPH (D) or ____	BTEX / MTBE (8021B)	HALOCARBONS (8021B)	VOCs (8260B)	VOCs (5035 / 8260B) EnCore	SVOCs (8270C)	PEST (8081A)	PCBs (8082)	EOB / DBCP (504.1) or (8011)	CAC, T22 METALS (6010B)	PNAs (8310)	VOCs (TO-14A) or (TO-15)	Organotins
		1	11/12/02		S	1														X
		4	11/13/02		↓	↓														↓
		6	11/13/02																	
		7	11/11/02																	
		10	11/12/02		↓	↓														↓

Relinquished by: (Signature)	Received by: (Signature)	Date: 11/19/02	Time: 1150
Relinquished by: (Signature)	Received by: (Signature)	Date: 11/19/02	Time: 2:30 PM
Relinquished by: (Signature)	Received for Laboratory by: (Signature) RG Moriarty Labs	Date:	Time:

DISTRIBUTION: White with final report, Green to File, Yellow and Pink to Client.
Please note that pages 1 and 2 of 2 of our T/Cs are printed on the reverse side of the Yellow and Pink copies respectively.

09/10/01 Revision

Q&Q Graphic (714) 898-9702

APPENDIX B

2021 Field Investigation

Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Key to Log of Boring

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Number	SAMPLES: Blows per 6"	SAMPLES: Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
1	2	3	4	5	6	7	8	9	10	11

COLUMN DESCRIPTIONS

1 **Elevation:** Elevation in feet referenced to mean sea level (MSL).

2 **Depth:** Depth in feet below the ground surface.

3 **Sample Type:** Type of soil sample collected at depth interval shown; sampler symbols are explained below.

4 **Sample Number:** Sample identification number.

5 **Sampling Resistance:** Number of blows required to advance driven sampler 6 inches, or distance noted, using the drive weight listed in hammer data. Hydraulic down-pressure may be recorded for pushed samplers.

6 **Sample Recovery:** Amount of sample recovered from sampling interval; given as inches of sample recovered or ratio of sample length to drive length (expressed as a percentage, %)

7 **Graphic Log:** Graphic depiction of subsurface material encountered; typical symbols are explained below.

8 **Material Description:** Description of material encountered; may include density/consistency (from field assessments), moisture, color (Munsell code), and grain size.

9 **Water Content:** Water content of sample, as percentage of dry weight of soil, measured in lab according to ASTM D2216.

10 **Dry Unit Weight:** The weight of soil solids per cubic foot of total volume of soil mass, measured according to ASTM D2937.

11 **Remarks and Other Tests:** Comments and observations regarding drilling or sampling made by driller or field personnel. Other lab tests are indicated using abbreviations explained below.

TYPICAL MATERIAL GRAPHIC SYMBOLS

- **Asphalt**
- **Concrete**
- **Base**
- **Topsoil**
- **Conglomerate**
- **Siltstone**
- **Claystone**
- **Shale**
- **Clayey GRAVEL (GP)**
- **Sand with Silt (SP-SM)**
- **Silty SAND (SM)**
- **Clayey SAND (SC)**
- **Clayey, Silty SAND (SC-SM)**
- **SILT**
- **Lean CLAY (CL)**
- **Fat CLAY (CH)**

TYPICAL SAMPLER GRAPHIC SYMBOLS

- Bulk Sample
- California Modified Sampler
- Standard Penetration Test
- Grab Sample

OTHER LABORATORY TEST ABBREVIATIONS

COMP	Compaction by modified effort (ASTM D1557)
OMC	Optimum moisture content from compaction test, %
MDD	Maximum dry density from compaction test, pcf
CONS	One-dimensional consolidation test (ASTM D2435)
CORR	Chemical tests to determine soil corrosivity
DS	Consolidated drained direct shear test (ASTM D3080)
EI	Expansion Index (ASTM D4829), EI at 50% saturation
SA	Sieve Analysis (ASTM D4222), % <#200 sieve
FC	Fines Content wash on #200 sieve (ASTM D1140)
HYD	Hydrometer Analysis on fine-grained soils
ER	Minimum soil electrical resistivity (DOT CA 532/643)
LL	Liquid Limit from Atterberg Limits test (ASTM D4318)
PI	Plasticity Index; NP indicates non-plastic determination

OTHER GRAPHIC SYMBOLS

- ____ Contact between strata
- _ _ _ Inferred contact between strata or gradational change
- Change within material properties within a stratum
- Water level measured after time of drilling

Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive; field descriptions have been modified to reflect lab test results. Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced; they are not warranted to be representative of subsurface conditions at other locations or times. Datum used is WGS84.

SOIL PLASTICITY DESCRIPTIONS

Plasticity Index Range	Plasticity Adjective	Adjective for Soil Type, Texture, and Plasticity Chart Location		
		ML & MH (SILT)	CL & CH (CLAY)	OL & OH (ORGANIC SILT or CLAY)
0	nonplastic	-	-	ORGANIC SILT
1 – 10	low plasticity	-	Silty	ORGANIC SILT
>10-20	medium plasticity	clayey	Silty to no adj.	ORGANIC clayey SILT
>20 – 40	high plasticity	clayey	-	ORGANIC silty CLAY
>40	very plastic	clayey	-	ORGANIC CLAY

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D-2487)					
MATERIAL TYPES	CRITERIA FOR ASSIGNING SOIL GROUP NAMES			GROUP SYMBOL	SOIL GROUP NAMES & LEGENDS
COARSE-GRAINED SOILS >50% RETAINED ON NO. 200 SIEVE	GRAVELS >50% OF COARSE FRACTION RETAINED ON NO. 4. SIEVE	CLEAN GRAVELS <5% FINES	$C_u \geq 4$ AND $1 \leq C_c \leq 3$	GW	WELL-GRADED GRAVEL
			$C_u < 4$ AND/OR $1 > C_c > 3$	GP	POORLY-GRADED GRAVEL
		GRAVELS WITH FINES >12% FINES	FINES CLASSIFY AS ML OR MH	GM	SILTY GRAVEL
			FINES CLASSIFY AS CL OR CH	GC	CLAYEY GRAVEL
	SANDS >50% OF COARSE FRACTION PASSES NO 4. SIEVE	CLEAN SANDS <5%	$C_u \geq 6$ AND $1 \leq C_c \leq 3$	SW	WELL-GRADED SAND
			$C_u < 6$ AND/OR $1 > C_c > 3$	SP	POORLY-GRADED SAND
		SANDS AND FINES >12% FINES	FINES CLASSIFY AS ML OR MH	SM	SILTY SAND
			FINES CLASSIFY AS CL OR CH	SC	CLAYEY SAND
FINE-GRAINED SOILS >50% PASSES NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT <50	INORGANIC	PI >7 AND PLOTS > "A" LINE	CL	LEAN CLAY
			PI <4 OR PLOTS < "A" LINE	ML	SILT
		ORGANIC	LL (oven dried)/LL (not dried) <0.75	OL	ORGANIC CLAY OR SILT
	SILTS AND CLAYS LIQUID LIMIT >50	INORGANIC	PI PLOTS > "A" LINE	CH	FAT CLAY
			PI PLOTS < "A" LINE	MH	ELASTIC SILT
		ORGANIC	LL (oven dried)/LL (not dried) <0.75	OH	ORGANIC CLAY OR SILT
HIGHLY ORGANIC SOILS		PRIMARILY ORGANIC MATTER, DARK IN COLOR, AND ORGANIC ODOR		PT	PEAT

PENETRATION RESISTANCE						
SAND & GRAVEL			SILT & CLAY			
RELATIVE DENSITY	SPT BLOWS/FOOT[1]	MOD CAL BLOWS/FOOT[2]	CONSISTENCY	SPT BLOWS/FOOT[1]	MOD CAL BLOWS/FOOT[2]	UNC. COMP. STRENGTH (KSF)
VERY LOOSE	0 - 4	0 - 6	VERY SOFT	0 - 1	0 - 3	0 – ½
LOOSE	5 - 10	7 - 16	SOFT	2 - 4	4 - 7	½ - 1
MEDIUM DENSE	11 - 30	17 - 47	MEDIUM STIFF	5 - 8	8 - 13	1 - 2
DENSE	31 - 50	48 - 76	STIFF	9 - 15	14 - 24	2 - 4
VERY DENSE	>50	>77	VERY STIFF	16 - 30	25 - 46	4 - 8
			HARD	>30	>46	>8

1. Number of blows of 140 lb hammer falling 30 inches to drive a 2 inch O.D. (1 3/8 inch I.D.) split-barrel sampler the last 12 inches of an 18 inch drive (ASTM-1586 Standard Penetration Tests)
2. Number of blows of 140 lb hammer falling 30 inches to drive a 2.5 inch O.D. (2 inch I.D.) split-barrel sampler the last 12 inches of an 18 inch drive (ASTM-3550 Standard Penetration Tests) Standard Practice for Thick Wall, Ring-Lined, Split Barrel, Drive Sampling of Soils (a multiplier of 0.65 was used to adjust densities for the larger surface area of the modified California sampler.

Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-1

Sheet 1 of 2

Date(s) Drilled	**12/20/2021**	Logged By	**R. Wakefield**	Checked By	**S. Duke**
Drilling Method	**Hollow Stem Auger**	Drill Bit Size/Type	**8" bullet bit**	Total Depth of Borehole	**33.3 feet**
Drill Rig Type	**CME-75**	Drilling Contractor	**Martini Drilling**	Approximate Surface Elevation	**38 ft msl**
Groundwater Level(s)	**Not Observed During Drilling**	Sampling Method	**Grab, SPT**	Hammer Data	**Automatic hammer 140 lbs/30" drop**
Borehole Location	**Lat: 34.04012° Long: -118.58340°**	Borehole Completion	**Backfilled with cement-grout via tremie, cuttings spread on site**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Blows per 6"	Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
	0						**[Undocumented Fill (Afu)]**			
35		☒	1				**SILT (ML)**, dry, brown, nonplastic; slight HCl reaction, common rootlets/root hairs			
	5			7						
			2	8			**Clayey SAND (SC)**, medium dense, dry, reddish brown, fine SAND; slight HCl reaction, roots, sandstone clasts			<#200=39%
				9						
30			3	14			becomes dense, dark olive; moderate HCl reaction, abundant gravel			
				16						
	10			16						
			4	8			becomes medium dense, moist, brown; slight HCl reaction			<#200=18%
				11						
				19						
25			5	8			**Silty SAND (SM)**, dense, moist, yellowish brown, fine SAND; moderate HCl reaction, slight mica			
				16						
	15			27						
			6	13			becomes olive brown, some mica			<#200=35%
				17						
				17						
20			7	19						
				13						
	20			26						
			8	17			becomes olive; strong localized HCl reaction from calcium carbonate stringers, highly mottled colors			<#200=44%
				19						
				16						
15			9	7			becomes medium dense, less mottled			
				7						
				8						
	25			3			become loose; moderate HCl reaction			<#200=30%
			10	5						
				5						
10			11	12			becomes medium dense, strong HCl reaction			
				8						
	30			17						

Report: GP SOIL BA LOG; File: 21013A TOPANGA LAGOON BRIDGE .GPJ; 3/23/2022

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Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-1

Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Blows per 6"	SAMPLES Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
30			12	11 19 25			**[Bedrock (Shale)]** **SHALE**, hard, moist, dark olive gray, low plasticity; moderate HCl reaction, speckled iron oxide staining			
5			13	30 50/4"			**Total Depth = 33.3' bgs** No groundwater observed during drilling Backfilled with cement bentonite grout on 12/20/2021			
35										
0										
40										
-5										
45										
-10										
50										
-15										
55										
-20										
60										
-25										
65										

Report: GP SOIL BA LOG; File: 21013A TOPANGA LAGOON BRIDGE .GPJ; 3/23/2022

Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-2

Sheet 1 of 2

Date(s) Drilled	**12/20/2021**	Logged By	**R. Wakefield**	Checked By	**S. Duke**
Drilling Method	**Hollow Stem Auger**	Drill Bit Size/Type	**8" bullet bit**	Total Depth of Borehole	**31.5 feet**
Drill Rig Type	**CME-75**	Drilling Contractor	**Martini Drilling**	Approximate Surface Elevation	**36 ft msl**
Groundwater Level(s)	**~30 ft bgs**	Sampling Method	**Grab, SPT**	Hammer Data	**Automatic hammer 140 lbs/30" drop**
Borehole Location	**Lat: 34.03946° Long: -118.58359°**	Borehole Completion	**Backfilled with cement-grout via tremie, cuttings spread on site**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Blows per 6"	Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
35	0						**[Undocumented Fill (Afu)]**			
		☒	1				**Clayey SAND (SC)**, dry, brownish gray, fine sand; moderate HCl reaction, sandstone and shale chunks and fragments, occasional coarse gravel			
30	5		2	10 15 17			becomes dense			<#200=31%
			3	7 12 16			**Silty SAND (SM)**, medium dense, moist, fine SAND; slight HCl reaction, highly mottled with layers of material			
25	10		4	8 15 18			**Clayey SAND (SC)**, dense, moist, yellowish brown, fine SAND; slight HCl reaction			<#200=28%
			5	8 15 16			becomes some sandier layers			
20	15		6	22 23 24			becomes moderate HCl reaction			
			7	10 9 16			becomes medium dense, moist, dark olive; moderate HCl reaction, highly mottled with sandstone and shale clasts			<#200=24%
15	20		8	18 31 26			**Silty SAND (SM)**, very dense, moist, gray, fine SAND; slight HCl reaction			
			9	16 20 32			becomes olive brown			<#200=23%
10	25		10	13 10 10			**Clayey SAND (SC)**, medium dense, moist, dark yellowish brown, fine SAND; moderate HCl reaction			
			11	6 7 5			**Silty SAND (SM)**, medium dense, moist, greenish gray, fine SAND; moderate HCl reaction			<#200=23%
	30						▽			

Report: GP SOIL BA LOG; File: 21013A TOPANGA LAGOON BRIDGE .GPJ; 3/23/2022

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Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-2

Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Blows per 6"	SAMPLES Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
	30									
5			12	5 7 4			**[Beach Deposits]** **Silty SAND (SM)**, medium dense, saturated, greenish gray, fine SAND; moderate HCl reaction, common small gravel			
							Total Depth = 31.5' bgs Groundwater observed at ~30' bgs during drilling Backfilled with cement bentonite grout on 12/20/2021			
	35									
0										
	40									
-5										
	45									
-10										
	50									
-15										
	55									
-20										
	60									
-25										
	65									

Report: GP SOIL BA LOG; File: 21013A TOPANGA LAGOON BRIDGE .GPJ; 3/23/2022

Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-3a

Sheet 1 of 1

Date(s) Drilled	**12/20/2021**	Logged By	**R. Wakefield**	Checked By	**S. Duke**
Drilling Method	**Hollow Stem Auger**	Drill Bit Size/Type	**8" bullet bit**	Total Depth of Borehole	**16.5 feet**
Drill Rig Type	**CME-75**	Drilling Contractor	**Martini Drilling**	Approximate Surface Elevation	**32 ft msl**
Groundwater Level(s)	**Not Observed During Drilling**	Sampling Method	**Grab, SPT**	Hammer Data	**Automatic hammer 140 lbs/30" drop**
Borehole Location	**Lat: 34.03921° Long: -118.58350°**	Borehole Completion	**Backfilled with cement-grout via tremie, cuttings spread on site**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Blows per 6"	SAMPLES Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
	0						2" asphalt, 8" base			
							[Undocumented Fill (Afu)] **Sandy SILT (ML)**, dry, brown, nonplastic; slight HCl reaction, occasional small gravel			
30		☒	1							
	5			3						
			2	5			**Clayey SAND with gravel (SC)**, medium dense, mottled dark greenish gray and brown, fine SAND; slight HCl reaction			<#200=19%
25				7						
				15			becomes poor recovery of grayish brown SAND			
			3	12						
	10			10						
				4			**Clayey SAND (SC)**, medium dense, moist, mottled dark greenish gray and brown, fine SAND; slight HCl reaction			<#200=28%
			4	4						
20				15						
				12			**Silty SAND (SM)**, medium dense, moist, yellowish brown, fine SAND; no HCl reaction			
			5	16						
	15			19						
				4			**Clayey SAND (SC)**, medium dense, moist, olive brown, fine SAND; moderate HCl reaction			
			6	5						
15				12			Hollow Stem Auger Refusal at 16.5 ft Move Location 5-ft and Redrill at HSA-3b CONTINUED ON LOG FOR HSA-3b			
	20									
10										
	25									
5										
	30									

Report: GP SOIL BA LOG; File: 21013A TOPANGA LAGOON BRIDGE .GPJ; 3/23/2022

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Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-3b

Sheet 1 of 2

Date(s) Drilled	**12/20/2021**	Logged By	**R. Wakefield**	Checked By	**S. Duke**
Drilling Method	**Hollow Stem Auger**	Drill Bit Size/Type	**8" bullet bit**	Total Depth of Borehole	**31.5 feet**
Drill Rig Type	**CME-75**	Drilling Contractor	**Martini Drilling**	Approximate Surface Elevation	**32 ft msl**
Groundwater Level(s)	**~27 ft bgs**	Sampling Method	**Grab, SPT**	Hammer Data	**Automatic hammer 140 lbs/30" drop**
Borehole Location	**Lat: 34.03921° Long: -118.58350°**	Borehole Completion	**Backfilled with cement-grout via tremie, cuttings spread on site**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Blows per 6"	SAMPLES Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
30	0						SEE LOG FOR HSA-3a			
25	5									
20	10									
15	15									
15							**[Undocumented Fill (Afu)]** **Clayey SAND (SC)**, medium dense, moist, olive brown, fine SAND; moderate HCl reaction			
			7	6 20 26			becomes dense, brown, fine SAND, varying lifts visible including some white sands			
20			8	5 11 16			becomes medium dense			<#200=23%
10			9	5 6 10						
25			10	6 9 22			becomes dense			
5							▽			
			11	9 7 10			**[Beach Deposits]** **Poorly-graded Sand with Clay (SP-SC)**, medium dense, saturated, gray, fine to medium SAND; slight HCl reaction			<#200=8%
30										

Report: GP SOIL BA LOG; File: 21013A TOPANGA LAGOON BRIDGE .GPJ; 3/23/2022

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Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-3b

Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Blows per 6"	SAMPLES Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
	30		12	15 8 8			**Poorly-graded SAND**, medium dense, saturated, gray, fine to coarse SAND, no HCl reaction			
0							**Total Depth = 31.5' bgs** Groundwater observed at ~27' bgs during drilling Backfilled with cement bentonite grout on 12/20/2021			
	35									
-5										
	40									
-10										
	45									
-15										
	50									
-20										
	55									
-25										
	60									
-30										
	65									

Report: GP SOIL BA LOG; File: 21013A TOPANGA LAGOON BRIDGE .GPJ; 3/23/2022

Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-4

Sheet 1 of 2

Date(s) Drilled	**12/20/2021**	Logged By	**R. Wakefield**	Checked By	**S. Duke**
Drilling Method	**Hollow Stem Auger**	Drill Bit Size/Type	**8" bullet bit**	Total Depth of Borehole	**29.0 feet**
Drill Rig Type	**CME-75**	Drilling Contractor	**Martini Drilling**	Approximate Surface Elevation	**35 ft msl**
Groundwater Level(s)	**Not Observed During Drilling**	Sampling Method	**Grab, SPT**	Hammer Data	**Automatic hammer 140 lbs/30" drop**
Borehole Location	**Lat: 34.038804° Long: -118.583594°**	Borehole Completion	**Backfilled with cement-grout via tremie, cuttings spread on site**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Blows per 6"	Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
35	0						**[Undocumented Fill (Afu)]**			
							Silty SAND (SM), dry, brown, fine SAND; moderate HCl reaction			
		☒	1							
30	5		2	3 4 4			becomes loose			<#200=21%
			3	4 12 10			becomes medium dense, yellowish brown, slight HCl reaction, some gray sand layers			
25	10		4	3 4 5			becomes loose, no sand layers			<#200=24%
			5	8 8 7			becomes medium dense			
20	15		6	3 4 4			**Lean CLAY (CL)**, medium stiff, moist, low plasticity; heavily mottled material sandstone and shale fragments with color varieties			
			7	5 9 12			**Clayey SAND (SC)**, medium dense, moist, fine SAND; slight HCl reaction, blocky texture, sandstone clast inclusions			<#200=28%
15	20		8	8 8 11						
			9	3 4 7			becomes gray			
10	25		10	5 5 8			becomes light gray on top and dark gray in middle of sample			<#200=47%
							SILT (ML), stiff, moist, light yellowish brown, nonplastic; no HCl reaction, mottled material with common small sandstone clast inclusions,			
			11	5 7 10			**Lean CLAY (CL)**, very stiff, moist, dark yellowish brown; slight HCl reaction, low plasticity			
							Fat CLAY (CH), very stiff, moist, black; slight HCl reaction, organic rich with strong organic odor, occasional roots			Historic lagoon deposits?
5	30									

Report: GP SOIL BA LOG; File: 21013A TOPANGA LAGOON BRIDGE .GPJ; 3/23/2022

Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-4

Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Blows per 6"	Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
5	30						**Total Depth = 29' bgs** No groundwater observed during drilling Backfilled with cement bentonite grout on 12/20/2021			
0	35									
-5	40									
-10	45									
-15	50									
-20	55									
-25	60									
-30	65									

Report: GP SOIL BA LOG; File: 21013A TOPANGA LAGOON BRIDGE .GPJ; 3/23/2022

Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-5

Sheet 1 of 1

Date(s) Drilled	**12/22/2021**	Logged By	**D. Wahl**	Checked By	**S. Duke**
Drilling Method	**Hollow Stem Auger**	Drill Bit Size/Type	**8" bullet bit**	Total Depth of Borehole	**14.0 feet**
Drill Rig Type	**CME-75**	Drilling Contractor	**Martini Drilling**	Approximate Surface Elevation	**17 ft msl**
Groundwater Level(s)	**~7 ft bgs**	Sampling Method	**Grab, SPT**	Hammer Data	**Automatic hammer 140 lbs/30" drop**
Borehole Location	**Lat: 34.038404° Long: -118.583924°**	Borehole Completion	**Backfilled with cement-grout via tremie, cuttings spread on site**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Blows per 6"	SAMPLES Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
15	0						**[Undocumented Fill (Afu)]** **Sandy Lean CLAY (CL)**, moist, dark brown; occasional cobbles, some gravel to 1" in diameter			
		☒	1							
10	5		2	1 4 4			becomes medium stiff			<#200=59%
5	10		3	5 6 5			▽ becomes stiff, occasional sand layers 2" thick			
							[Beach Deposits] **Poorly-graded beach SAND (SP)**, medium dense, moist, light brown, fine SAND			
0	15		4	3 4 7						<#200=4%
-5			5	4 5 6			becomes brownish gray, coarse SAND			GW@13' rising to about 7' after pulling augers
-10	20						**Total Depth = 14' bgs** Groundwater observed at ~7' bgs during drilling Backfilled with cement bentonite grout on 12/22/2021			
	25									
	30									

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Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-6

Sheet 1 of 2

Date(s) Drilled	**12/21/2021**	Logged By	**R. Wakefield**	Checked By	**S. Duke**
Drilling Method	**Hollow Stem Auger**	Drill Bit Size/Type	**8" bullet bit**	Total Depth of Borehole	**31.5 feet**
Drill Rig Type	**CME-75**	Drilling Contractor	**Martini Drilling**	Approximate Surface Elevation	**37 ft msl**
Groundwater Level(s)	**~30 ft bgs**	Sampling Method	**Grab, SPT**	Hammer Data	**Automatic hammer 140 lbs/30" drop**
Borehole Location	**Lat: 34.03989° Long: -118.58266°**	Borehole Completion	**Backfilled with cement-grout via tremie, cuttings spread on site**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Blows per 6"	Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
37	0						**[Undocumented Fill (Afu)]**			
							Silty SAND (SM), dry, brown, fine SAND; slight HCl reaction			
35		☒	1							
	5			4			becomes medium dense			<#200=34%
			2	10						
30				16						
				13			becomes dense, olive yellow; no HCl reaction, siltier material at top of sample			
			3	25						
	10			22						
				5			**Clayey SAND (SC)**, medium dense, moist, olive, fine SAND; slight HCl reaction, highly mottled, iron-oxide staining			<#200=25%
			4	7						
25				16						
				21			becomes very dense, cored and broken up big gray rock fragment			
			5	40						
	15			20						
				9			**Silty SAND (SM)**, dense, moist, very dark gray, fine SAND; slight HCl reaction			<#200=28%
			6	11						
20				20						
				21			becomes medium dense, dark gray, with occasional cobble sized rock fragments			
			7	20						
	20			7						
				2			**SILT (ML)**, medium stiff, moist, dark greenish gray, nonplastic			
			8	3						
				4			**Clayey SAND (SC)**, loose, moist, black, fine SAND; slight HCl reaction with associated strong H2S odor, strong organic odor			
15							becomes dark greenish gray, less organic odor, roots			<#200=46%
			9	2						
				3						
	25			5						
				2			becomes black, more organic			
			10	3						
10				3						
				5			becomes medium dense, dark gray, with alternating sandy clay and clayey sand layers			
			11	10						
	30			9						

▽

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Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-6

Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Blows per 6"	SAMPLES Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
30			12	17 25 20			**[Beach Deposits]** **Poorly-graded SAND with silt (SP-SM)**, dense, saturated, dark gray, fine to coarse SAND			
5							**Total Depth = 31.5' bgs** Groundwater observed at ~30' bgs during drilling Backfilled with cement bentonite grout on 12/21/2021			
	35									
0										
	40									
-5										
	45									
-10										
	50									
-15										
	55									
-20										
	60									
-25										
	65									

Report: GP SOIL BA LOG; File: 21013A TOPANGA LAGOON BRIDGE .GPJ; 3/23/2022

Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-7

Sheet 1 of 1

Date(s) Drilled	**12/21/2021**	Logged By	**R. Wakefield**	Checked By	**S. Duke**
Drilling Method	**Hollow Stem Auger**	Drill Bit Size/Type	**8" bullet bit**	Total Depth of Borehole	**26.5 feet**
Drill Rig Type	**CME-75**	Drilling Contractor	**Martini Drilling**	Approximate Surface Elevation	**34 ft msl**
Groundwater Level(s)	**Not Observed During Drilling**	Sampling Method	**Grab, SPT**	Hammer Data	**Automatic hammer 140 lbs/30" drop**
Borehole Location	**Lat: 34.03955° Long: -118.58275°**	Borehole Completion	**Backfilled with cement-grout via tremie, cuttings spread on site**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	SAMPLES Blows per 6"	SAMPLES Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
30	0						3/4" asphalt, 7" base			
							[Undocumented Fill (Afu)]			
		☒	1				**Silty SAND (SM)**, dry, yellowish brown, fine SAND; moderate HCl reaction, occasional medium gravel			
25	5	▨	2	5 15 18			becomes dense, dark yellowish brown, mottled, clast inclusions, abundant gravel			
		▨	3	18 17 18			becomes more highly mottled with abundant clasts of sandstone and shale with variety of colors, slight HCl reaction			<#200=21%
20	10	▨	4	10 20 16						
		▨	5	11 14 20						
15	15	▨	6	6 17 40			becomes very dense, moist; highly mottled with variable colors			<#200=26%
		▨	7	13 25 22			**Clayey SAND (SC)**, dense, moist, very dark gray, fine SAND; no HCl reaction, some gravel			
10	20	▨	8	22 13 7			becomes medium dense, yellowish brown, slight HCl reaction			<#200=23%
		▨	9	8 14 22			becomes dense, dark olive; mottled with variable colors			
5	25	▨	10	6 8 9			becomes medium dense, very dark green, fine SAND; iron-oxide stained stringers, gray sand at top of sample, less mottled			<#200=21%
							Total Depth = 26.5' bgs No groundwater observed during drilling Backfilled with cement bentonite grout on 12/21/2021			
0	30									

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Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-8

Sheet 1 of 1

Date(s) Drilled	**12/22/2021**	Logged By	**D. Wahl**	Checked By	**S. Duke**
Drilling Method	**Hollow Stem Auger**	Drill Bit Size/Type	**8" bullet bit**	Total Depth of Borehole	**26.5 feet**
Drill Rig Type	**CME-75**	Drilling Contractor	**Martini Drilling**	Approximate Surface Elevation	**33 ft msl**
Groundwater Level(s)	**Not Observed During Drilling**	Sampling Method	**Grab, SPT**	Hammer Data	**Automatic hammer 140 lbs/30" drop**
Borehole Location	**Lat: 34.039427° Long: -118.582869°**	Borehole Completion	**Backfilled with cement-grout via tremie, cuttings spread on site**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Blows per 6"	Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
	0						3" asphalt, 3" base			
							[Undocumented Fill (Afu)]			
							Clayey SAND (SC), moist, dark brown, fine SAND; cobble near surface, occasional subangular gravel			
30		☒	1							
	5			7			becomes medium dense			
			2	9						
				10						
25			3	8			becomes discs of intact sandstone, very weak to friable, massive			<#200=27%
				5						
	10			6						
			4	13						No Recovery
				8						
				8						
20			5	11			**Silty SAND (SM)**, dense, moist, light brown, fine SAND; mottled with black and orange, occasional gravel and cobble			<#200=30%
				16						
				16						
	15			13			**Clayey SAND (SC)**, medium dense, moist, light orangish brown, fine SAND; chunks of intact very strong sandstone			
			6	15						
				10						
15			7	9			becomes dark brown			<#200=24%
				15						
				15						
	20			7			becomes light brown			
			8	10						
				7						
10			9	17			becomes dense			<#200=18%
				19						
				14						
	25			9			becomes medium dense, ~6" of recovery (upper sample)			
			10	8						
				10						
5							**Total Depth = 26.5' bgs**			
							No groundwater observed during drilling			
							Backfilled with cement bentonite grout on 12/22/2021			
	30									

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Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-M1

Sheet 1 of 2

Date(s) Drilled	**12/21/2021**	Logged By	**R. Wakefield**	Checked By	**S. Duke**
Drilling Method	**Hollow Stem Auger**	Drill Bit Size/Type	**8" bullet bit**	Total Depth of Borehole	**50.8 feet**
Drill Rig Type	**CME-75**	Drilling Contractor	**Martini Drilling**	Approximate Surface Elevation	**38 ft msl**
Groundwater Level(s)	**~30 ft bgs**	Sampling Method	**Bulk, Grab, Mod Cal, SPT**	Hammer Data	**Automatic hammer 140 lbs/30" drop**
Borehole Location	**Lat: 34.039925° Long: -118.582523°**	Borehole Completion	**Backfilled with cement-grout via tremie, cuttings spread on site**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Blows per 6"	Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
35	0		Bulk-1				**[Undocumented Fill (Afu)]** **Silty SAND (SM)**, dry, reddish brown, fine SAND; slight HCl reaction, occasional silt clumps			Bulk-1: CORR
30	5		1	14 19 50/4"			**Clayey SAND (SC)**, very dense, moist, olive, fine SAND; slight HCl reaction, common gravel and variable	7	113.0	<#200=26%
25	10		2	11 19 18			becomes dense, yellowish brown; abundant sandstone and shale clasts, abundant gravel and rocks			SA:G=36% S=43% F=21%
20	15		3	19 25 31			becomes moderate HCl reaction, strong localized HCl reaction from calcium carbonate stringers, abundant fine gravel			<#200=20.7% DS
15	20		4	8 9 24			**Lean CLAY (CL)** with silt and sand layers, hard, moist, greenish gray, medium plasticity, strong localized HCl reaction from calcium carbonate stringers, mottled materials and colors			LL=28 PI=15
10	25		5	15 50/2"			becomes dark olive, less sand and silt layers, moderate HCl reaction, large rock in sampler shoe	11	99.0	
	30									

Report: GP SOIL BA LOG; File: 21013A TOPANGA LAGOON BRIDGE .GPJ; 3/21/2022

Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-M1

Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES Type	Number	Blows per 6"	Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
	30						**[Beach Deposits]**			
			6	3 4 8			**Poorly-graded SAND (SP)**, medium dense, saturated, fine to medium SAND, no HCl reaction			
5										
	35		7	32 50/4"			becomes very dense, dark yellowish brown, fine to coarse SAND, abundant small to large gravel,			DS
0										
	40		8	4 13 22			**Poorly-graded SAND with silt (SP-SM)**, dense, saturated, medium gray (salt and pepper), fine SAND, no HCl reaction, with no gravel			<#200=5.5%
-5										
	45		9	18 31 50/3"			becomes very dense, olive brown	19	112.3	
-10										
	50		10	34 50/3"			Alternating layers of **Silty SAND (SM)** and **Poorly-sorted SAND with gravel (SP)** , very dense, saturated, fine to coarse SAND, no HCl reaction			
							Total Depth = 50.75' bgs Groundwater observed at ~30' bgs during drilling Backfilled with cement bentonite grout on 12/21/2021			
-15										
	55									
-20										
	60									
-25										
	65									

Report: GP SOIL BA LOG; File: 21013A TOPANGA LAGOON BRIDGE .GPJ; 3/21/2022

Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-M2

Sheet 1 of 2

Date(s) Drilled	**12/21/2021**	Logged By	**R. Wakefield**	Checked By	**S. Duke**
Drilling Method	**Hollow Stem Auger**	Drill Bit Size/Type	**8" bullet bit**	Total Depth of Borehole	**50.8 feet**
Drill Rig Type	**CME-75**	Drilling Contractor	**Martini Drilling**	Approximate Surface Elevation	**38 ft msl**
Groundwater Level(s)	**~30 ft bgs**	Sampling Method	**Bulk, Grab, Mod Cal, SPT**	Hammer Data	**Automatic hammer 140 lbs/30" drop**
Borehole Location	**Lat: 34.039982° Long: -118.581986°**	Borehole Completion	**Backfilled with cement-grout via tremie, cuttings spread on site**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Blows per 6"	Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
35	0						Surface: covered by dead leaves, twigs, bark and branches **[Undocumented Fill (Afu)]** **Lean CLAY (CL)**, moist, medium plasticity; moderate HCl reaction, large sandstone clasts up to 3" in diameter.			
30	5			7 20 24			becomes hard	8	101.2	
25	10			7 10 17			**Clayey SAND (SC)**, medium dense, moist, reddish brown, fine SAND; slight HCl reaction			<#200=17.9%
20	15			16 27 46			becomes dense, yellowish brown, mottled colors and material			LL=26 PI=9 DS
15	20			11 16 12			becomes medium dense, brown, moderate HCl reaction			SA:G=25% S=40% F=35%
10	25			11 34 22			**[Beach Deposits]** **Sandy SILT (ML)**, hard, moist, nonplastic; no HCl reaction	10	112.6	DS
	30									

Report: GP SOIL BA LOG; File: 21013A TOPANGA LAGOON BRIDGE .GPJ; 3/21/2022

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Project: Topanga Lagoon Restoration
Project Location: Malibu, CA
Project Number: 21013A

Log of HSA-M2

Sheet 2 of 2

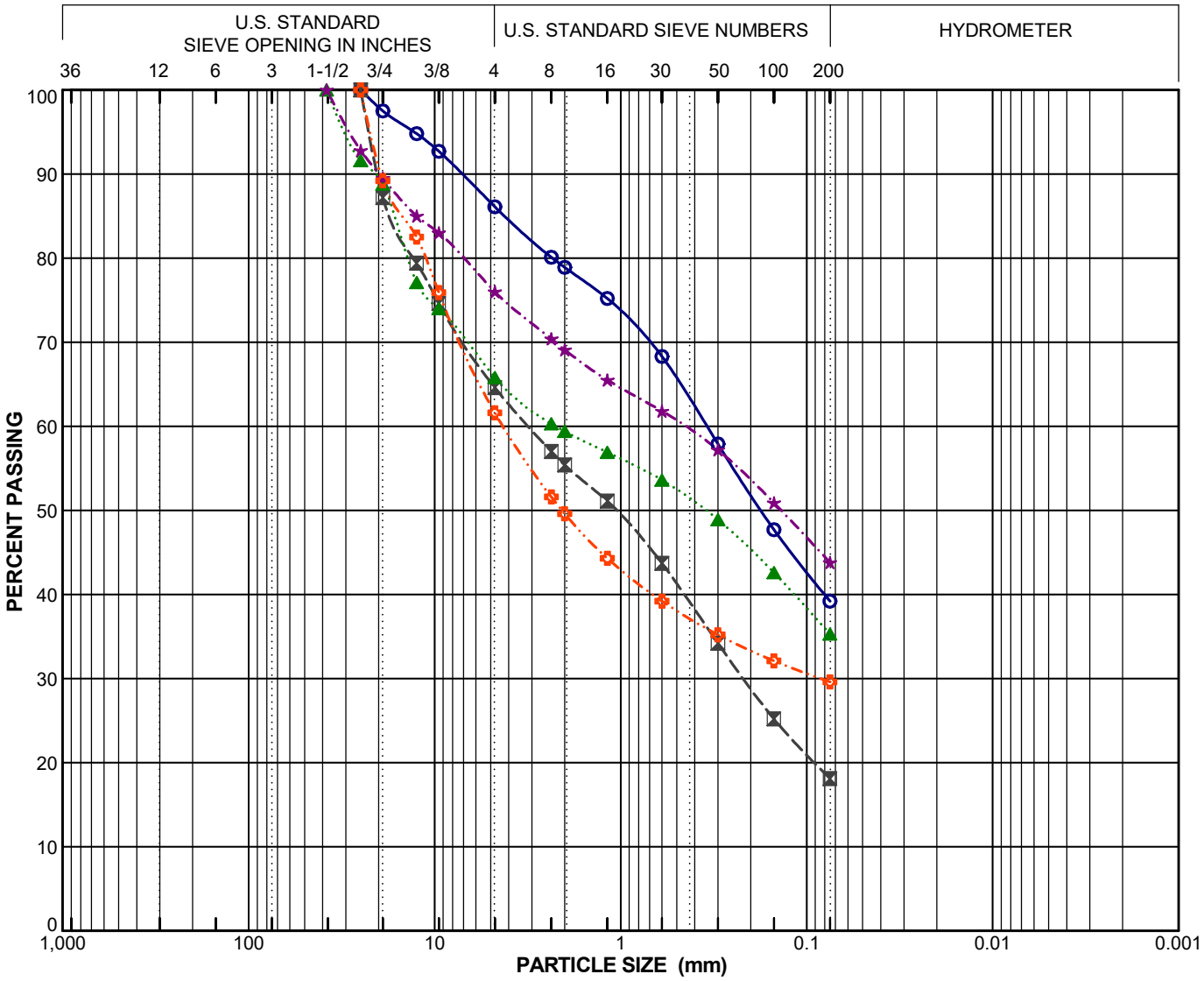
Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Blows per 6"	Recovery	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS
	30			4 6 6			**Poorly-graded SAND with silt (SP-SM)**, medium dense, saturated, yellowish brown, fine SAND; slight HCl reaction, iron oxide stained grains			<#200=11.9%
5										
	35			7 19 37			**Poorly-graded SAND (SP)**, dense, saturated, dark gray, fine to medium SAND, no HCL reaction, no iron oxide staining			DS
0										
	40			5 15 24			becomes fine to coarse SAND			
-5										
	45			19 42 40			becomes very dense, siltier zones a few inches thick	14	120.8	
-10										
	50			16 50/3"						
							Total Depth = 50.75' bgs Groundwater observed at ~30' bgs during drilling Backfilled with cement bentonite grout on 12/21/2021			
-15										
	55									
-20										
	60									
-25										
	65									

Report: GP SOIL BA LOG; File: 21013A TOPANGA LAGOON BRIDGE .GPJ; 3/21/2022

APPENDIX C

2021 Laboratory Tests

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



Symbol	Boring Number	Sample Number	Depth (feet)	Field Moisture (%)	LL	PI	Activity PI/-2μ	C_u	C_c	Passing No. 200 Sieve (%)	Passing 2μ (%)	USCS
○	HSA-1	2	5.0							39		SC/SM
⊠	HSA-1	4	10.0							18		SC/SM
▲	HSA-1	6	15.0							35		SC/SM
★	HSA-1	8	20.0							44		SC/SM
✿	HSA-1	10	25.0							30		SC/SM

PARTICLE SIZE DISTRIBUTION

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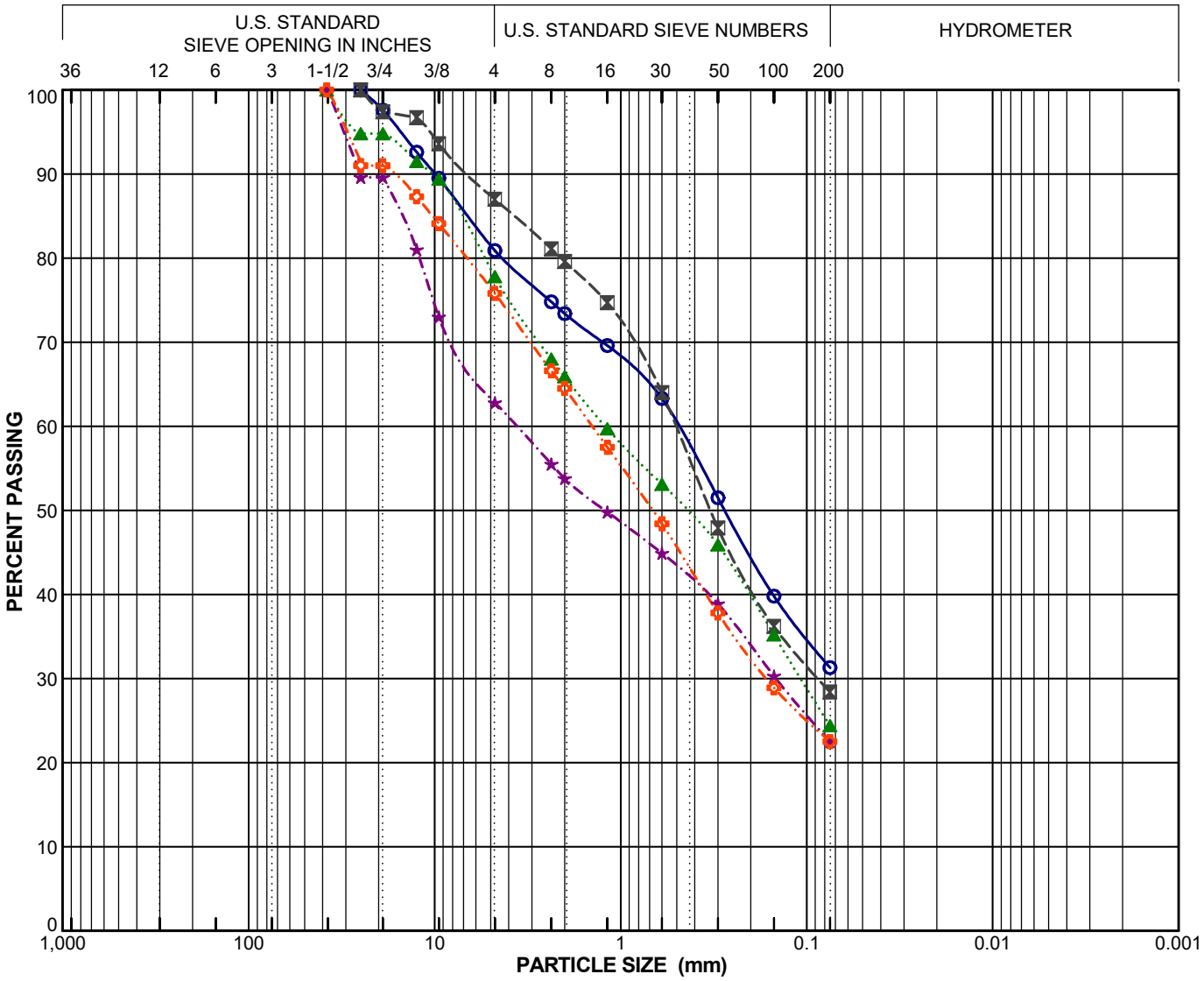
PROJECT NO. 19122-03

NMG Geotechnical, Inc.

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



Symbol	Boring Number	Sample Number	Depth (feet)	Field Moisture (%)	LL	PI	Activity PI/-2μ	C_u	C_c	Passing No. 200 Sieve (%)	Passing 2μ (%)	USCS
○	HSA-2	2	5.0							31		SC/SM
⊠	HSA-2	4	10.0							28		SC/SM
▲	HSA-2	7	17.5							24		SC/SM
★	HSA-2	9	22.5							23		SC/SM
✿	HSA-2	11	27.5							23		SC/SM

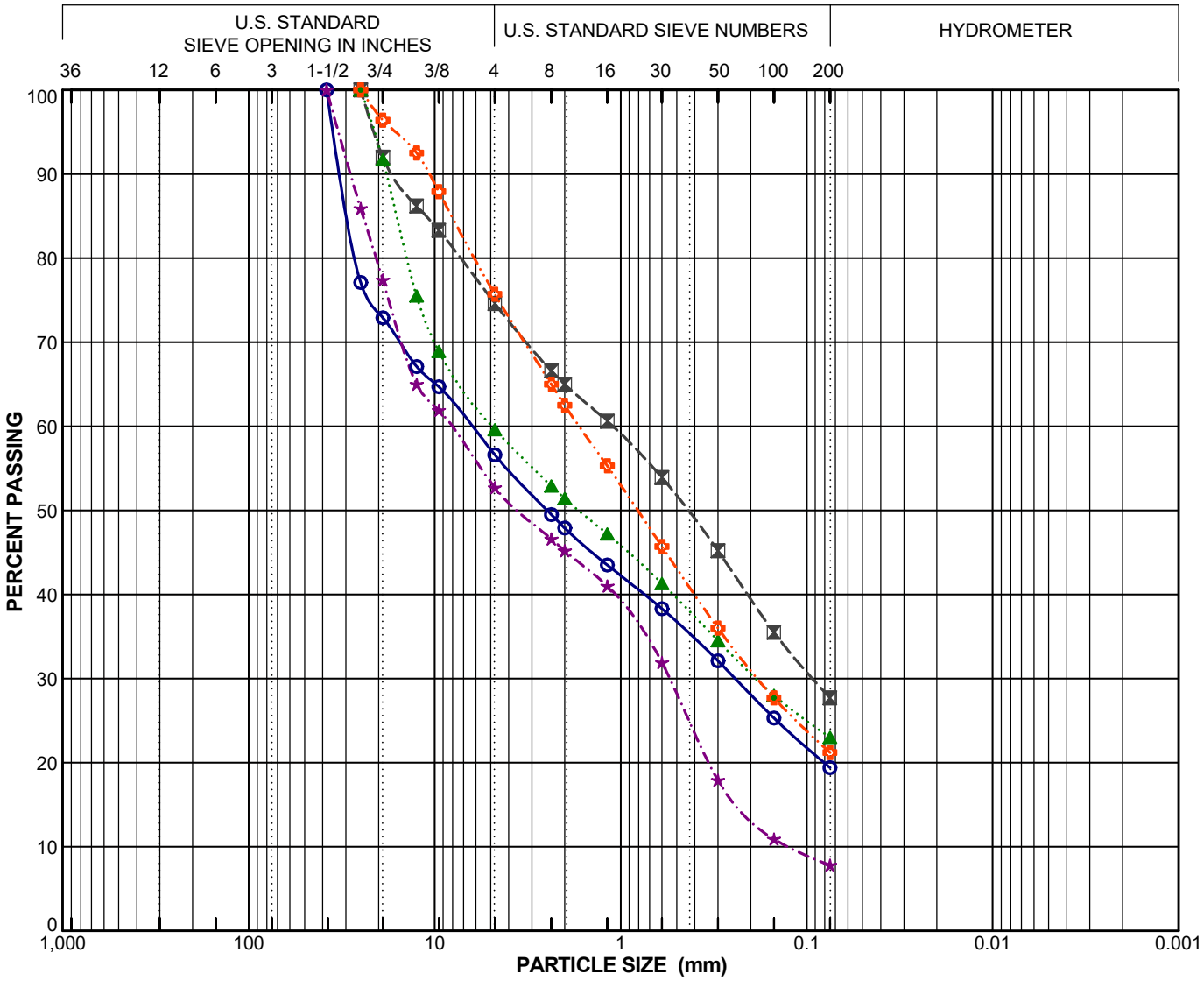
PARTICLE SIZE DISTRIBUTION

Geopentech / RCDSMM Topanga Lagoon Bridge (21013A)

PROJECT NO. 19122-03

NMG Geotechnical, Inc.

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



Symbol	Boring Number	Sample Number	Depth (feet)	Field Moisture (%)	LL	PI	Activity PI/-2μ	C_u	C_c	Passing No. 200 Sieve (%)	Passing 2μ (%)	USCS
○	HSA-3	2	5.0							19		SC/SM
⊠	HSA-3	4	10.0							28		SC/SM
▲	HSA-3	8	20.0							23		SC/SM
★	HSA-3	11	27.5					67.1	0.3	8		SP-SC
✿	HSA-4	2	5.0							21		SC/SM

PARTICLE SIZE DISTRIBUTION

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PROJECT NO. 19122-03

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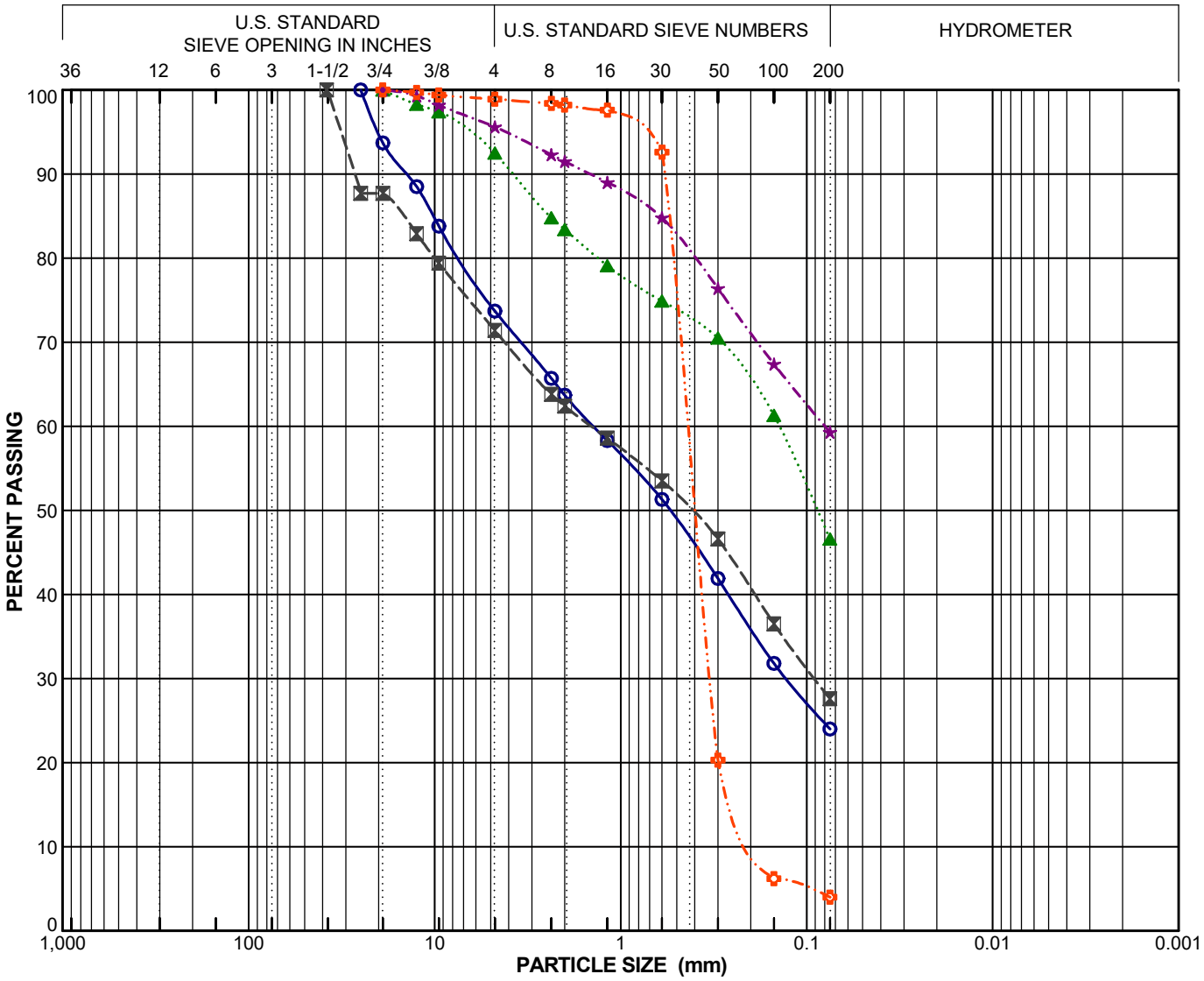
BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



Symbol	Boring Number	Sample Number	Depth (feet)	Field Moisture (%)	LL	PI	Activity PI/-2μ	C_u	C_c	Passing No. 200 Sieve (%)	Passing 2μ (%)	USCS
○	HSA-4	4	10.0							24		SC/SM
⊠	HSA-4	7	17.5							28		SC/SM
▲	HSA-4	10	25.0							47		SC/SM
★	HSA-5	2	5.0							59		CL/ML
✿	HSA-5	4	10.0					2.4	1.4	4		SP

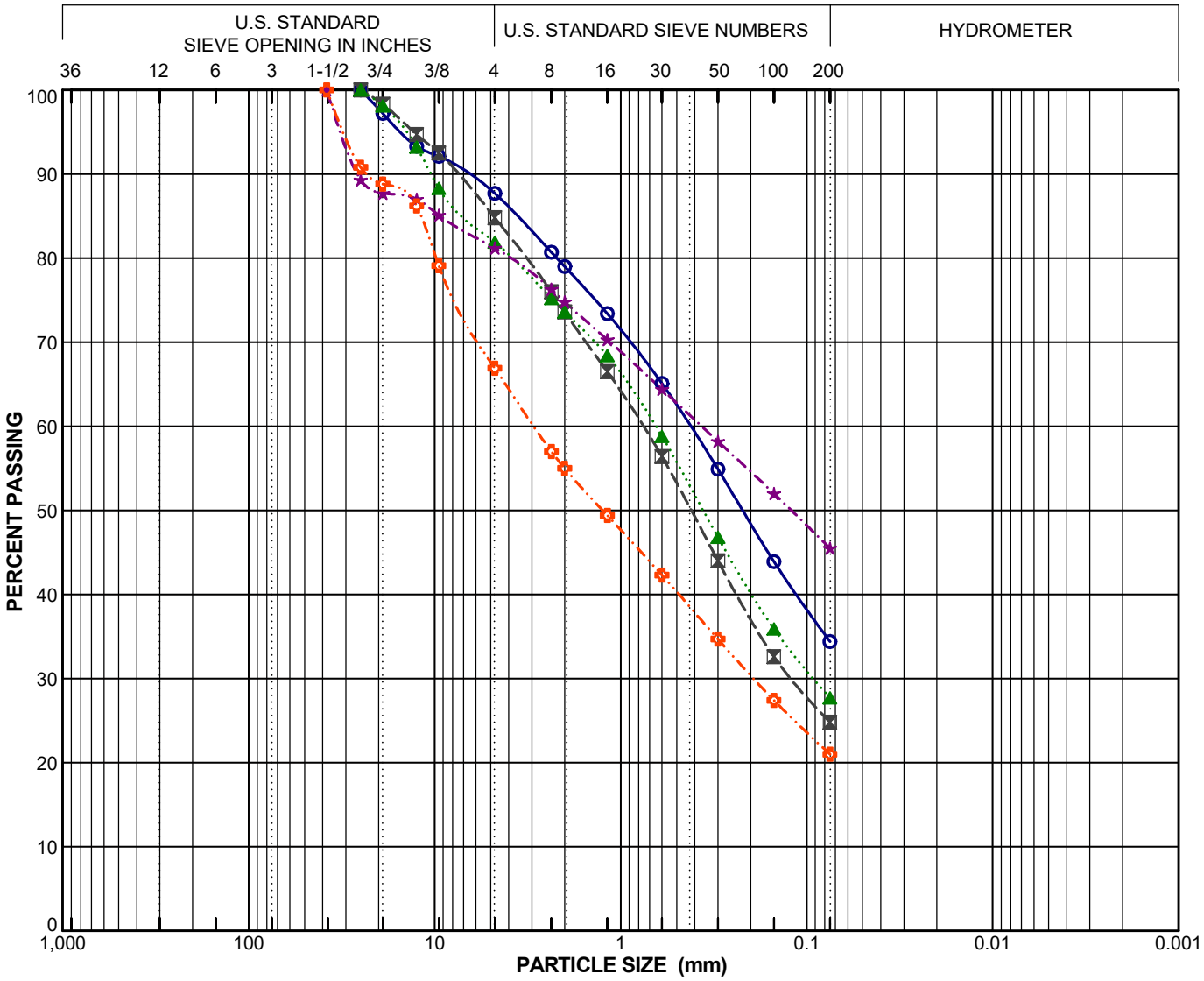
PARTICLE SIZE DISTRIBUTION

Geopentech / RCDSMM Topanga Lagoon Bridge (21013A)

PROJECT NO. 19122-03

NMG Geotechnical, Inc.

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



Symbol	Boring Number	Sample Number	Depth (feet)	Field Moisture (%)	LL	PI	Activity PI/-2μ	C_u	C_c	Passing No. 200 Sieve (%)	Passing 2μ (%)	USCS
○	HSA-6	2	5.0							34		SC/SM
⊠	HSA-6	4	10.0							25		SC/SM
▲	HSA-6	6	15.0							28		SC/SM
★	HSA-6	9	22.5							46		SC/SM
✿	HSA-7	3	7.5							21		SC/SM

PARTICLE SIZE DISTRIBUTION

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PROJECT NO. 19122-03

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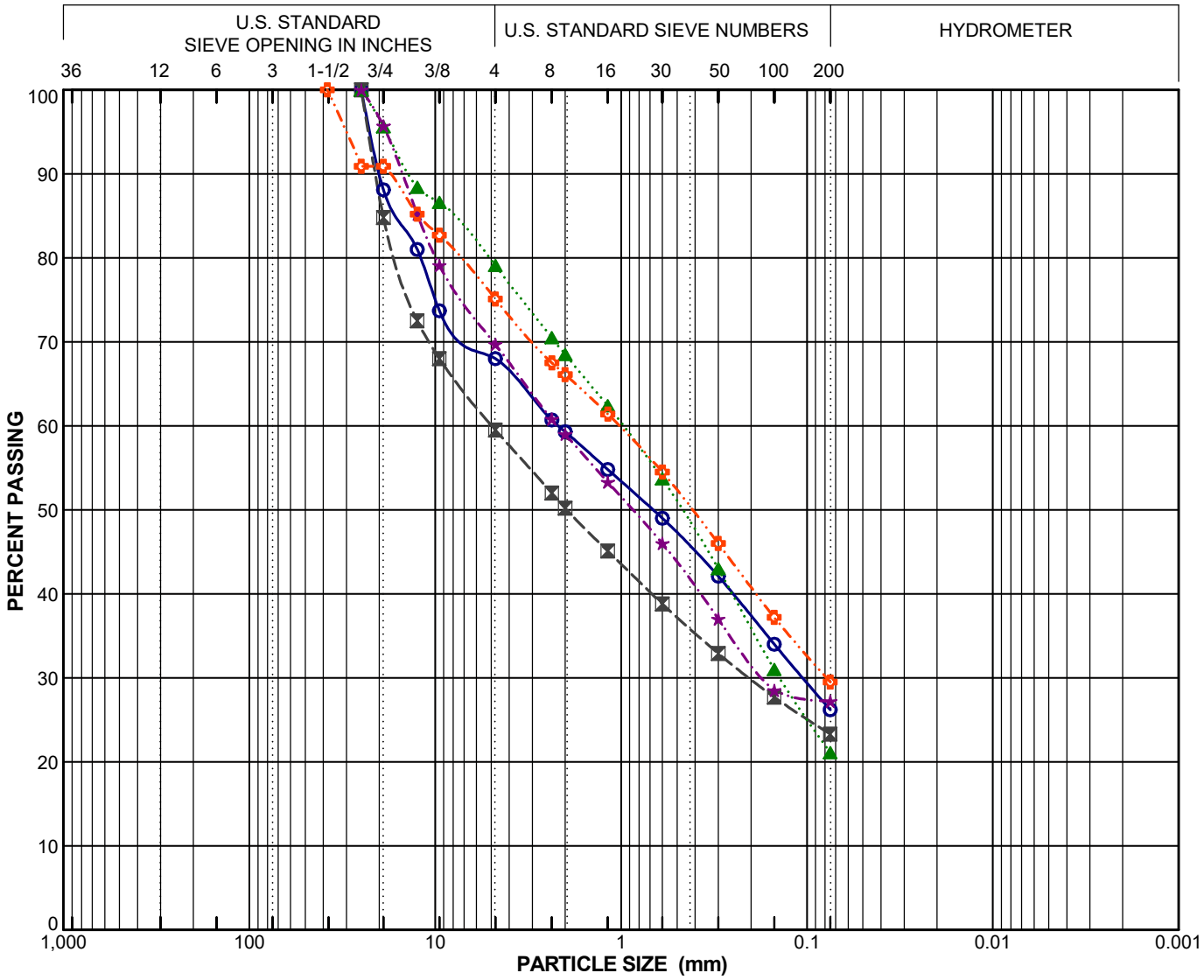
BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



Symbol	Boring Number	Sample Number	Depth (feet)	Field Moisture (%)	LL	PI	Activity PI/-2μ	C_u	C_c	Passing No. 200 Sieve (%)	Passing 2μ (%)	USCS
○	HSA-7	6	15.0							26		SC/SM
⊠	HSA-7	8	20.0							23		SC/SM
▲	HSA-7	10	25.0							21		SC/SM
★	HSA-8	3	7.5							27		SC/SM
✿	HSA-8	5	12.5							30		SC/SM

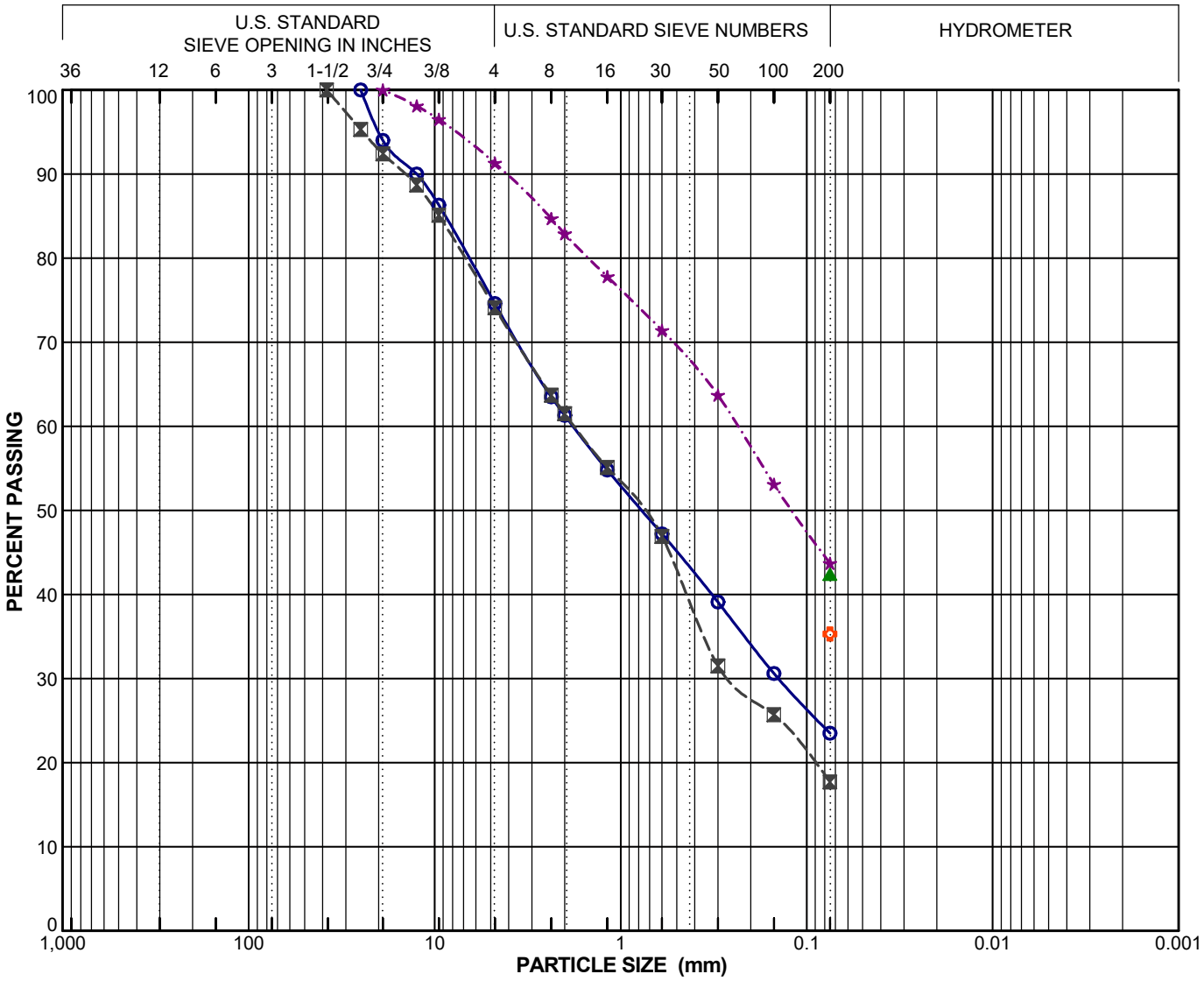
PARTICLE SIZE DISTRIBUTION

Geopentech / RCDSMM Topanga Lagoon Bridge (21013A)

PROJECT NO. 19122-03

NMG Geotechnical, Inc.

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



Symbol	Boring Number	Sample Number	Depth (feet)	Field Moisture (%)	LL	PI	Activity PI/-2μ	C_u	C_c	Passing No. 200 Sieve (%)	Passing 2μ (%)	USCS
○	HSA-8	7	17.5							24		SC/SM
⊠	HSA-8	9	22.5							18		SC/SM
▲	HSA-S1	1	5.0		31	15				42		SC
★	HSA-S1	3	15.0		31	15				44		SC
✿	HSA-S1	7	35.0		29	13				35		SC

PARTICLE SIZE DISTRIBUTION

Geopentech / RCDSMM Topanga Lagoon Bridge (21013A)

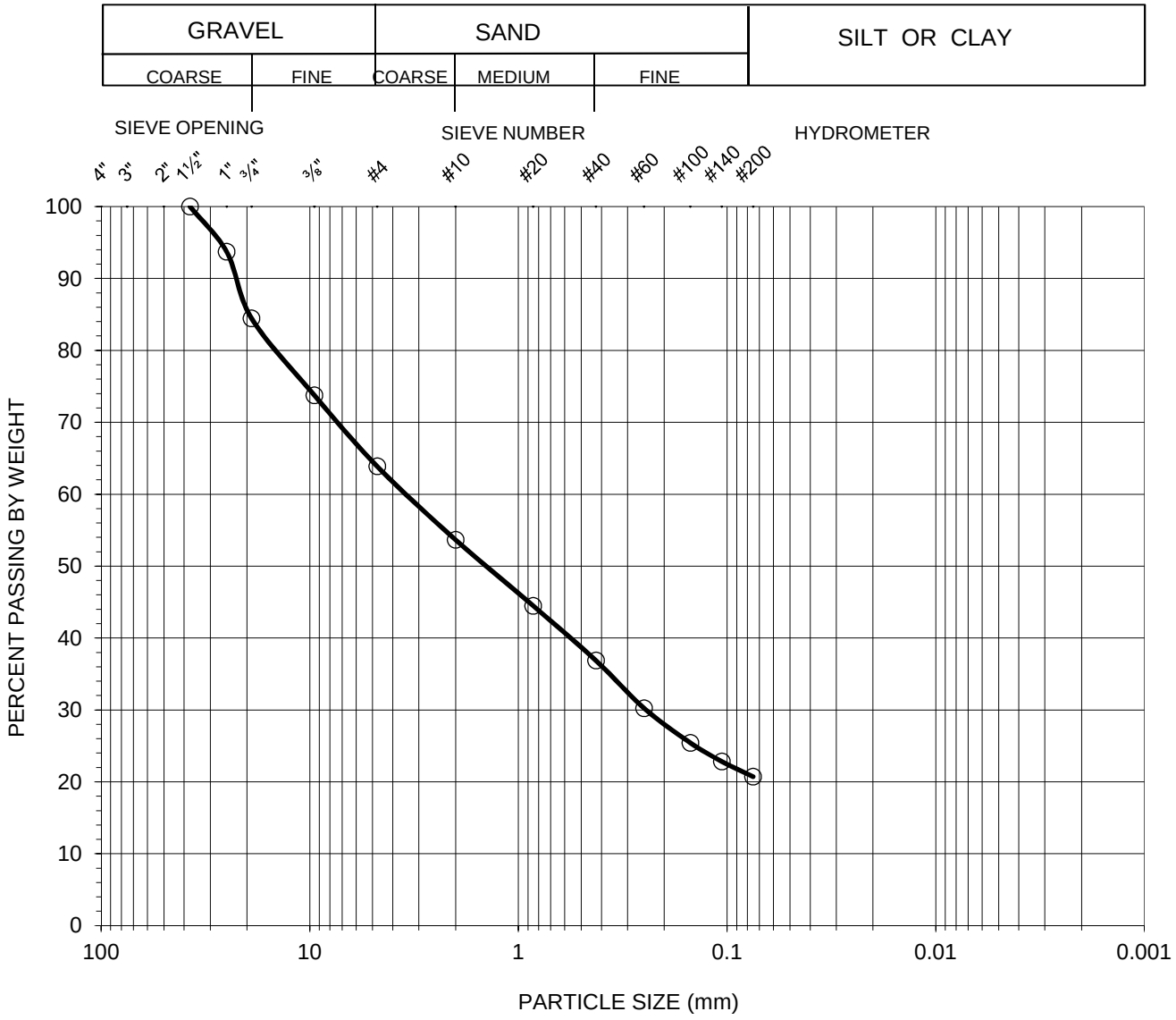
PROJECT NO. 19122-03

NMG Geotechnical, Inc.

AP Engineering and Testing, Inc.
DBE|MBE|SBE
2607 Pomona Boulevard | Pomona, CA 91768
t. 909.869.6316 | f. 909.869.6318 | www.aplaboratory.com

GRAIN SIZE DISTRIBUTION CURVE
ASTM D 6913

Client Name: GeoPentech — Tested by: TV — Date: 02/16/22
Project Name: RCDSMM - Topanga Lagoon Bridge — Computed by: NR — Date: 02/16/22
Project No.: 21013A — Checked by: AP — Date: 02/17/22



Symbol	Boring No.	Sample No.	Sample Depth (feet)	Percent			Atterberg Limits LL:PL:PI	Soil Type U.S.C.S
				Gravel	Sand	Silt & Clay		
○	HSA-M1	2	10	36	43	21	N/A	SM

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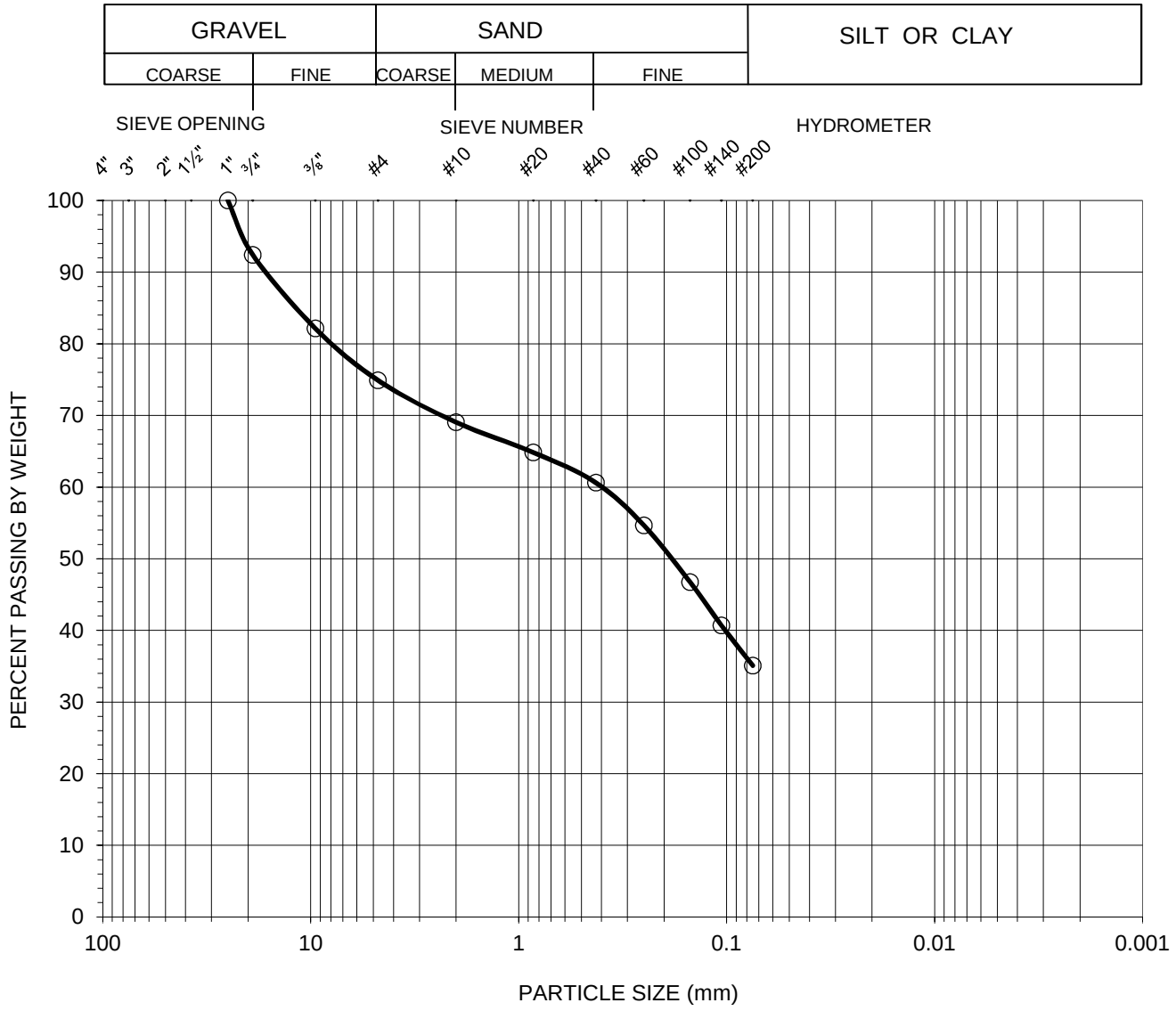

Symbol	Boring No.	Sample No.	Sample Depth (feet)	Percent			Atterberg Limits LL:PL:PI	Soil Type U.S.C.S
				Gravel	Sand	Silt & Clay		
○	HSA-M2	4	20	25	40	35	N/A	SC*

**Note: Based on visual classification of sample*

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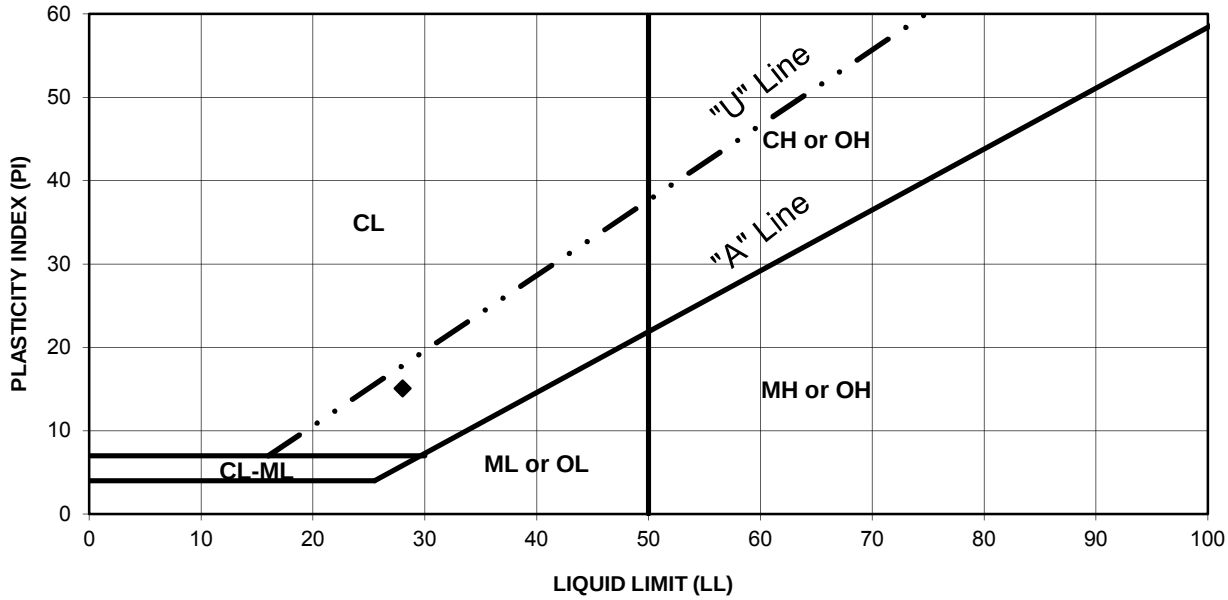
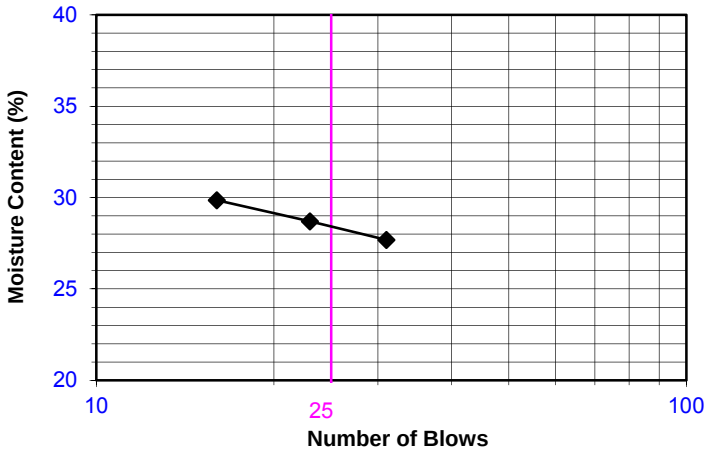
ATTERBERG LIMITS
ASTM D 4318

Client Name:	GeoPentech	Tested By:	DK	Date:	02/14/22
Project Name:	RCDSMM - Topanga Lagoon Bridge	Computed By:	NR	Date:	02/16/22
Project No.:	21013A	Checked By:	AP	Date:	02/17/22



PROCEDURE USED

- ☐ Wet Preparation
- ☒ Dry Preparation
- ☒ Procedure A Multipoint Test
- ☐ Procedure B One-point Test



Symbol	Boring Number	Sample Number	Depth (feet)	LL	PL	PI	Plasticity Chart Symbol
♦	HSA-M1	4	20	28	13	15	CL

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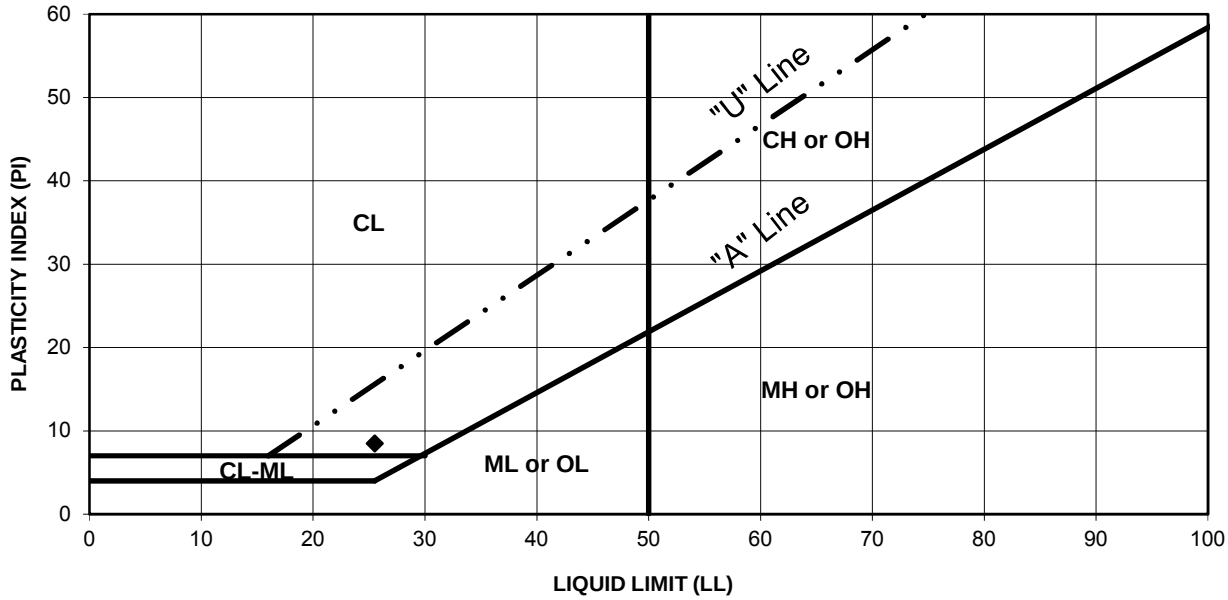
ATTERBERG LIMITS
ASTM D 4318

Client Name:	GeoPentech	Tested By:	DK	Date:	02/14/22
Project Name:	RCDSMM - Topanga Lagoon Bridge	Computed By:	NR	Date:	02/16/22
Project No.:	21013A	Checked By:	AP	Date:	02/17/22



PROCEDURE USED

- ☐ Wet Preparation
- ☒ Dry Preparation
- ☒ Procedure A Multipoint Test
- ☐ Procedure B One-point Test

Symbol	Boring Number	Sample Number	Depth (feet)	LL	PL	PI	Plasticity Chart Symbol
♦	HSA-M2	3	15	26	17	9	CL

Appendix H

Surf Quality Impact Assessment for Topanga Lagoon Restoration (Integral 2023)

The Appendices herein contain supporting information. These Appendices contain highly detailed figures and other graphic information, which are difficult to translate for screen reading software; therefore, the Appendices have not been translated into an auditory format. If you have a disability and/or have difficulty accessing any material in this document, please contact us by mail, email, or telephone, and we will work with you to make all reasonable accommodations. Please indicate 1) the nature of the accessibility need; 2) your preferred format; 3) the material you are trying to access and its location within this document; and 4) how to reach you if questions arise while fulfilling your request. You can direct your requests to:

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Topanga Surf Quality Impact Assessment Report

Topanga Lagoon Restoration Project

Prepared for

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November 10, 2023

CONTENTS

LIST OF FIGURES ..... **iv**
LIST OF TABLES ..... **vi**
ACRONYMS AND ABBREVIATIONS ..... **vii**
EXECUTIVE SUMMARY ..... **viii**
1 Introduction **1-1**
2 Surf Focus Group Survey **2-1**
2.1 SAMPLING PROCESS 2-1
2.1.1 Respondent Demographics 2-2
2.1.2 Economic Value of Surf Visits by Survey Respondents 2-3
2.1.3 Critical Components and Optimal Conditions Sampling 2-3
2.2 PREFERRED SURFING CONDITONS 2-5
2.2.1 Swell Size 2-6
2.2.2 Swell Period 2-6
2.2.3 Swell Direction 2-6
2.2.4 Tide Height and Direction 2-7
2.2.5 Takeoff Location 2-7
2.2.6 Lagoon Entrance Conditions 2-8
2.3 OPINIONS ON PROJECT IMPACTS 2-9
2.3.1 Surfer Perceptions of Lagoon Entrance Impacts 2-9
2.3.2 Perceptions of Impacts on Surfing 2-10
2.3.3 Opinions of Project Impacts on Access 2-11
2.4 SUMMARY 2-12
3 Surf Quality Modeling Analysis **3-1**
3.1 SURF ANALYSIS METHODOLOGY 3-1
3.1.1 Wave Peel Angle Definition 3-2
3.1.2 Surf Wave Model 3-3
3.1.3 Peel Angle Calculation 3-4
3.2 SURF MODEL SCENARIOS 3-6
3.2.1 Wave Cases 3-6
3.2.2 Existing Surf Conditions 3-7
3.2.3 Project Alternatives 3-8
3.2.4 Surf Model Scenarios 3-10
3.3 SURF MODEL RESULTS 3-11

3.3.1 Alternative 2 3-11
3.3.2 Alternative 4 3-14
3.3.3 Sea Level Rise 3-16
3.4 SURF MODEL CONCLUSIONS 3-18
4 References 4-1

LIST OF FIGURES

Figure 1. Overview of Project area and surf break around Topanga Point and Topanga Creek Lagoon.
Figure 2. Surfer respondent age distribution.
Figure 3. Surf survey results of the importance of surfing visit attributes.
Figure 4. Surf survey results of factors affecting surf quality.
Figure 5. Surf survey results of optimal swell direction for Topanga based on number of responses.
Figure 6. Surf survey results of primary takeoff location.
Figure 7. Perception of the Topanga Lagoon Restoration Project impacts.
Figure 8. Surfer perceptions of Project impact on surf quality.
Figure 9. Perception of Project impact on access.
Figure 10. Overview of site with structures and important features along the point break.
Figure 11. (*Left*) Depiction of the peel angle (α) (from Mendonça et al. 2012) and (*Right*) a simplified schematic of peel angle (α) and definition of wave peel speed, wave propagation speed, and surf speed.
Figure 12. Snapshot of wave breaking from XBeach surf model (a) and composite breaking map over the entire model simulation (b) with the wave path (blue dashed line in b) delineated the "whitewater" region of the surf zone.
Figure 13. Example peel angle calculation (red angle; 55 degrees) for an individual wave with the wave path (dashed line) and wave crest (solid line) shown.
Figure 14. Peel angle results for three wave cases (1 is blue, 2 is orange, and 3 is green) with existing bathymetric conditions. The model-computed peel angle alongshore is shown (dots) with a smoothed trend line (solid line) and with key landmarks for reference, including turning, restrooms, 2nd, and 3rd stairs (vertical lines).
Figure 15. Example of the bathymetric change (comparing Alternative 2 and Alternative 1) for the 100-year flood event 1-year post-construction.
Figure 16. Peel angle after a 100-year flood event 1 year post-construction (upper panel) and 5 years post-construction (lower panel) for the southern, long period swell (Wave Case 1) for Alternative 1 (no change) and Alternative 2.
Figure 17. Peel angle after dry conditions 1-year post-construction (upper panel) and 5 years post-construction (lower panel) for the southern, long period swell (Wave Case 1) for Alternative 1 (no change) and Alternative 2.
Figure 18. Peel angle after a 100-year flood event 1-year post-construction for the large western waves (Wave Case 3) for Alternative 1 (no change) and Alternative 2.
Figure 19. Peel angle after dry conditions 1-year post-construction for the large western waves (Wave Case 3) for Alternative 1 (no change) and Alternative 2.
Figure 20. Peel angle after a 100-year flood event 1 year post-construction (upper panel) and 5 years post-construction (lower panel) for the southern, long period swell (Wave Case 1) for Alternative 1 (no change) and Alternative 4.

Figure 21. Peel angle after a 100-year flood event 1-year post-construction for large western waves (Wave Case 3) for Alternative 1 (no change) and Alternative 4.
Figure 22. Peel angle with 1.6 ft SLR compared with existing conditions.
Figure 23. Wave breaking composite map shown for Wave Case 1 and with 1.6 ft of SLR.
Figure 24. Wave breaking composite map shown for Wave Case 1 and with 6.6 ft of SLR.

LIST OF TABLES

Table 1. Model Wave Cases as Determined from the Surf Focus Group.
Table 2. Summary of Modeling Scenarios and Results Provided by M&N.
Table 3. Surf Model Scenarios.
Table 4. Average Model Predicted Peel Angle for Wave Case 1 for the Three Regions Along Topanga Point (Turning to Restrooms, Restrooms to 2nd Stairs, and 2nd to 3rd Stairs).

ACRONYMS AND ABBREVIATIONS

ENSO	El Niño Southern Oscillation
Integral	Integral Consulting Inc.
M&N	Moffatt & Nichol
Project	Topanga Lagoon Restoration Project
RCDSMM	Resource Conservation District of Santa Monica Mountains
SLR	sea level rise

EXECUTIVE SUMMARY

Integral Consulting Inc. (Integral) completed a surf quality impact assessment to evaluate the potential impacts of the Topanga Lagoon Restoration project (Project) on the quality of surf conditions at Topanga in coordination with Moffatt & Nichol (M&N) and through the Resource Conservation District of the Santa Monica Mountains. Topanga Point, formed by cobbles and sediment from the Topanga Creek and Lagoon, is an important feature that provides recreational surf conditions and draws surfers year-round with different skill levels ranging from beginner to expert. The proposed Project alternatives include modifications to the lagoon to enhance habitat and lengthening the Pacific Coast Highway bridge to allow the creek thalweg to migrate, with the potential to modify sediment discharge and affect nearshore wave conditions. To evaluate the potential impact of the Project on wave conditions and surf quality, Integral conducted a surf quality impact assessment, described herein.

As part of the surf quality impact assessment, Integral facilitated a surf group focus workshop and survey to better understand existing surf quality and conditions at Topanga Point. The survey responses were used to document wave conditions that result in preferred surfing conditions and surfer concerns about Project impacts. The results of the survey (Section 2) were used to develop wave cases for preferred surf conditions used in the surf model. Surveyed surfers overall believed that the Project will have negative impacts on surf quality at Topanga Point. The surfer focus group and survey were conducted prior to the wave modeling impact analysis, so these views represent preconceptions. A follow-up survey of key surfing stakeholders is scheduled, after presentation of the initial wave modeling results to gauge changes in surfer perceptions; however, results of the post-project survey were not available at the time of preparation of this report.

The impact of proposed changes on surf quality was evaluated by Integral using a high-fidelity wave modeling tool to resolve the propagation and breaking on a wave-by-wave basis. The wave model used morphological model results provided by M&N (2023) to evaluate the impact of Project alternatives on surf conditions at Topanga (Section 3). Integral simulated wave breaking conditions for Alternatives considered (provided by M&N 2023) for the three wave conditions (identified in the surf focus group). The purpose of the surf quality study was to determine what would cause the largest risk to surf quality—the effects of the Project, drought and flood year conditions, or sea level rise.

The surf modeling results indicate that sea level rise has an outsized impact on surf conditions at Topanga, drastically altering wave breaking and surf conditions. The impacts of the Project (based on morphological change maps provided by M&N) were most significant 1 year after restoration work and the impacts decayed by 5 years following project completion. Rainfall and watershed runoff variability also produced significant changes to the wave climate with differences in surf conditions associated with dry years and 100-year flood events. The smaller wave height scenarios were more impacted by small changes in the offshore topography

compared with large wave scenarios, which break farther offshore in deeper water. Based on the rigorous modeling analysis, the surf conditions are not expected to be negatively impacted by the Project when compared to natural seasonal variability (flood/drought) and SLR impacts. Overall, the results of the surf study indicate that the Project impacts to surf conditions are comparable to interannual creek flow discharge changes and that any of the short-term impacts of the Project decay within 5 years of project completion.

1 INTRODUCTION

Moffatt & Nichol (M&N) contracted with the Resource Conservation District of the Santa Monica Mountains (RCDSMM) to provide professional services to restore estuarine lagoon habitat at Topanga Lagoon. The Topanga Lagoon Restoration project (Project) led by M&N has proposed four potential restoration alternatives (M&N 2022, 2023), including Alternative 1 (no change). Alternative 2 (maximum lagoon habitat expansion) involves the most significant change to the lagoon and potential to alter sediment discharge from Topanga Creek. Alternative 3 (limited lagoon habitat expansion) is a more limited lagoon habitat expansion alternative. Alternative 4 (maximum managed retreat) expands the area for managed retreat by moving the highway northward and expands lagoon habitat.

Integral Consulting Inc. (Integral) is supporting M&N to evaluate the potential impacts of the Project alternatives on wave and surf quality conditions at Topanga. The shoreline at Topanga forms a cobble point (Topanga Point) where Topanga Creek Lagoon meets the ocean (Figure 1), which is an important feature that provides recreational surf conditions. The point break is a righthander (breaking from west to east) around the point that breaks predominantly over cobbles and sand. The surf break at Topanga Point draws surfers year-round with different skill levels ranging from beginner to expert.

Figure 1. Overview of Project area and surf break around Topanga Point and Topanga Creek Lagoon.

The Project has the potential to modify sediment discharge and offshore sediment location, important for surf quality. The surf quality impact analysis and evaluation conducted by Integral were to identify the potential impacts of the Project on surf quality.

As part of the analysis, Integral held a focus group workshop with local surfers to get a qualitative understanding of surf conditions as related to offshore and lagoon conditions. The results of the focus group workshop are presented in Section 2 and summarize the survey methods, characterization of preferred surf conditions, and documented surfer's perceived impacts of the project on surf conditions.

The impact of proposed changes on surf quality was evaluated using a high-fidelity wave modeling tool that can resolve the propagation, refraction, and breaking on a wave-by-wave basis. The surf model used results from morphological modeling provided by M&N (2023) that showed where sediment discharge changes associated with the Project would affect nearshore bathymetry off Topanga Point. Integral simulated wave breaking conditions pre- and post-construction for the three wave conditions (identified in the surf focus group), two stream flows (drought and 100-year discharge), with three sea level rise (SLR) conditions (present day, 1.6 ft, 6.6 ft). The surf model development, wave condition analysis, and surf quality model results are presented in Section 3.

2 SURF FOCUS GROUP SURVEY

Integral conducted a surf study focus group to help the RCDSMMbetter understand the importance of surfing at Topanga Beach and Topanga Point, as part of the Project. The surfer consultation process had two key objectives:

- Inform the process of modeling the impacts on the surf zone
- Gather information about the contingent behavior response of local surfers to the new surfing conditions.

The data collection process for the focus groups and surveys was structured to obtain detailed information about surf quality parameters from experienced surfers, and to gather general information about the views and concerns of local surfers regarding potential impacts from the Project.[1] Respondents were asked questions that sought to identify the key swell conditions to produce excellent surf at Topanga. Surf conditions are the result of bathymetry (affected by water levels, including tide heights), swell size, swell direction, swell period, wind strength, and wind direction. A range of other (nonphysical) factors can also influence the quality of the "surf experience," including traffic, ease of parking, weather, and crowding or congestion. The following summarizes the sampling process and survey results.

2.1 SAMPLING PROCESS

An in-person surfer focus group was held at Topanga Ranch Motel on July 24, 2023, attended by approximately 35 people. Hard copy surveys were distributed, and 14 hard copy responses were collected at the meeting. The meeting attendees also provided input to the concurrent surf modeling process by identifying the optimum conditions for surfing across the following parameters:

- Swell direction and size
- Tide height
- Lagoon entrance conditions and sediment supply.

To allow for participation of those who were unable to attend the in-person meeting, an online survey was distributed on July 25, 2023. The survey remained open for 17 days and could be completed online or by returning a hard copy to the RCDSMM office.

[1] Due to delays in obtaining information about the modeled sediment delivery to the surf zone associated with the new lagoon entrance, and overall time constraints of the Project, it was not possible to conduct the surf modeling exercise prior to the socioeconomic data collection activities. It was therefore not possible to conduct a true contingent behavior study, as there was insufficient information about the contingent states.

A total of 110 surveys provided at least partial responses to the questions posed in the survey and focus group materials, across both the in-person, email, and online survey. The completion and comprehension rates were good, with 77 respondents providing answers to all questions.

2.1.1 Respondent Demographics

Anecdotal data suggests that surfers at Topanga are typically older than the general population, and the survey was also specifically targeted towards respondents with extensive surfing experience. As a result, the sampled population is skewed towards the central age brackets (35 to 64 years of age). Figure 2 shows the age distribution of the sampled population, relative to the 2020 Census data for Los Angeles County. Only three percent of the sample responses were from people under 18 years of age (three responses), whereas 27 percent of the population of Los Angeles County was under 18 at the 2020 Census. As surfing is an active pursuit, the level of participation among those over 65 is lower than the total proportion of residents.

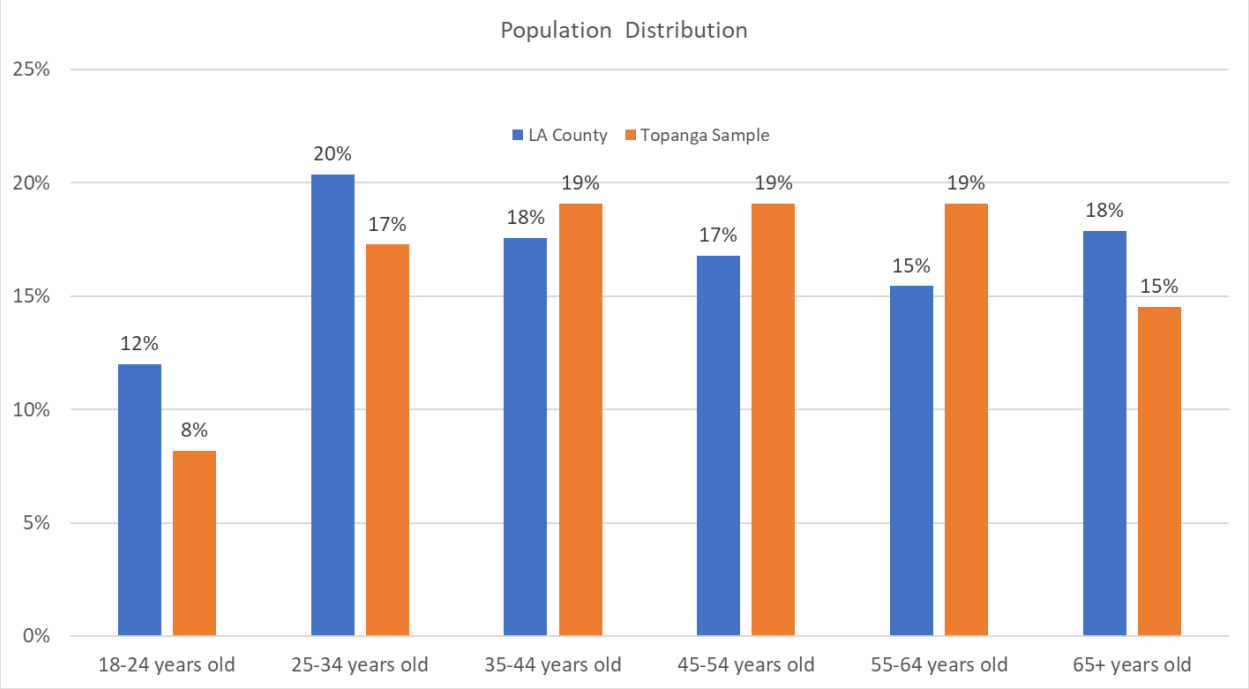

Figure 2. Surfer respondent age distribution.

The respondent sample (deliberately) comprised highly experienced and avid surfers. The median number of years of surfing experience was 20. The median number of years of experience with surfing Topanga was 14 years. The total number of years of surfing experience accessed through the survey and focus group was 2,762 years, with 2,052 years of cumulative experience surfing at Topanga.

Surfing avidity (the number of sessions per week) was also high. Respondents indicated that they surfed on average almost four times per week, across all seasons. The median number of surf sessions per surfer per year was 163, or almost 18,000 surf session observations per year across the sampled surfers. Across 14 years, that represents a collective experience resource of more than 250,000 lifetime surf observations. Average travel time was 37 minutes for weekday visits and 27 minutes for weekend visits.

Approximately 14 percent of respondents (13 of 95) stated that they kept a surf diary, which indicates some degree of focus on the conditions that existed for each surf session. Four respondents had been keeping a surf diary for more than 30 years, with two respondents having kept surf diaries for more than 60 years. One-third (33 of 92) of respondents who answered the question stated that they kept images of the best surfing conditions.

2.1.2 Economic Value of Surf Visits by Survey Respondents

The survey sample was deliberately biased towards the most avid and knowledgeable surfers. As a result, it is not possible to use the travel cost data collected in the survey and focus group to estimate the total economic value of surfing at Topanga. It is possible, however, to make some estimates of the non-market value of surfing for the survey respondents. As noted, the surfers who participated in the survey and focus group collectively undertake approximately 18,000 surf sessions per year. If it is assumed that 50 percent of those sessions take place at Topanga, that totals approximately 9,000 sessions per year. That assumption is likely conservative for local resident surfers, but is balanced by the site avidity of those traveling from further afield.

A surf session in California is valued at somewhere between $57 and $150, based on previous studies conducted at Mavericks and Trestles, respectively. Using a conservative central estimate of $75 per session, this equates to $675,000 per annum in recreational value. It is not possible to estimate the potential impacts on these existing values due to the project alternatives, or changes in weather and climate, but the scale of these values highlights the importance of surf impact analysis for similar projects.

2.1.3 Critical Components and Optimal Conditions Sampling

An open-ended text-entry question asked people to name the best surf conditions they could remember. The most cited answers related to the recent swells in May 2023, December 2022 to January 2023, and those associated with Hurricane Marie in August 2014. There is likely some measure of recency bias in the focus on events in the past 12 months, although these periods were also identified by those who had been surfing for multiple decades.

Most years identified as being good surf years related to El Niño conditions, or neutral El Niño Southern Oscillation (ENSO) years that occurred immediately after El Niño years. Specific years mentioned include 1960–1964, 1975–1976, 1982–1983, 1997–1998, 2006–2007, and

2022–2023.[2] Comments made specific mention of the need for heavy rains and El Niño conditions to provide optimal conditions, due to the delivery of sediment to the surf zone.

While respondents generally agreed that the best months for surf were from September to October and December to February, the most frequently named individual swell events occurred in July, August, and January.

Figure 3 summarizes responses to the importance of different components of the surfing experience at Topanga. Respondents were asked to rate the importance of the following attributes, and could also write in and rate an attribute of their choice:

- Easy parking
- Length of ride
- Shape of the wave
- Speed of the wave
- Multiple sections or takeoff points.

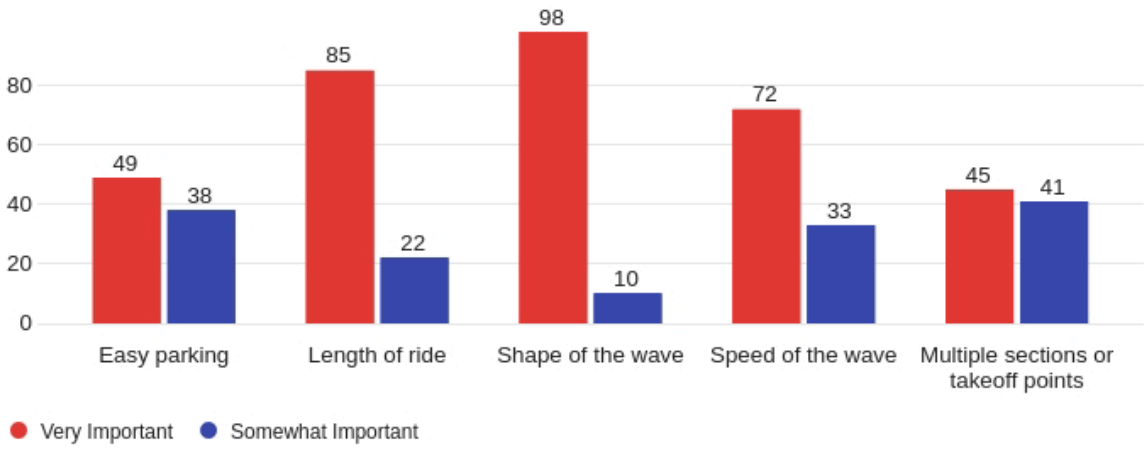

Figure 3. Surf survey results of the importance of surfing visit attributes.

The most critical components of the surf quality for respondents were the shape of the wave and the length of the ride. Having multiple sections was considered less important, as was having convenient parking.

In text-based responses, water quality, surf consistency, and crowding or congestion were highlighted as key issues. The presence of multiple generations of surfers of differing ability

[2] NOAA, Physical Science Laboratory, ENSO – Past Events, accessed on August 30 2023.

levels was also identified as a prized attribute. Showers and bathroom facilities were also listed as key attributes.

2.2 PREFERRED SURFING CONDITONS

This section reports on the physical attributes identified by the surf survey that describe the context of the surf itself.

Unsurprisingly, physical wave parameters were identified as the most important factors in determining surf quality. Figure 4 summarizes the number of responses rating weather, climate, and lagoon characteristics as either Very Important or Somewhat Important.

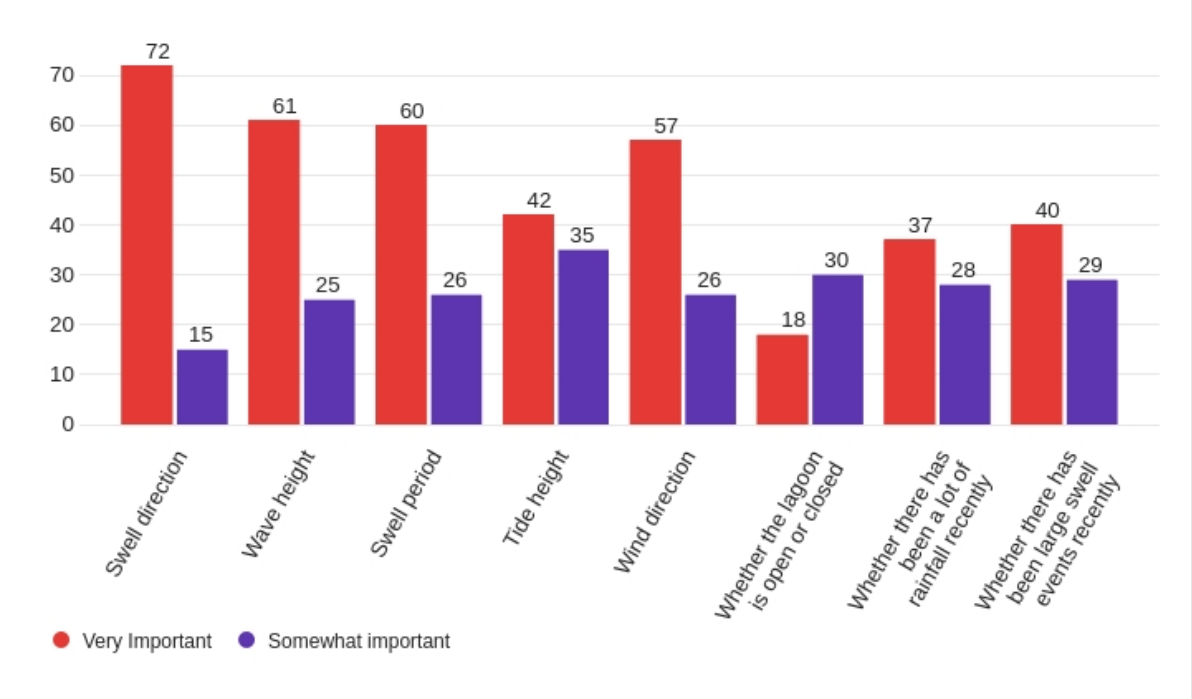

Figure 4. Surf survey results of factors affecting surf quality.

Swell parameters and wind conditions were rated as Very Important by the greatest number of respondents. Tide height was less likely to be rated as Very Important, indicating that the break is surfable on most tides. The state of the lagoon entrance was the least likely parameter to be rated as Very Important. The rainfall and wave climate history were considered more important than the state of the lagoon entrance, as these parameters more directly affect the location and volume of sediment in the surf zone.

2.2.1 Swell Size

The preferred swell size was in the range of 2–5 ft. This represents measurements taken at the offshore buoy, which translate into larger wave faces as the swells interact with local bathymetry. Wave height is a product of both amplitude and wave period, but as a general rule, a 2 ft swell would translate to waves in the knee–thigh high range, and a 5 ft swell would translate to waves that were roughly head high.[3] Surfable swell sizes at Topanga range from 1 to 15 ft, or ankle–shin height to triple overhead, though few surfers listed upper surf sizes over 10 ft (double overhead). Although the bathymetry of Topanga may be suitable for larger waves, there is a substantially smaller pool of surfers who wish to surf waves of that size.

2.2.2 Swell Period

The optimum swell period identified by respondents was dependent on direction. Longer period swells (14–16 seconds or more) were preferred from the south, whereas swells from the west or northwest were considered optimum when the period was in the range 10–12 seconds.

2.2.3 Swell Direction

Respondents provided information about the optimal swell direction, which was incorporated into the surf modeling process. Responses were transformed from degree readings to cardinal directions, and the numbers of mentions of each direction are summarized in Figure 5.

Swell shadowing from the Channel Islands and more westerly regions of mainland California (e.g., Point Conception) mean that optimum swell angles are restricted to 185–210 degrees (south to south-southwest), and 240–260 degrees (west-southwest to west).

[3] Surfline, Surfline's Rating of Surf Heights and Quality, May 5, 2017.

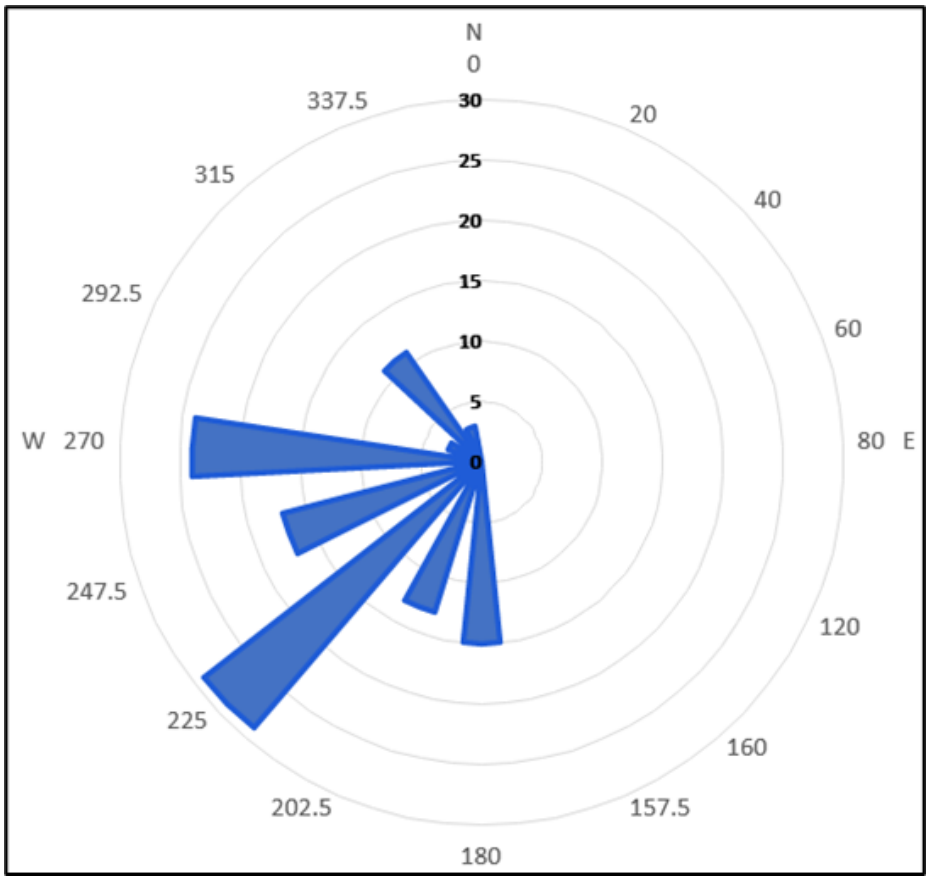

Figure 5. Surf survey results of optimal swell direction for Topanga based on number of responses.

2.2.4 Tide Height and Direction

Most respondents identified that moderate tide heights (2 to 5 ft) and a rising tide were ideal for surfing, but also that Topanga was not particularly sensitive to tide height, and that only the highest and lowest tide ranges caused reduced surf quality, namely during negative tides and when tide heights were above 6 ft. When swell was small or swell periods were low (under 10 seconds), lower and falling tides were preferred by some.

2.2.5 Takeoff Location

The online survey asked people to click on an aerial image to identify the primary takeoff location. Focus group participants were also asked to draw on an image on the hard copy survey instrument. Few focus group responses were received, and those that were provided were incorporated into the online survey location data. Figure 6 shows a heat map of the preferred takeoff location.

Figure 6. Surf survey results of primary takeoff location.

Interviews and focus group responses highlight the importance of nearshore bathymetry, with a number making mention of a rock outcropping immediately to the east of the lagoon entrance.

2.2.6 Lagoon Entrance Conditions

Despite many respondents saying that surf conditions were best in El Niño conditions, which typically would be associated with higher intensity rainfall events and more frequent or intense lagoon breaching events, respondents were divided on whether surf conditions were better when the lagoon was open (19 percent), had recently breached (9 percent), or was closed (14 percent). About one in seven (13 percent) said that it made no difference, while almost half (45 percent) provided more information about the complex interaction between rainfall, sediment supply, and the position of the lagoon entrance.

The consensus from the survey results and focus group responses was that lagoon breaching further west was better for surfing. The supply of sediment to the break was considered important in the creation of the sandbars, which create a more powerful section or extension of the surf break into the bay.

Multiple respondents noted that the surf quality and water quality are intrinsically linked, and that water quality after the lagoon breaches is poor. Though some surfers avoided poor water quality events, others indicated that surfers would expose themselves to the risk of infection if the surf was very good.

2.3 OPINIONS ON PROJECT IMPACTS

Understanding the anticipated changes in the behavior of the lagoon entrance and the expected impacts on surf quality is important to gauge the level of impact of the project. As noted previously, modeling of the surf zone was not completed prior to collection of surfer responses, so the survey asked respondents the extent to which they agreed with statements about potential impacts on the lagoon itself, secondary impacts on the surf quality, and non-surf impacts related to access and parking.

2.3.1 Surfer Perceptions of Lagoon Entrance Impacts

As swell, tide, and wind conditions are external drivers that are not affected by the proposed activities of the Project, the key impacts are those resulting in changes of the behavior of the lagoon entrance. Figure 7 summarizes the level of agreement with statements about potential impacts on the lagoon. These outcomes are not modeled, but rather those that respondents anticipated as a result of the project. The statements were chosen based on initial discussions with local surfers, and questions posed in the public information sessions about the broader Project.

Approximately one third of respondents either agreed or strongly agreed that the lagoon flow velocity would change, that the lagoon would be open more frequently, and that sediment supply to the surf zone would be reduced. More than 40 percent of respondents thought that the lagoon entrance would change location, and that the beach would be narrower than it is now. Half of the respondents thought that water quality would get worse as a result of the Project.

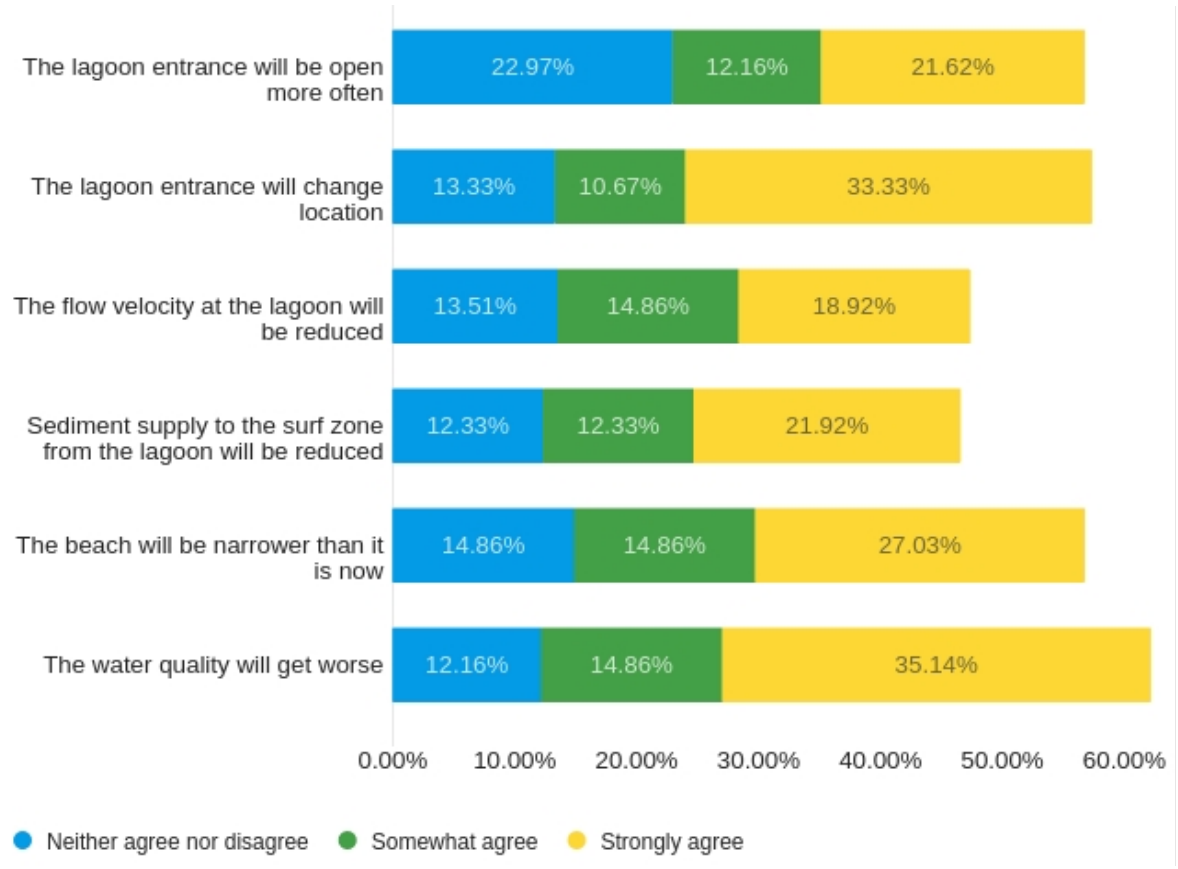

Figure 7. Perception of the Topanga Lagoon Restoration Project impacts.

2.3.2 Perceptions of Impacts on Surfing

Respondents and focus group participants were asked how they expected the Project to impact surf quality, both overall and on the best days. Figure 8 summarizes their responses.

Around half of respondents strongly agreed with statements that surf quality would go down, both across the average conditions experienced at Topanga, and the conditions on the best days. Including those who somewhat agreed with the statement, between 60 and 65 percent of respondents thought that the project would have negative impacts on the surf quality. This is almost twice the proportion of respondents who agreed that there would be impacts on the lagoon entrance and highlighted the importance of the surf modeling exercise to estimate true impacts.

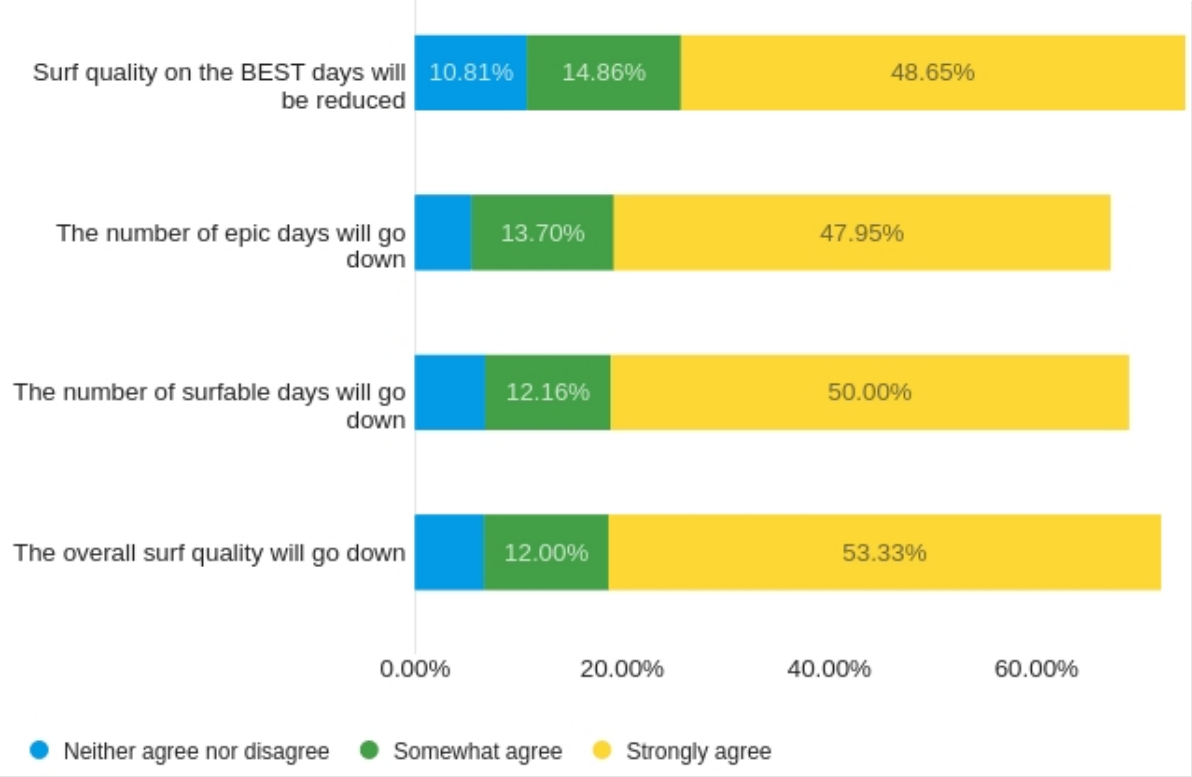

Figure 8. Surfer perceptions of Project impact on surf quality.

2.3.3 Opinions of Project Impacts on Access

Respondents were less likely to agree with statements that suggested that access or parking would be more difficult after the project had been completed, relative to the expected impacts on the wave itself. Approximately one-third of respondents expected more difficult parking and access, while a little over a quarter of respondents anticipated a reduced ability to see the surf from the highway. Figure 9 summarizes the level of agreement with statements about parking and access impacts.

A number of respondents were residents of Topanga Beach, and as a result, the availability of parking spaces is not relevant to them. As a more experienced cohort of surfers, including those who are considered “locals,” the respondents are likely less impacted by crowding and able to compete for waves at the primary takeoff point.

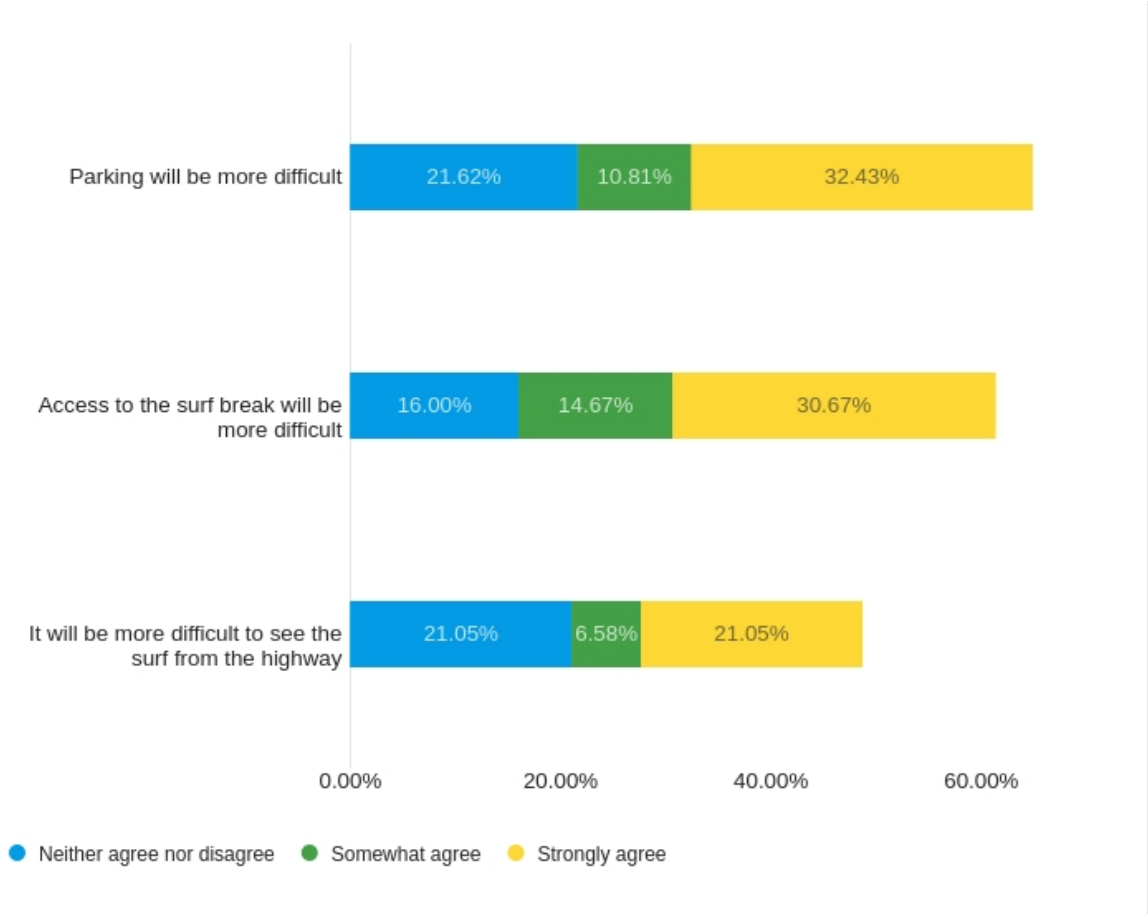

Figure 9. Perception of Project impact on access.

2.4 SUMMARY

Results of the surfer focus group and survey data analysis were presented to key stakeholders on November 1, 2023. Attendees of the November 1 presentation agreed that the presented data reflected an aggregation of their views on the physical factors that contribute to surf quality at Topanga, and that their concerns related to the Project had been captured. Participants thanked the RCDSMM for the opportunity to be involved in the assessment of Project impacts on the surfing resource, and to guide the development of the impact analysis outlined in the next section. The qualitative and quantitative data collected through the participatory processes provide critical inputs to the full evaluation of Project alternatives. A shorter, perception-focused survey will be distributed to key stakeholders to determine the extent to which the surf impact analysis process has improved understanding and addressed key concerns and uncertainties.

3 SURF QUALITY MODELING ANALYSIS

Integral evaluated the impact of the Project on surf quality using a high-fidelity wave modeling tool (XBeach 2-dimensional) to resolve the propagation and breaking on a wave-by-wave basis. The Project impacts to sediment loading and lagoon extent as well as interannual conditions (flood event or drought) result in changes in sedimentation and erosion in the nearshore, which were provided to Integral by M&N (see M&N 2023 for more sediment transport modeling analysis). These bathymetric change results associated with Project alternatives and interannual variability (flood or drought) were incorporated into the surf model to evaluate the impact of the scenario on breaking wave conditions. Integral simulated wave breaking conditions for the Project scenarios with and without construction for the three wave conditions (identified in the surf focus group), two creek flows (drought and 100-year discharge) and for three SLR conditions (present day, 1.6 ft, 6.6 ft).

The wave at Topanga was assessed along three different sections, which are divided with respect to points along the shoreline, depicted in Figure 10. Surfers use the different points along the shoreline (helipad, restrooms, and the two staircases) to orient themselves in the water and determine how far they've traveled along the wave. The first section is between a "turning" point (Figure 10), where the surfers first catch the wave (also called the "takeoff" section). The second section is between the restroom and 2nd stairs, and the final section is between the second and third stairs.

3.1 SURF ANALYSIS METHODOLOGY

Wave surf quality, often referred to simply as "surf quality," is a term used to describe the characteristics and conditions of ocean waves that are ideal for surfing. It is a subjective assessment made by surfers and is influenced by a variety of factors (e.g., tides, wind, swell size) that can affect the overall experience of riding a wave, as documented in the surf survey results presented in Section 2. The objective of the surf modeling analysis is to determine the impact of the Project on surf quality for a set of wave scenarios, determined by the surf focus group.

Figure 10. Overview of site with structures and important features along the point break.

3.1.1 Wave Peel Angle Definition

A key component of wave surfability and surf quality is the wave peel angle, which is the angle between the wave crest and the breaker line shown in Figure 11. A small peel angle (0 degrees) would be a "close-out" wave that would break everywhere along the crest at the same time, while a large peel angle (90 degrees) is a "soft" wave where the crest would break more slowly and more or less go straight toward the shoreline. The peel angle dictates the rate of wave breaking across a site (peel rate, Vp), which governs the surf skill required to catch and execute surf maneuvers. For example, small peel angles (or "steep" waves), require a surfer to ride quickly along the face parallel to the shoreline at the peel rate, while large peel angles (or "soft" waves) would require a surfer to ride straight towards the shoreline. An ideal peel angle is associated with a well-defined, smoothly peeling wave face, making it easier for surfers to ride and perform tricks. The optimal peel angle for recreational surfing is typically between 30 and 65 degrees.

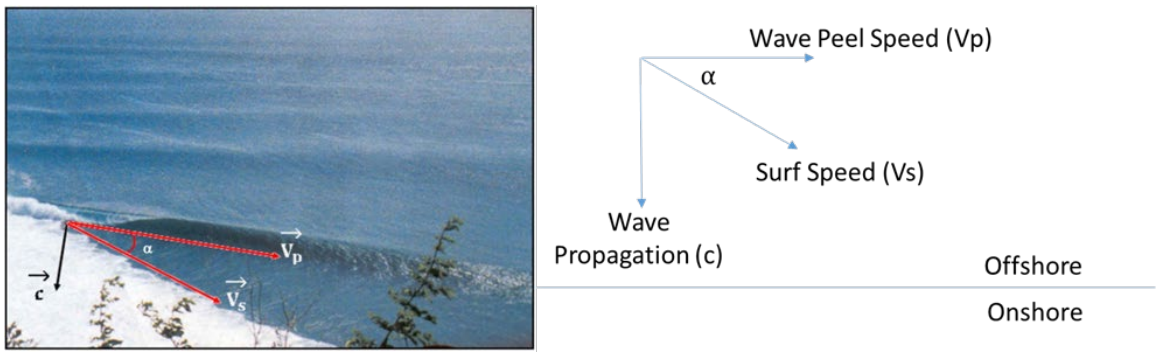

Figure 11. (*Left*) Depiction of the peel angle (α) (from Mendonça et al. 2012) and (*Right*) a simplified schematic of peel angle (α) and definition of wave peel speed, wave propagation speed, and surf speed.

As the wave surf angle decreases, the skill required to surf the wave also increases for a given wave height due to an increase in the surf speed. In addition, different surf maneuvers are associated with different peel angles as documented in Scarfe et al. (2002). The "takeoff" on the wave, or the point at which the surfer would initially begin the ride, might have a peel angle ranging between 45 to 60 degrees. A cutback, a maneuver wherein the surfer reverses directions on the face of the wave, occurs on softer waves (peel angles 55 degrees or higher). A "re-entry" surf maneuver involves redirecting the surfboard back into the face of the wave after completing a bottom turn or a top turn and is viable at medium peel angles (50 to 55 degrees). Finally, a speed section, where the surfer races along the face of the wave, is a surf maneuver that occurs for steeper waves (peel angles approximately 40 degrees). In summary, a smaller peel angle results in a faster more high-performance wave, while a higher peel angle results in a slower mushier wave.

The wave peel angle is therefore an important component of assessing surf quality and has been documented as an important parameter for assessing surfability, surf quality, and possible surf maneuvers (Scarfe et al. 2002). While the determination of surf quality and optimal peel angle is highly subjective and dependent on surf skill, this study uses the wave peel angle as a metric for assessing the Project impact on surf quality by evaluating the change in peel angle with and without construction for a set of preferred wave scenarios identified by the surf focus group.

3.1.2 Surf Wave Model

Breaking wave characteristics and wave surfability were evaluated using a 2-dimensional XBeach model in nonhydrostatic mode (or wave resolving mode). XBeach is a publicly available numerical model and software tool specifically designed for coastal and estuarine environments and is commonly used in the field of coastal engineering, coastal management,

and research (Deltacrest 2010).[4] The nonhydrostatic wave model solves nonlinear wave equations with nonhydrostatic pressure correction and simulates propagation and breaking of individual waves.[5] The 2-dimensional XBeach model also includes the ability to introduce vertical variability with a reduced two-layer model in order to improve wave breaking and dispersion. The reduced two-layer model (parameter no+) effectively introduces vertical variability, important for accurately resolving wave breaking dynamics, with a pressure correction to improve accuracy over a standard 2-dimensional model formulation. The 2-dimensional nonhydrostatic (with no+) XBeach model (herein, the "surf model") provides the best modeling approach to evaluate the wave-by-wave breaking conditions that are critical for evaluating surf conditions and quality. In summary, this XBeach 2-dimensional model has the capability to model individual waves necessary to represent what surfers already know, which is that no single wave is the same as any other wave.

The surf model grid had a 5 ft resolution within the breaking region offshore of Topanga and extends 1 km offshore and 1.5 km east and west of the lagoon mouth .(The surf model was run for 35 minutes of real-world time, sufficient time to see multiple sets of breaking waves for each given wave scenario.

3.1.3 Peel Angle Calculation

To determine peel angle, both the wave path and the breaking wave crest are extracted from the XBeach surf model (Figure 11). The wave path is the general line that the breaking waves make and can be found by outlining the "whitewater," or the foam line, while the wave crest is the shape of the ridden part of the breaking wave as it moves toward shore (Figure 11).

The surf model identifies the location of each wave breaking as the wave moves down the point (Figure 12, a). Since most surfers tend to surf the highest waves, only the breakers associated with the top 1/3 wave heights were considered in the study. composite of wave breaking (summation of wave breaking snapshots over the entire simulation period; Figure 12, b), indicating the location of the top 1/3 of breaking waves, was used to define the "whitewater" region within the breaking zone. The composite of breaking waves was then used to delineate the wave path for each wave case (blue dashed line in Figure 12, b).

[4] XBeach is available here: https://download.deltares.nl/en/xbeach and open source documentation is available here: https://xbeach.readthedocs.io/en/latest/.

[5] The nonhydrostatic XBeach model and has been shown to better characterize single breaking wave dynamics compared to Boussinesq wave modeling (Zijlema et al. 2011). In particular, nonhydrostatic wave modeling has been shown to accurately characterize breaking waves without relying on empirical formulations for breaking conditions required in a Boussinesq wave model.

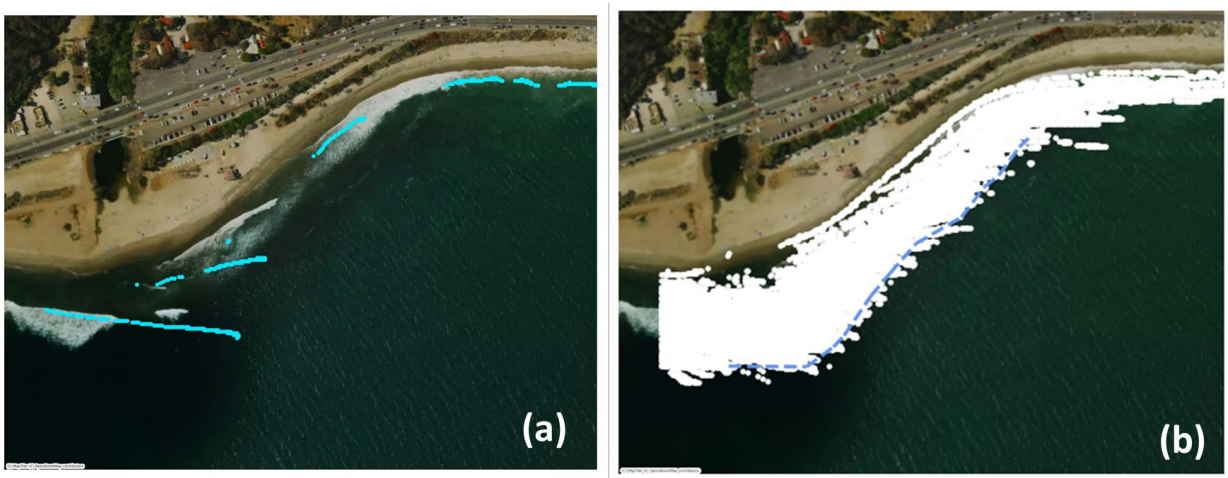

Figure 12. Snapshot of wave breaking from XBeach surf model (a) and composite breaking map over the entire model simulation (b) with the wave path (blue dashed line in b) delineated the "whitewater" region of the surf zone.

The wave crest is then defined as an individual wave as the wave moves down the point. The wave intersection between the breaking wave crest, and the wave path line is then used to calculate the peel angle along the shoreline (Figure 13). The methodology is summarized in the following steps:

1. Extract breaking locations from model output for each wave scenario.

2. Determine areas of high breaking density (i.e., the "whitewater") to delineate the wave path (dashed line, Figure 13).

3. Delineate the wave crest at the wave path for each individual wave (solid line, Figure 13).

4. Calculate the peel angle as the intersection angle between individual breaking waves and the wave path (red angle, Figure 13).

The wave peel angle and the alongshore position of the peel angle is computed for each breaking wave over the 35-minute simulation period and for all scenarios considered to characterize the potential Project impacts on surf conditions and quality.

Figure 13. Example peel angle calculation (red angle; 55 degrees) for an individual wave with the wave path (dashed line) and wave crest (solid line) shown.

3.2 SURF MODEL SCENARIOS

The primary objective of this study was to determine which of the following parameters will have the greatest impact on surf quality: 1) Project conditions; 2) SLR; 3) drought conditions; 4) flood conditions. In particular, the impact of Project construction and future conditions on surf quality was determined by simulating the three wave cases. The surf model analysis incorporated bed elevation changes associated with Project construction (from M&N) to determine the relative impact of the Project on surf quality based on changes to the wave breaking peel angle. The following describes the set of model scenarios evaluated in this analysis.

3.2.1 Wave Cases

Three different wave scenarios were assessed on existing conditions without the Project to determine baseline peel angle conditions to allow for comparison. The preferred wave case scenarios were determined through an in-person surfer focus group held on July 24, 2023 (additional details about the surfer meeting can be found in Section 2). The meeting attendees identified the optimum conditions for surfing based on 1) wave direction, 2) wave size, and

3) tide height. The three wave conditions with the highest ratings across the survey responses were modeled and are detailed in Table 1.

Wave Case 1 represents a long period south swell and has an offshore wave height of 2 ft, period of 15 seconds, and mean wave direction of 230 degrees (nautical from north). The wave case simulates a long period south swell, where waves are more likely to come in defined "sets" and travel obliquely across the point. Wave Case 2 represents a typical small west swell with an offshore wave height of 4 ft, period of 11 seconds, and a mean wave direction of 255 degrees. This case simulates a more "head-on" (shore-normal) wave, with shorter period swell, where the waves might be more consistent in frequency, come in less defined sets, and break more "peaky." Wave Case 3 represents a large west swell and is the largest of the three at 7 ft, period of 10 seconds, and mean wave direction of 260 degrees, representative of a large and less frequently observed wave case.

Table 1. Model Wave Cases as Determined from the Surf Focus Group.

Wave Case	Wave Height (ft)	Wave Period (s)	Incident Wave Direction (degrees from North)
1	2	15	230°
2	4	11	255°
3	7	10	260°

In addition, surfers determined the optimum tide condition to be a "mid-tide." At Santa Monica tidal gage (station 9410840), mean high water is 4.69 ft and mean low water is 0.93 ft (relative to mean lower low water). Therefore, a mid-tide value of approximately 3 ft was taken as the tidal condition for all wave model scenarios considered.

3.2.2 Existing Surf Conditions

The surf model was used to simulate surf conditions for the three wave conditions with existing bathymetry[6] to establish a baseline peel angle to qualitatively validate the surf model results with the surf description from the surf focus group. The peel angle for all three wave cases is shown as it moves down the point (Figure 14) to capture the variability in surf conditions along the surf break from takeoff (near the lagoon entrance where the waves "turn" down the point) toward the second and third stairs.

All three cases begin with steep sections before the "turn" down the point. After the turning point and between the restrooms, the wave becomes softer (peel angles become higher).

[6] Existing conditions bathymetric data from USACE 2014 DEM available at: https://www.fisheries.noaa.gov/inport/item/49416

Between the restrooms and the second stairs, all waves become steeper (peel angle drops) as the wave speeds up, and the southern oblique wave becomes the steepest and fastest of all three wave cases; in the section between the restroom and second stairs, the southern, long period wave case has a peel angle average of 30 degrees, whereas the highest wave height wave case has a peel angle average of 55 degrees. At the final section, between the second and third stairs, the wave becomes softer and more "rippable" as the peel angles increase. The three wave cases have similar peel angles in the final section, averaging around 50 degrees.

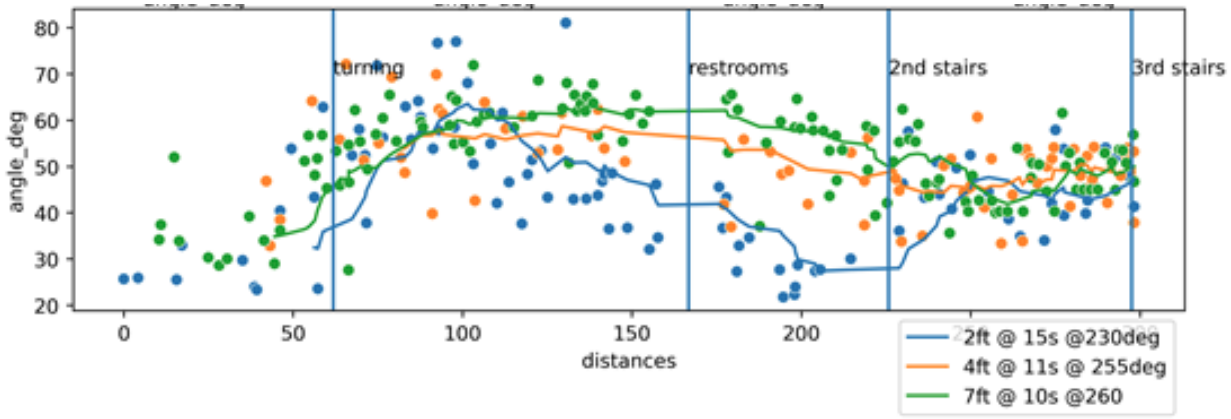

Figure 14. Peel angle results for three wave cases (1 is blue, 2 is orange, and 3 is green) with existing bathymetric conditions. The model-computed peel angle alongshore is shown (dots) with a smoothed trend line (solid line) and with key landmarks for reference, including turning, restrooms, 2nd, and 3rd stairs (vertical lines).

The baseline scenarios form an envelope of conditions, where the biggest (7 ft at 10 seconds) swell is the softest wave (highest peel angles), and the longest period (2 ft at 15 seconds) is the steepest wave (lowest peel angles). Because they demonstrate the disparate end members of the range of conditions within the baseline, the long period (Case 1) and high wave height (Case 3) cases were selected for further study. The model results and surf quality assessment for current conditions based on wave peel angle were presented to the surf focus group on November 1, 2023. The surfers in the second focus group held on November 1, 2023, agreed that the model and peel angle characterization of wave conditions for the three wave cases were consistent with their experience riding the various wave conditions.

3.2.3 Project Alternatives

M&N has proposed four potential restoration alternatives for the Project (M&N 2022), including Alternative 1 (no change). Alternative 2 (maximum lagoon habitat expansion) involves the most significant change to the lagoon and potential to alter sediment discharge from Topanga Creek. Alternative 3 (limited lagoon habitat expansion) is a more limited lagoon habitat expansion alternative. Alternative 4 (maximum managed retreat) expands the area for managed retreat by moving the highway northward and expands lagoon habitat. M&N used a 2-dimensional

hydrodynamic and sediment transport model to evaluate the effects of each alternative on sediment morphology (see M&N 2023 for more details).

The evolution of the nearshore morphology for the project alternatives included different conditions (dry or drought, 10-year flood event, and 100-year flood event) to incorporate the effect of different seasonal conditions of project evolution. For example, storm conditions may result in more frequent lagoon breaching and more fluvial sediment delivery to the beach and nearshore, which may affect wave breaking and surf quality around the point break. These scenarios were also evaluated 1-year post-construction and 5-years post-construction by M&N. Model results were provided to Integral by M&N for each of the four alternatives and for each of six conditions (dry conditions 1-year post-construction, dry conditions 5-year post-construction, 10-year flood 1-year post-construction, 10-year flood 5-year post-construction, 100-year flood 1-year post-construction, and 100-year flood 5-year post-construction) for a total of 24 alternative scenarios (Table 2). M&N provided Integral with the sediment bed elevation at the end of the 24 model scenarios, which were then incorporated into the surf model by modifying the surf model bathymetry.[7] An example of the bathymetric changes among the alternatives provided by M&N is shown in Figure 15 for a 100-year flood event 1-year post-construction.

Table 2. Summary of Modeling Scenarios and Results Provided by M&N.

Alternative	Alternative Description	Model Conditions	Period Post-Construction	No. of Cases
Alternative 1	No Change with Managed Decay	Dry, 10-year and 100-year flood	1 and 5 years	6
Alternative 2	Maximum Lagoon Expansion	Dry, 10-year and 100-year flood	1 and 5 years	6
Alternative 3	Limited Lagoon Expansion	Dry, 10-year and 100-year flood	1 and 5 years	6
Alternative 4	Maximum Managed Retreat	Dry, 10-year and 100-year flood	1 and 5 years	6

[7] The alternative results provided by M&N do not include any changes associated with offshore placement of material nor do the results include any changes to lagoon outlet location.

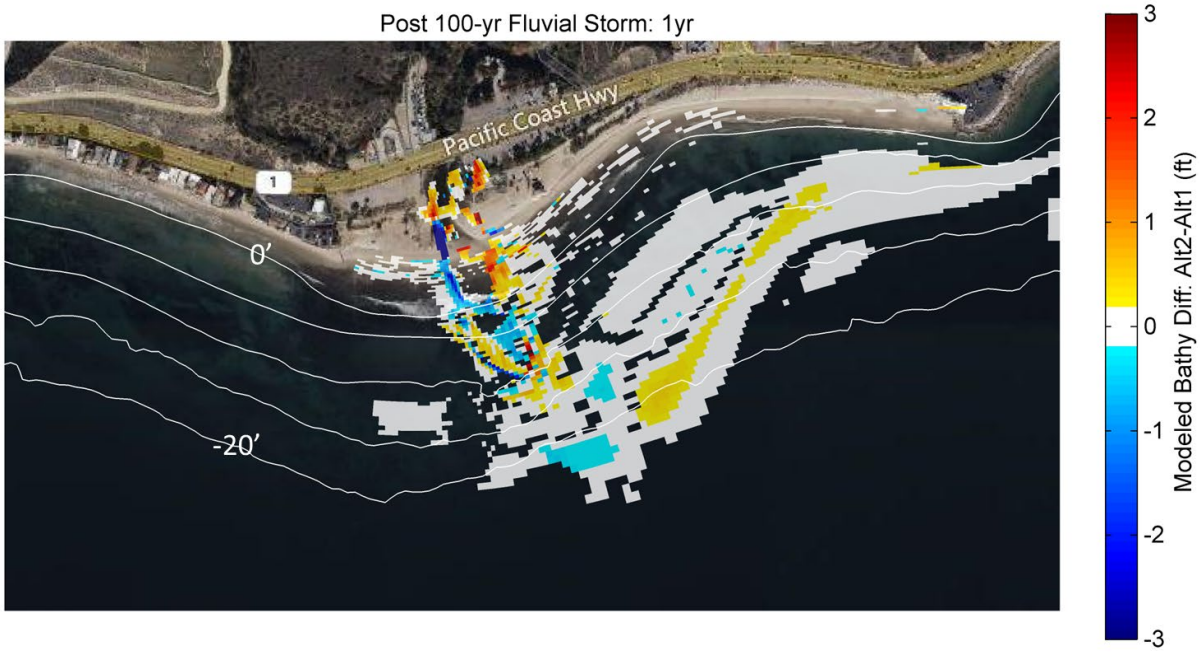

Figure 15. Example of the bathymetric change (comparing Alternative 2 and Alternative 1) for the 100-year flood event 1-year post-construction.

3.2.4 Surf Model Scenarios

The change in bed elevation associated with the restoration Project has the potential to impact wave quality through changes in wave refraction and breaking patterns. The impact of the Project on wave quality was evaluated by incorporating the modified bathymetry (output provided by M&N) associated with Project construction into the surf model to evaluate the Project's impact on wave quality through the peel angle calculation (described in Section 3.1.3).

Project alternatives with construction impacts were evaluated and compared to Alternative 1 (no change). Alternative 2 (maximum lagoon expansion) is expected to result in the smallest sediment loading from the lagoon, whereas Alternative 4 (maximum managed retreat) is anticipated to result in the largest sediment loading from the lagoon mouth (M&N 2022) comparing to no change Alternative 1. Alternative 3 is expected to the be most similar to existing conditions and was therefore not included in the surf impact modeling analysis. These two alternatives are anticipated to provide bounding of the maximum potential impacts of the Project (relative to Alternative 1, no change) on wave and surf conditions; therefore, Alternatives 2 and 4 were the focus of the surf modeling and analysis.

Two different environmental conditions (dry and 100-year flood) at two different time horizons (1 year and 5 years post-construction) were analyzed.[8] In addition, two different SLR scenarios (1.6 and 6.6 ft) in addition to no SLR were considered for existing conditions to characterize the impact of SLR on surf conditions. The model scenarios used for the surf analysis are shown in Table 3.

Table 3. Surf Model Scenarios.

Scenarios	Wave Scenarios	Wet/Dry Conditions	Post-construction	Sea Level Rise	Total Model Runs
Existing Conditions	Cases 1	--	--	1.6 and 6.6 ft	2
Alternative 1 (no change)	Cases 1–3	Dry and 100-year	1 and 5 years	--	12
Alternative 2	Cases 1–3	Dry and 100-year	1 and 5 years	--	12
Alternative 4	Cases 1–3	100-year[9]	1 and 5 years	--	6

3.3 SURF MODEL RESULTS

The surf model results summarize the change in surf peel angle for the range of Project alternatives and conditions described in Table 3. The following describes surf impact associated with Alternative 2, with Alternative 4, and with SLR.

3.3.1 Alternative 2

The model and surf quality were evaluated for Alternative 2 (maximum lagoon expansion) relative to no change (Alternative 1) for the dry and 100-year flood event 1 and 5 years post construction provided by M&N (Table 2) for all three wave cases. The peel angle results presented below are shown for Wave Cases 1 and 3 because these wave cases bound the range of conditions observed at the Site.

Wave Case 1

Wave Case 1 is a long period south swell and is the smallest wave case considered. The model results for peel angle for the wet conditions (100-year flood) 1 and 5 years post-construction are shown in Figure 16. The figure shows the peel angle alongshore (similar to Figure 14 for

[8] M&N also simulated 10-year flood event results. These results fall within the range of impacts between 100-year flood and dry conditions and were therefore not included in the surf evaluation.
[9] Only the 100-year flood event was evaluated for Alternative 4 because the 100-year flood event resulted in the most significant bathymetric changes across all alternatives.

existing conditions) for existing conditions (today), Alternative 1 (no change), and Alternative 2 (design conditions).

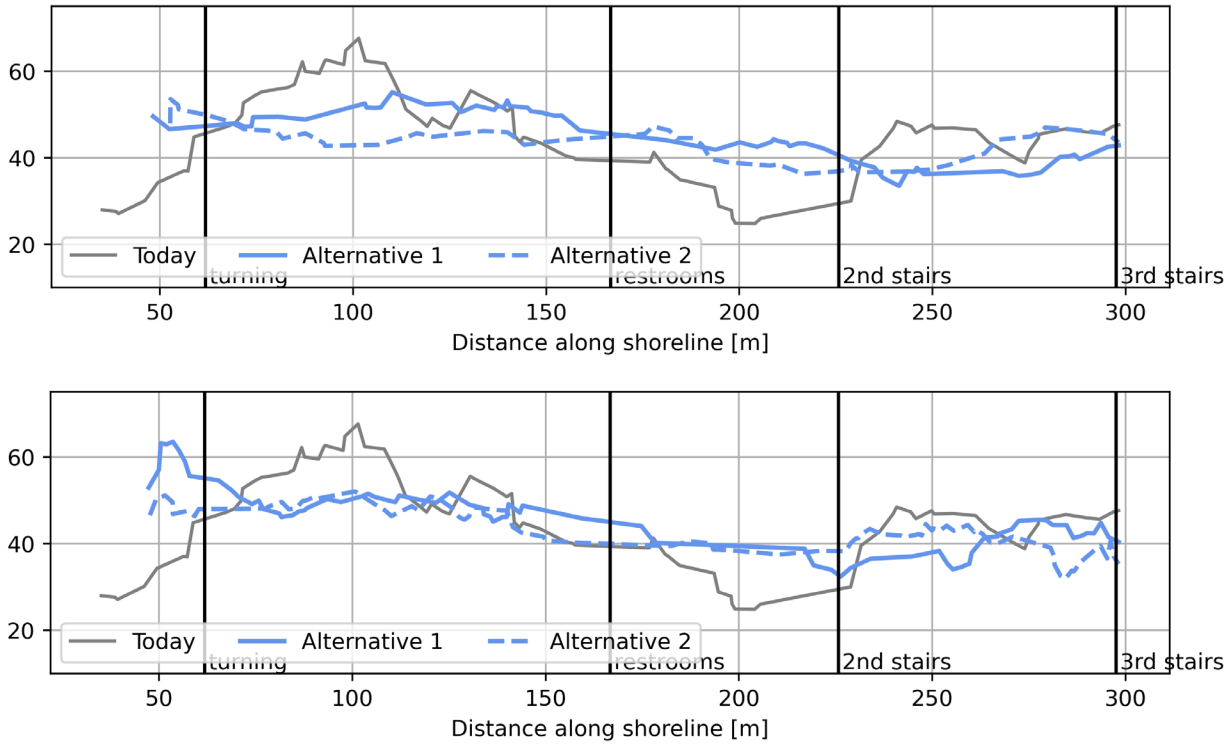

Figure 16. Peel angle after a 100-year flood event 1 year post-construction (upper panel) and 5 years post-construction (lower panel) for the southern, long period swell (Wave Case 1) for Alternative 1 (no change) and Alternative 2.

For the 100-year flood conditions, the peel angle is modified pre- and post-construction compared to present day conditions (gray line, Figure 16). In particular, the section between the turning and restrooms becomes slightly steeper (smaller peel angle) after the large flood compared to the baseline for both Alternative 1 (no change) and Alternative 2 (maximum lagoon expansion). In contrast, the section between the restroom and second stairs becomes softer and more “rippable” (higher peel angles) than the present-day conditions for both alternatives 1 and 2. Alternative 2 results in a slightly steeper wave compared to Alternative 1 (no change) up to the restrooms for the 1-year post-construction scenarios (upper panel, Figure 16). At the final section (between the second and third stairs), the wave conditions become slightly steeper (lower peel angles). After 5 years, the model-predicted peel angles for Alternative 1 and Alternative 2 scenarios converge, indicating that the project’s impacts are diminished over time (lower panel, Figure 16).

The model results for peel angle for the dry conditions (drought) 1 and 5 years post-construction are shown in Figure 17. The figure shows the peel angle alongshore for existing conditions (today), Alternative 1 (no change), and Alternative 2 (design conditions).

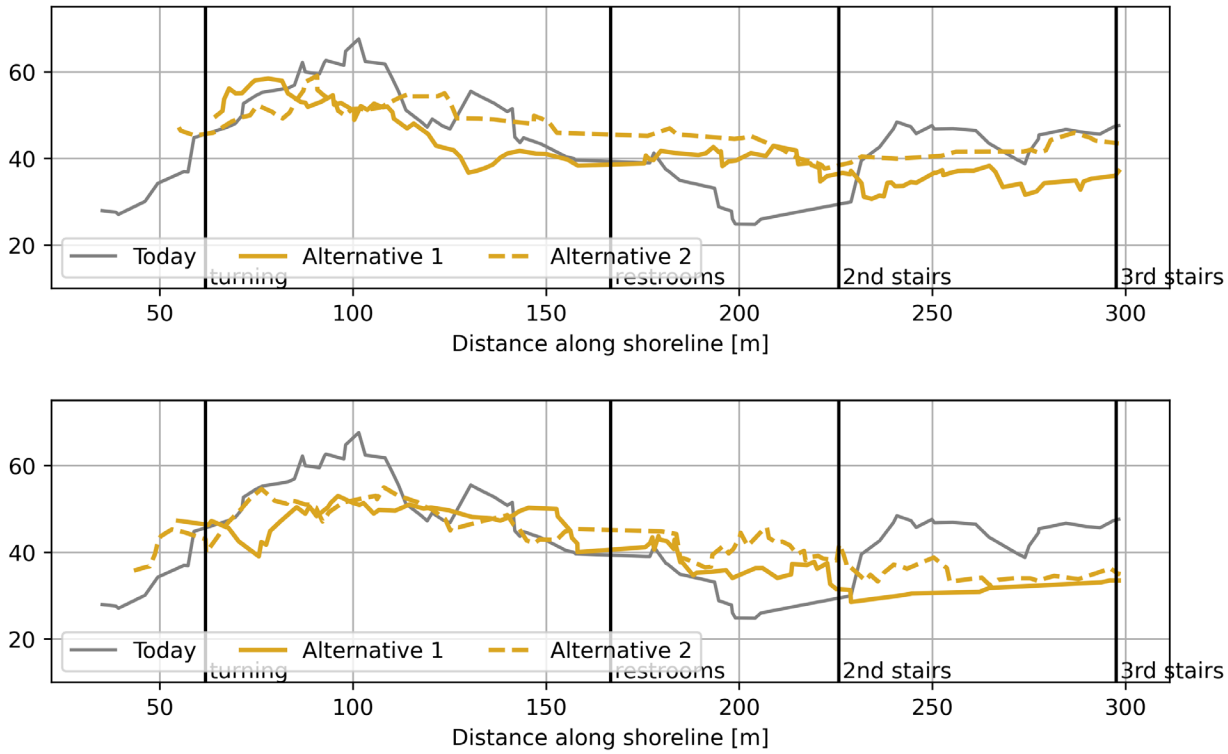

Figure 17. Peel angle after dry conditions 1-year post-construction (upper panel) and 5 years post-construction (lower panel) for the southern, long period swell (Wave Case 1) for Alternative 1 (no change) and Alternative 2.

Similar to the 100-year flood conditions, the peel angle is modified for both Alternative 1 (no change) and Alternative 2 from present day conditions (gray line). Specifically, the wave becomes steeper than baseline before the restrooms, softer than baseline before the second stairs, and steeper for the final section (Figure 17). The dry conditions result in smaller changes in the peel angle relative to the baseline conditions, with the largest impact occurring between the restrooms and the second stairs. After 5 years, the model-predicted peel angles for Alternative 1 (no change) and Alternative 2 (design conditions) converge, indicating that the Project's impacts are diminished over time with some lingering impacts between the restrooms and second stairs (softening relative to no change).

Wave Case 3

Wave Case 3 is the largest of the three wave cases at 7 ft, period of 10 seconds, and mean wave direction of 260 degrees, representative of a large and less frequently observed wave

case. For Case 3, results from the post-1 year are displayed in Figure 18 and Figure 19 for the wet (100-year flood) and dry conditions, respectively.

For all scenarios considered with Wave Case 3, the project alternatives closely follow the existing conditions, indicating minimal or negligible Project impact on the largest wave case surf conditions. The large (7 ft) waves break farther offshore and are less impacted by nearshore bathymetric changes compared to the smaller wave case (Wave Case 1).

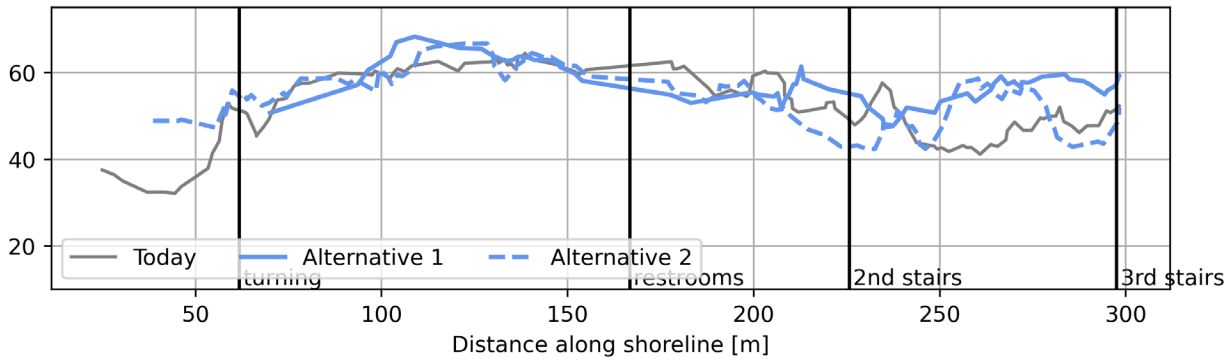

Figure 18. Peel angle after a 100-year flood event 1-year post-construction for the large western waves (Wave Case 3) for Alternative 1 (no change) and Alternative 2.

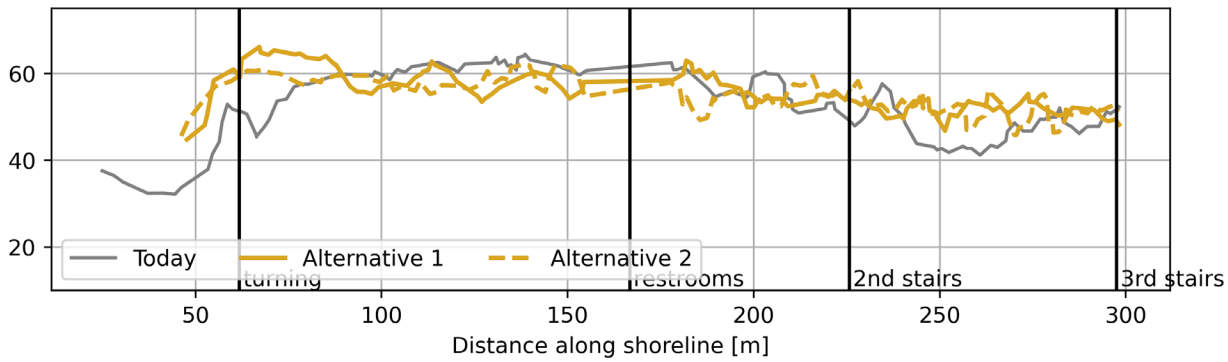

Figure 19. Peel angle after dry conditions 1-year post-construction for the large western waves (Wave Case 3) for Alternative 1 (no change) and Alternative 2.

3.3.2 Alternative 4

The model and surf quality were evaluated for Alternative 4 (maximum managed retreat) relative to no change (Alternative 1) for the 100-year flood event 1- and 5- years post construction provided by M&N (Table 2) for all three wave cases. The peel angle results presented below are shown for Wave Cases 1 and 3 because these cases bound the range of conditions observed at the Site. For all scenarios, the 100-year flood event scenarios resulted in the most significant changes to the offshore bathymetry, important for wave breaking and

surf quality. Therefore, the model results from the 100-year scenarios for Alternative 4 are presented here.

Wave Case 1

Wave Case 1, the long period south swell, is the smallest wave case considered and the most sensitive to Project impacts. The model results for peel angle for the wet conditions (100-year flood) 1 and 5 years post construction are shown in Figure 20.

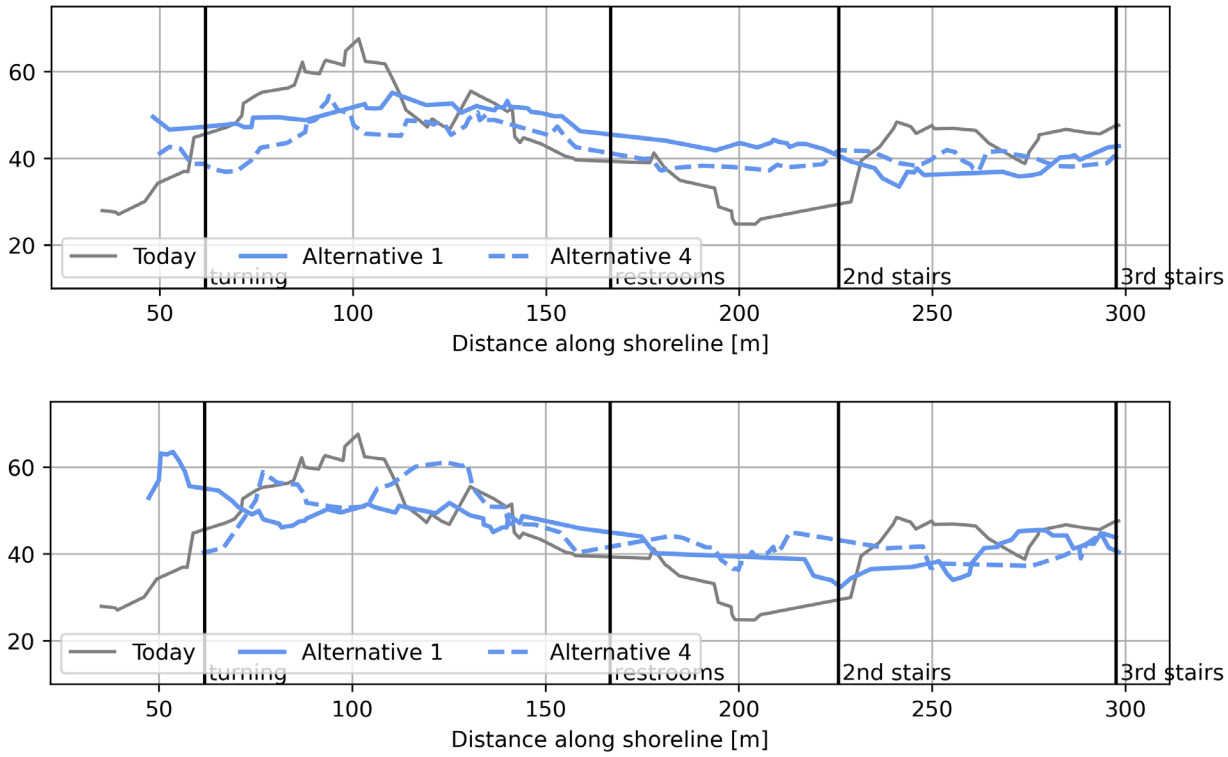

Figure 20. Peel angle after a 100-year flood event 1 year post-construction (upper panel) and 5 years post-construction (lower panel) for the southern, long period swell (Wave Case 1) for Alternative 1 (no change) and Alternative 4.

Overall, Alternative 4 impacts are similar to those observed for Alternative 2 for the 100-year condition (Figure 16). The model predicted peel angles are slightly smaller (faster, steeper waves) compared to existing conditions between turning and the restrooms and gets larger (softer wave) compared to existing conditions between the restroom and the second stairs (Figure 20). The wave then gets steeper for both Alternatives 1 and 4 compared to existing conditions after the second stairs. The results are similar 5 years post-construction with some slight differences in alternatives between turning and the restrooms.

Wave Case 3

Similar to the Alternative 2 results, the surf conditions for the large wave case (Wave Case 3) are relatively insensitive to nearshore changes associated with Alternative 4 (Figure 21). The peel angle for Alternative 4 is slightly lower (faster) between the turning point and the restrooms and then converges with Alternative 1 (no change). Only the surf impact 1-year post construction is shown because the impacts are minimal for Wave Case 3 and diminish over time. The peel angle impact for the 100-year event 5-year post construction are expected to be negligible for the Wave Case 3.

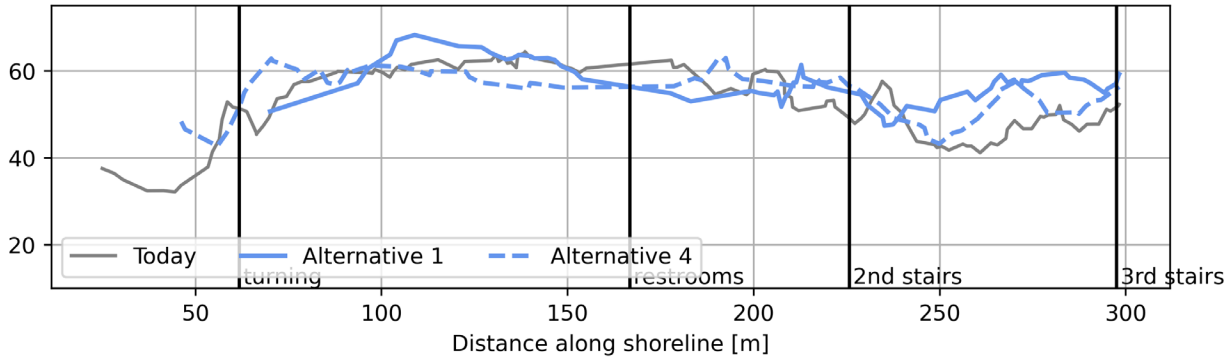

Figure 21. Peel angle after a 100-year flood event 1-year post-construction for large western waves (Wave Case 3) for Alternative 1 (no change) and Alternative 4.

3.3.3 Sea Level Rise

The impact of SLR on breaking conditions, was evaluated using two SLR conditions (1.6 and 6.6 ft) relative to existing conditions as required by the coastal commission and USACE. SLR of 3.3 ft was not included because the impacts to surf quality are bounded by 1.6 and 6.6 ft. The effect of SLR was evaluated only for Wave Case 1 (small, southern, long period wave case) because it is the most sensitive to Project design and interannual creek discharge changes.

The surf conditions were compared for SLR of 1.6 ft with existing conditions (Figure 22). The impact of SLR reduces the peel angle relative to existing conditions near turning, increases peel angle between restrooms and 2nd stairs, and reduces between 2nd and 3rd stairs. The changes in surf conditions associated with 1.6 ft SLR are slightly more significant than changes associated with the 100-year flood event for all alternatives. For a SLR of 1.6 ft, the waves break offshore, similar to current conditions with higher tide as shown in Figure 23. Many surfers have indicated that the best waves occur during mid-tide (3 ft) and that wave quality is reduced at high tide. An increase in SLR will reduce the optimal water level conditions for surfing.

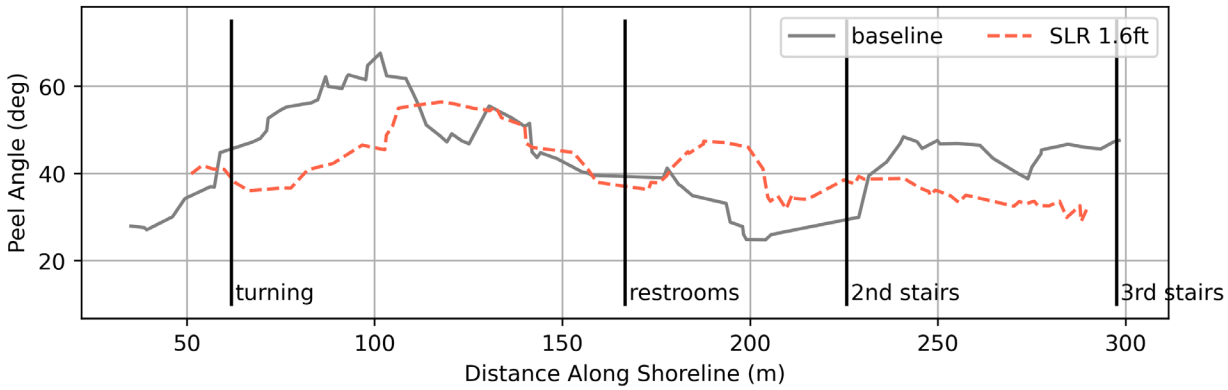

Figure 22. Peel angle with 1.6 ft SLR compared with existing conditions.

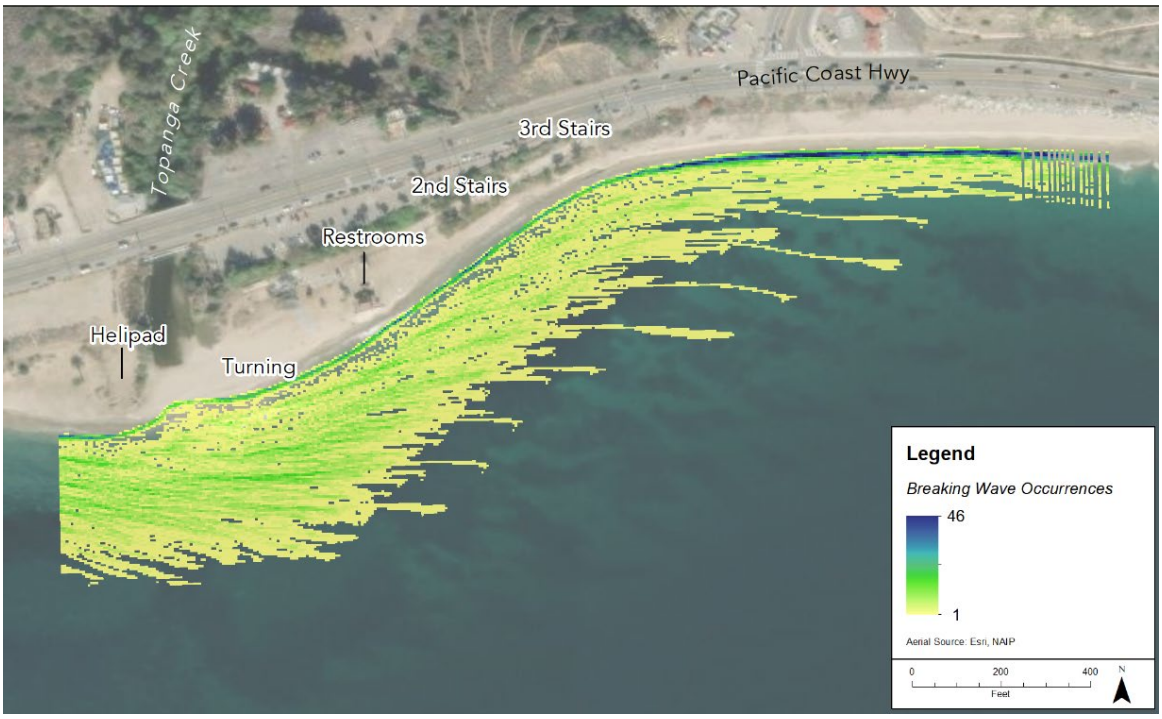

Figure 23. Wave breaking composite map shown for Wave Case 1 and with 1.6 ft of SLR.

At a SLR of 6.6 ft, wave breaking becomes quasi-unrecognizable, as breaking occurs overtop of structures, on the beach, and within the lagoon as shown in Figure 24. Under the high SLR scenario, the wave breaking will be on the beach and within the lagoon at the steepest bathymetric slopes. In fact, without the removal of the helipad, restrooms, and revetment during the Project, the waves are shown to close out at both of those locations. SLR of this magnitude will result in modifications of the shoreline over time such that the upland topography changes (not considered in this analysis) and managed retreat conditions will be important for wave conditions in the future.

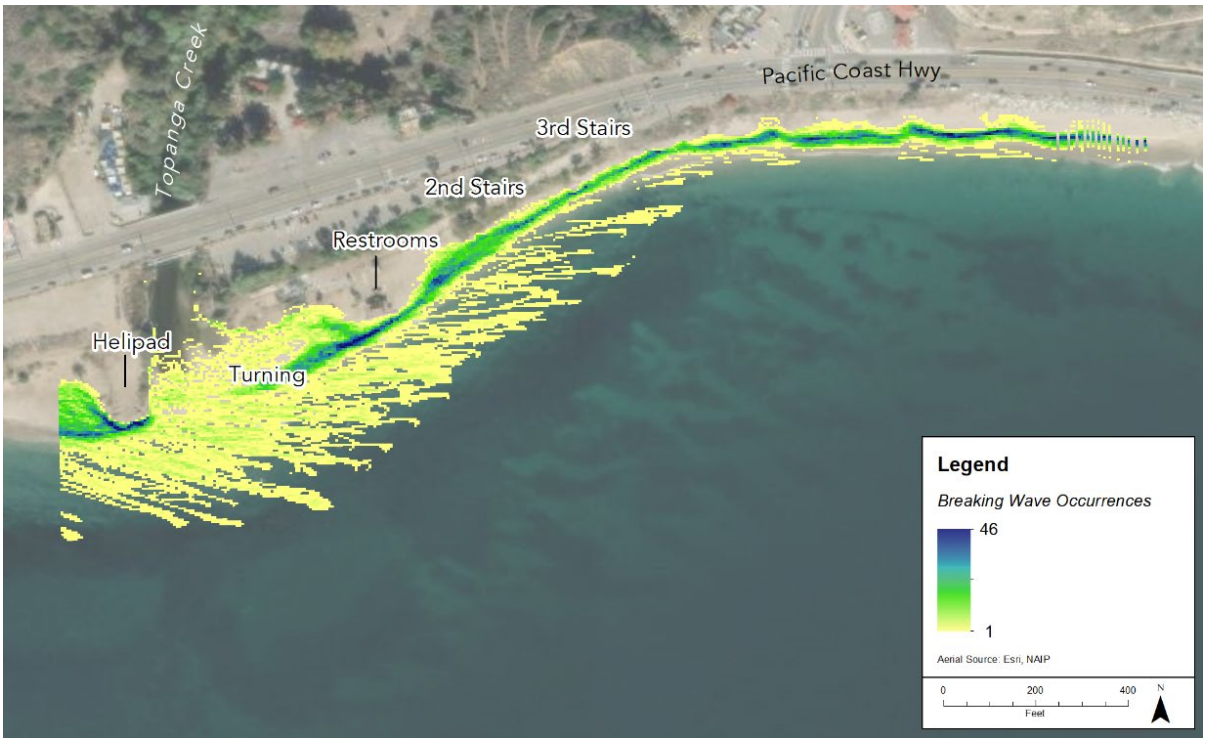

Figure 24. Wave breaking composite map shown for Wave Case 1 and with 6.6 ft of SLR.

3.4 SURF MODEL CONCLUSIONS

As part of the surf focus group, multiple concerns were raised about the future of surfing at Topanga Point and which factor would have the biggest impact on surf quality over time:

- Project Alternatives
- Flood versus Drought Conditions
- Sea Level Rise.

The impact the Project on surf conditions at Topanga Point were evaluated using a high-fidelity surf model with three characteristic wave conditions (informed by the surf focus group). The surf model incorporated the potential impacts associated with the Project by modifying the projected nearshore bathymetry associated with varying Project designs, wet and dry conditions, 1 and 5 years post-construction, and SLR. Nearshore bathymetric elevations were provided by M&N for the range of scenarios considered (M&N 2023). The surf quality impact assessment did not consider the effect of various mouth locations over time, which was beyond the scope of the analysis. This surf quality impact assessment also did not consider any effects of the nearshore placement of sediment resulting from Project construction, although proposed placement location was selected to minimize any impacts to Topanga Point and analysis of nearshore dispersal modeling is in progress. The wave model was used to

predict surf conditions through the calculation of a wave peel angle, the angle that the breaking wave crest forms with the "whitewater" or wave path, an important metric to characterize wave surf conditions. Overall, Wave Case 1 (long period, small southern waves) was the most sensitive to changes in the nearshore bathymetry while there was minimal or negligible impact observed for the largest wave case (Wave Case 3) for all scenarios considered (project design and seasonal). Wave Case 1 surf conditions were impacted by all Project alternatives, including Alternative 1 (no change) when compared to existing conditions. High rain periods (100-year flood) result in steeper waves while dry seasons result in flatter waves compared to existing conditions for all scenarios considered for Wave Case 1. The most significant changes occur at or near takeoff. A summary table of the average peel angle the three surf regions is included in Table 4 for all model scenarios considered for Wave Case 1 (most sensitive wave conditions).

Table 4. Average Model Predicted Peel Angle for Wave Case 1 for the Three Regions Along Topanga Point (Turning to Restrooms, Restrooms to 2nd Stairs, and 2nd to 3rd Stairs).

Average Peel Angle Model Scenario (Wave Case 1)	Turning to Restrooms	Restrooms to 2nd Stairs	2nd to 3rd Stairs
Alternative 1 (100-year event, 1-year post)	51	43	38
Alternative 2 (100-year event, 1-year post)	45	42	41
Alternative 4 (100-year event, 1-year post)	47	38	40
Alternative 1 (100-year event, 5-year post)	49	38	40
Alternative 2 (100-year event, 5-year post)	47	39	40
Alternative 4 (100-year event, 5-year post)	53	41	40
Alternative 1 (Dry event, 1-year post)	49	40	35
Alternative 2 (Dry event, 1-year post)	51	43	42
Alternative 1 (Dry event, 5-year post)	48	38	31
Alternative 2 (Dry event, 5-year post)	48	41	35
Existing 0.0 ft SLR	53	32	44
Existing 1.6 ft SLR	47	39	34

Note: SLR 6.6 ft was not included because peel angles were not able to be computed due to breaking in present-day onshore areas and within the lagoon.

Importantly, the changes to peel angle for Wave Case 1 associated with Project Alternatives 2 and 4 were within the seasonal and interannual variability (e.g., drought and flood) demonstrated by peel angle changes for Alternative 1 (no change), and the impact diminishes within 5 years following construction. In addition, a SLR of 6.6 ft will have the most significant impact on wave conditions. With a large SLR, waves will begin to break within the lagoon mouth (and elsewhere along the shoreline), making the existing surf break unrecognizable. The potential impact of the Project is diminished in comparison to significant SLR in the future.

In summary, the largest impact to future surf conditions at Topanga will be caused by SLR. The changes among the different Project alternatives are similar to the differences in surf quality between a flood or a drought year, indicating that the Project impacts are consistent with changes to surf associated with seasonal variability. In the few cases where the surf quality was impacted by Project alternatives, those differences dissipated within 5 years post-construction, indicating that there is not likely to be any long-term impact to surf quality resulting from the Project.

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Appendix I

Wastewater Management Options Conceptual Design and Construction Summary, Topanga Lagoon Restoration Project (EPD 2023)

The Appendices herein contain supporting information. These Appendices contain highly detailed figures and other graphic information, which are difficult to translate for screen reading software; therefore, the Appendices have not been translated into an auditory format. If you have a disability and/or have difficulty accessing any material in this document, please contact us by mail, email, or telephone, and we will work with you to make all reasonable accommodations. Please indicate 1) the nature of the accessibility need; 2) your preferred format; 3) the material you are trying to access and its location within this document; and 4) how to reach you if questions arise while fulfilling your request. You can direct your requests to:

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September 20, 2023

Attn: Rosi Dagit
Resource Conservation District of
the Santa Monica Mountains
4505 Las Virgenes Road, Suite 215
Calabasas, CA 91302

Subject: Wastewater Management Options Conceptual Design and Construction Summary, Topanga Lagoon Restoration Project.

Dear Ms. Dagit,

The proposed Topanga Lagoon Restoration Project (Project) is located in an unsewered portion of the Unincorporated Area of Los Angeles County. Project participants include California State Parks (CSP) and (potentially) County of Los Angeles Department of Beaches and Harbors (DBH), with facilitation by the Resource Conservation District of the Santa Monica Mountains (RCDSMM). Connection of new buildings' drainage plumbing to public sewer is a requirement of the California Plumbing Code, with exceptions allowable for cases where buildings are located more than 200 feet from the public sewer (on a lot that abuts and is served by the public sewer) and where a Private Sewage Disposal System (a.k.a, onsite wastewater system, or advanced onsite wastewater treatment system) with adequate capacity to serve the buildings is demonstrated to be feasible. The closest horizontal distance (straight line) between existing buildings at the Project Boundary corner at Pacific Coast Highway (PCH) and Topanga Canyon Boulevard (TCB) and the nearest public sewer (at Sunset Mesa) is approximately 680-ft. Therefore, if onsite wastewater management can be proven feasible for the Project, then there is no California Plumbing Code requirement for Project buildings to connect to public sewer. However, a public sewer connection may provide a more convenient wastewater management option over the long-term.

1.0 Wastewater Management Options Analyzed and Selected for Inclusion in the Environmental Impact Report

EPD Consultants, Inc. (EPD) reviewed off-site and onsite wastewater management options for the Project, and performed planning-level preliminary feasibility analysis for several onsite wastewater treatment and effluent dispersal sites and two public sewer connection options (EPD, 2022 (a),(b),(c)). Summaries of the analyses performed, and preferred wastewater management options, according to feasibility and environmental performance criteria prescribed by RCDSMM, are provided in this Report.

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1.1 Project Wastewater Generation Rates by Alternative

An analysis of wastewater generation rates associated with each alternative was performed at the outset of EPD's effort (EPD, 2002(a)). Alternative 2 with visitor services was projected to produce 15,790 gpd, while Alternative 3 and 4 were projected to produce 24,320 gpd and 23,786 gpd, respectively. Refinements to these rates were developed after the Project description was clarified and new information became available on parking and visitor services. Current wastewater generation projections are 8,380 gpd for Alternative 2 without visitor services, and 12,330 gpd and 11,370 gpd for Alternatives 3 and 4, respectively. For the onsite wastewater system (OWS) currently serving the Topanga Beach Lifeguard Station and restrooms, the 2019 Annual Report for Waste Discharge Requirements compliance submitted to the Los Angeles Regional Water Quality Control Board (RWQCB) shows a peak-month (July) maximum average and daily maximum wastewater flow of 603 gpd and 1,347 gpd, respectively. Public sewer options, as well as OWS with two (2) effluent dispersal options, subsurface drip irrigation (SDI), and seepage pits, were assessed for viability to support the project alternatives.

2.0 Public Sewer Connection Evaluation

Public sewer options considered were: (1) extension of the public sewer main within the State Highway 1 (Pacific Coast Highway) right-of-way from Coastline Drive to Topanga Beach parking lot and the motel site; (2) construct an onsite force main and new gravity sewer line between TCB and through a private property easement to Coastline Drive. EPD and representatives from Project Team organizations had separate meetings to discuss these options with the Los Angeles County Sanitation Districts (LACSD) and the Los Angeles County Department of Public Works' Sewer Maintenance Division (SMD) (see Meetings in References section). During these meetings, staffs from the two public sewer agencies communicated to the Project Team the following critical criteria for establishing sewer connections under the two options considered.

LACSD – An extension of this agency's sphere of influence to include the Project area would be required to provide sewer service. This would require consideration through California Environmental Quality Act (CEQA) analysis and approval by the Los Angeles County Local Formation Commission (LAFCO). Connection of the new public pipeline from project participants' properties to LACSD facilities would be made at the existing sewage pump station located on the south side of Highway 1 across from Coastline Drive. The following is new information developed from the meeting.

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- Based on a discussion with LACSD, EPD understands that the existing LACSD pump station on Highway 1 across from Coastline Drive has available capacity to accommodate wastewater flows projected to be generated from the Project, regardless of which alternative is selected.
- Several additional regulatory agencies would be required to review and approve a sewer alignment and installation, including the City of Los Angeles Bureau of Sanitation.

SMD – Gravity sewer feasibility must be evaluated and determined infeasible before any type of force main (pump station and pressure pipe) design will be accepted. Twenty (20) foot minimum drivable roadway must be part of any public sewer corridor. DPW sewer design and construction standards would need to be met. The following is new information developed from the meeting.

- A new assessment district would need to be formed and the sewer and associated pump stations (with easements) would be dedicated to Los Angeles County for acceptance and operation.
- For Pacific Coast Highway sewer extension (public sewer connection Option 2), criteria for gravity sewer feasibility would include reconstruction of the existing LACSD pump station next to Pacific Coast Highway across the highway from Coastline Drive.
- For a municipal pump station and force main built across TCB and through a private property easement to Coastline Drive (public sewer connection Option 1), there is no existing easement or graded roadway that would meet minimum standards.

If the Highway 1 public sewer extension is selected as the preferred wastewater management option, both the DBH and CSP are anticipated to connect to it. If both agencies join in the formation of a sewer district, they will use a shared building sewer (i.e., on-lot sewage collection and conveyance system) running between the area of the motel (on CSP side) and the beach parking lot (on DBH side) to TCB, where there may be a second highway crossing. The sewer alignment within PCH is assumed to be located in the highway median, with construction closures periodically affecting the closest lane for west bound traffic (#1 westbound lane). Due to several existing unknowns, it is currently uncertain whether a gravity sewer is feasible or if a force main will be required. Both contingencies are accounted for in EPD's analysis of construction requirements.

Construction of a public sewer extension from the intersection of TCB and east along PCH to the LACSD pump station facility at Coastline Drive, as well as connection to waste water generating facilities within the project boundary, would take approximately 12 months to construct. The building sewer from beach and lagoon parks

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properties would extend to a sewer lateral crossing all or part of PCH. Construction is assumed to occur during the last year of the four-year construction window of the greater lagoon restoration project.

Estimated Costs for Public Sewer Connection

A rough order magnitude cost estimate developed by EPD in 2022 for the Highway 1 sewer extension was $6.1M, including both soft and hard costs (EPD, 2022(c)). After a subsequent meeting with Project participants and SMD, participants and EPD learned new information about critical criteria for sewer construction mentioned above. EPD also contacted a cost estimator at Blois Construction, Inc., who has recent experience performing trenchless pipeline work in Highway 1 locally, and together discussed major cost items (see Personal Communication in References section). Based on the new information, additional cost items updating current estimated costs for the Highway 1 public sewer extension are the following.

Updated trenchless construction costs (Blois info; varies based on soil conditions and groundwater depth):	$2.7M to $4.1M (additional)
• Dual force mains (if gravity sewer not feasible; requirement per SMD):	$300K (additional)
• Deepen municipal pump station at Coastline Drive (for gravity sewer feasibility; requirement per SMD):	$450K (additional)
	$3.45M to $4.85M (additional)
Updated Public Sewer Extension Cost (Range)	**$9.6M to $11M**

Major cost elements included in the updated cost estimate include $1,600/lineal foot for jack boring or $1,600/lineal foot for microtunneling (where required due to geotechnical demands; e.g., shallow groundwater, unstable soils), and lowering of the LACSD pump station facility to achieve for gravity sewer flow. Actual costs would be determined during the public sewer engineering phase, after additional geotechnical and survey field work, regulatory coordination, a sewer feasibility study, and engineering design are performed and reviewed by the public sewer agencies.

The expected extent and locations of the public sewer connection option for the Project are shown on Exhibit 1 (attached hereto). Phasing for permitting and construction of the two leading sewage disposal options (OWS and public sewer connection with sewer alignment in Pacific Coast Highway) will be described in the EIR, which will explain the anticipated Project overall timeline and the potential for minor adjustments in how phasing

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is implemented. Staging areas for the construction are shown on the conceptual public sewer plan provided as Attachment 1. To protect against the possibility of sewage spills from rupture, sewer pipelines would be designed in accordance with seismic safety standards.

2.1 Public Sewer Construction

For sewer construction within Pacific Coast Highway, trenchless methods are proposed for 4,000-ft of pipeline installation in areas most sensitive to roadway lane closures or with critical underground obstructions, and another 1,000 ft of steel pipe installed in open trenches (anticipated for west of TCB). The Los Angeles County minimum main line sewer burial depth is 7.5 ft (not including a bedding depth below the pipe determined based on soil testing; assumed here as 1-ft). Trenchless methods do not require an open trench for installing the pipeline, and this can minimize the roadway area subject to lane closure during construction. Two different methods for trenchless pipeline construction, described in more detail below, are considered for minimizing the length and duration of highway lane closures: 1) jack and bore trenching, and 2) microtunneling.

Underground pipe sizes for the public sewer connection, to be installed using trenchless technologies, would be determined during the engineering design phase post-CEQA. Associated cut and fill quantities for the underground pipeline can be conservatively estimated roughly assuming 4,000 lineal feet of underground microtunnel sleeve sized at 60” diameter to carry dual 8” HDPE force mains and associated appurtenances; this yields approximately 930 cubic yards for the trenchless underground pipeline installation within Highway 1 (removal with 100% export to a destination yet to-be-determined). Open trench construction for 1,000 lineal feet of steel pipeline for the balance of PCH sewer sized at 8” diameter (8.5-ft x 4-ft trenches), and 1,000 lineal feet of solvent welded plastic pipeline building sewers sized at 6” diameter (3-ft x 3-ft trenches), corresponds with approximately 1,260 cubic yards (for the steel pipeline) and 350 cubic yards (for the plastic pipelines) balanced cut and fill (removal and 100% replacement with compaction occurring longitudinally within the PCH right-of-way, and on park agencies’ lands and PCH at perpendicular crossings, respectively). For pump stations, conservatively assuming three (3) underground units each with underground excavation dimensions of 8-ft x 16-ft x 15-ft, the cut and fill (removal and replacement, with 20% export to a destination yet to-be-determined) quantity is approximately 215 cubic yards. The projected export quantity therefore is: 930 + 215(0.2) = 973 cubic yards.

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Jack and Bore

Jack and bore is a non-steerable trenchless pipeline installation system that drives an open-ended pipe sleeve laterally using a percussion hammer, thereby resulting in displacement of soil equivalent to the wall thickness of the pipe. For this method, a launch pit and a receiving pit would be dug on either end of the pipeline length to be installed. Jacking pits would be approximately 35 feet long and 15 feet wide; receiving pits would be smaller, approximately 20 feet long and 13 feet wide. Hydraulic jacking equipment would be placed in the jacking pit. The depth would depend on adjacent utilities, but is assumed would be between 10-ft and 12.5-ft deep. The boring equipment and pipe would be lowered alongside the pit.

One section at a time would be installed. The ramming tool would be removed after each section is in place and a new section would be welded on to the end of the newly installed section. The ramming machine would be connected to the new section and ramming would continue. Soil spoils from inside the pipe would be removed with an auger, compressed air, water, or a combination of techniques.

Microtunneling

Microtunneling is a tunnel construction technique used to construct utility tunnels in areas where groundwater interferes with the underground pipeline alignment. A remote operator drives the boring machine's location, orientation and hydraulic devices via a computer console. Microtunneling would also use a jacking pit and receiving pit. This method is similar to jack and bore, but a pilot tube is pushed from the jacking pit to receiving pit. Once the pilot tube reaches the receiving pit, a pulling adaptor would be installed and used to pull high density polyethylene force main pipe from the jacking pit to the receiving pit. The pipe sleeve installation depth and the dimensions of launch and receiver pits would be similar to those for the Jack and Bore method.

Municipal Pump Station(s)

A municipal station for the wastewater collection system would be located along pipeline alignments, below ground and on public rights-of-way and/or easements (see Attachment 1). The pump station would have odor control equipment to avoid nuisance odors. Above-ground features of these facilities would be air release valves along pipelines at high or low elevation points, vent pipes at the pump stations, and backup generators, transformers, electrical control switchboards. These would be fenced and screened for security and aesthetics. Air release valves would be about three feet tall and 18 inches in diameter. The above-ground components at the municipal pump station site are described below; these would be painted green to blend with existing vegetation. An image depicting a typical municipal pump station is shown in Figure 1. Dimensions for major

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elements of a municipal grade pump station are provided below as length (L), width (W), height (H), and depth (D) in feet.

Above Ground

- Generator: 9-ft (L) x 4-ft (W) x 7-ft (H)
- Transformer: 4.5-ft (L) x 6-ft (W) x 4.5-ft (H)
- Electrical panel: 2.5-ft (L) x 1-ft (W) x 4.5-ft (H)
- Vent: 4-in diameter x 3-ft (H)

Underground

- Vault: 6-ft diameter; 12.5-ft (D)
- Valve box: 6-ft diameter; 5-ft (D).

3.0 Onsite Wastewater System Evaluation

The majority of the properties within the Topanga and Malibu area are semi-rural properties where wastewater disposal is accomplished using onsite wastewater treatment (a.k.a., septic) systems. Available land and reserve subsurface leaching areas are generally sufficient for the majority of these properties. Similarly, it is generally considered feasible to provide wastewater management for the Project using onsite wastewater technologies. Onsite wastewater system (OWS) options were considered, with an advanced treatment works to meet groundwater quality requirements and analysis of the several potential effluent dispersal sites. Waste Discharge Requirements (WDR; a type of renewable permit) would need to be obtained from the RWQCB to meet state and Federal water quality requirements for any alternative wherein the wastewater generation rate exceeds 10,000 gpd. Approval of the OWS engineered design by the Conty of Los Angeles DPH, DPW agencies (Geotechnical and Building Safety, or equivalent State agency), and County of Los Angeles Department Regional Planning (DRP), are anticipated to be required as conditions of the Coastal Development Permit.

Onsite Treatment Works

The raw wastewater in the system would be conveyed in underground (~4,000-ft) and above ground (~450-ft) building sewer pipelines to the treatment works site located next to TCB (see Attachment 1 and Figure 2). At this location, the raw wastewater would be treated with a mechanical treatment system. The effluent from this

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system would then be released to seepage pits and/or a drip dispersal system for subsurface disposal. The treatment facility (or treatment plant) would have a small operation and control shed.

The precise design of the treatment works will depend on WDR or Waiver conditions issued by the Los Angeles Regional Water Quality Control Board. In concept, the treatment works would comprise a hybrid fixed-film, suspended growth, extended aeration wastewater treatment system with a two-stage biological process referred to as a Moving Bed Biological Reactor (MBBR). The equipment includes a large primary clarifier compartment for extended storage of sludge. The MBBR system removes nitrogen using biological processes; specifically, ammonification followed by nitrification and denitrification. An effluent filter protects the effluent chamber and subsequent dispersal field from solids carry-over during upset conditions. It is designed to remove all particles larger than 1/16". An ultraviolet light (UV) disinfection unit would be included reduce remaining pathogens.

The operation and control shed would be constructed and would be approximately 10 feet by 12 feet, single story and approximately 16 feet high. The building would be built from concrete masonry unit (CMU) blocks with a wood truss roof and asphalt shingles, or similar, and would house the operations control equipment and provide limited storage.

Effluent Dispersal Works

Effluent from the treatment works would be pumped to a SDI area located alongside TCB and/or seepage pit field at the "horseshoe corner" area, containing from 8 to 12 seepage pits (see Attachment 2). The area for seepage pits has been tested and demonstrated to handle effluent discharge for all non-visitor serving and visitor serving Project alternatives. Based on surveyed topography, the mapped area for SDI is currently projected to provide capacity for wastewater flows for part of Alternative 2 (approximately 6,800 gpd); after future infiltration testing and/or facility use modifications (deintensification), it is anticipated that SDI will provide the minimum necessary capacity to serve Alternative 2. Drip dispersal is a more non-conventional method of effluent dispersal than seepage pits, and because the proposed subsurface drip dispersal area is in uncertified earth fill special regulatory consideration would be required (per County Department of Public Works, Geotechnical Division; see references section). Also, the SDI area has not yet been tested to prove a feasible design infiltration rate. Vertical separation to groundwater of a minimum of 10-ft would be maintained for all onsite wastewater options. Horizontal separation to Topanga Creek and the Blue Line stream to the east would be more than 250-ft in the "horseshoe corner" area and 100-ft in the SDI area.

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The following potential effluent dispersal sites were initially evaluated on CSP property: (1) an area for seepage pits at the existing building pad above the highway at the western end of the project boundary above Wylie's bait shop and Cholada restaurant; (2) an area for seepage pits at the top of the knoll above the Reel Inn seafood restaurant; (3) an area for leaching trenches on the western side of Topanga Creek where residences were formerly located; (4) a subsurface drip irrigation area on the western side of TCB. A multi-criteria evaluation was performed, and the sites were ranked for feasibility likelihood (EPD, 2022(a),(b)). Field exploration of top scoring sites revealed poor percolation rates for the otherwise best qualified area (the building pad above Cholada's). Except for SDI area on the western side of TCB, all other sites were initially ruled out.

EPD estimated a range of potential infiltration rates for the SDI area initially under consideration and developed projections of the site's capacity to accept treated wastewater (Reference EPD, 2022(b)). After site plan development, a new SDI area farther to the north was area was performed at the "horseshoe corner" and an area for up to twelve (12) 40-ft deep seepage pits was found by percolation testing and setback analysis to be feasible for dispersal of treated wastewater effluent for all proposed Project alternatives (EPD, 2023; GeoConcepts, 2023). With Project participants, EPD met with representatives from DRP, Department of Public Health (DPH), and Department of Public Works (Geotechnical division) to discuss critical criteria for siting and design of an OWS. For wastewater generation rates larger than 10,000 gpd (Alternatives 3 or 4), WDR issuance by the RWQCB would be required.

Following screening analysis and percolation testing, two (2) potential methods for dispersal of treated wastewater effluent are currently being considered for serving the proposed Project; seepage pits and SDI (see Attachment 2). SDI is likely able to support up to 6,800 gpd of the wastewater generation associated with Project Alternative 2, while seepage pits could support the balance of Alternative 2, with a future expansion/replacment area, and/or any other Project alternative. After future infiltration testing and/or facility use modifications (deintensification), it is anticipated that SDI will provide the minimum necessary capacity to serve Alternative 2 present requirements. Future expansion/replacement area any of the alternatives would rely on using seepage pits at the horseshoe corner. Typical installation equipment for seepage pits and SDI is shown in Figure 4.

Estimated Costs for Onsite Wastewater Treatment System Options

EPD developed a very rough order magnitude cost estimates for OWS with seepage pits and SDI options at $1.6M (EPD, 2020(c)). That OWS cost estimate was developed for drip dispersal on the west side of TCB, before the horseshoe area seepage pits effluent dispersal area, which provides significantly greater capacity, was

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tested and proven feasible. For use of this seepage pit area, the 2022 cost estimate will need to be updated to account for an additional private pump station, a private force main conveyance, and a highway crossing, and removal of a bridge crossing. Also, the specific type of treatment works to be designed and constructed will depend on WDR permit conditions that will be established during Project implantation. Effluent and groundwater quality limitations will dictate the type of secondary and tertiary (disinfection and nutrient removal) treatment processes required. The $1.6M very rough order magnitude cost estimate is still considered valid for both OWS options (dispersal by seepage pits or SDI) at the time of this writing.

3.1 Onsite Wastewater System Construction

A description of the proposed onsite wastewater system construction considered as part of the Project alternatives is provided in this section. A conceptual OWS layout and staging areas for the construction are shown on Attachment 2.

- The time duration to construct an OWS would be approximately 3- to 6-months, and the installation would occur during the last year of Project construction.
- Cut and fill quantities would be approximately 40 cubic yards for the treatment works (assuming 8-ft diameter treatment tanks and equivalent deep grease interceptor; 40% export), 50 cubic yards for underground building sewer pipelines (assuming 4,000-ft maximum 3-ft deep plastic pipelines; balanced cut and fill), and 925 cubic yards for seepage pits (assuming 40-ft deep by 6-ft diameter seepage pits; 100% export) as per the conceptual OWS site plan shown in Attachment 2.
- SDI would require a balanced cut/fill of approximately 2,500 cu yd (assuming 2-ft depth over an area of approximately 34,000 sq ft). Disposition of export soil associated with the OWS would be determined during Project construction, and onsite reuse of soils within the Project boundary is the preferred method.
- In summary, an OWS with the maximum number of seepage pits would yield 40 + 15 + 925 = 980 cubic yards of grading, with an export quantity of 40(0.4) + 925 = ~941 cubic yards.

<u>Private (Park Lands) Building Sewer Construction</u>

The building sewer would be laid out to include connections from park buildings to the wastewater treatment works. The majority of the building sewer system would be designed to be of the gravity-flow type, but up to two pump stations with pressurized conveyance pipes could be necessary to serve buildings where there is

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not enough vertical fall to accomplish gravity drainage. A CAD model would be developed during the engineering design phase to determine feasible pipe slopes, trench depths, flow rates, velocities for individual sections of the system, and pumping requirements. Preliminary layouts were generated to determine physical constraints and to assist in cost estimating. Pressure pipes in the building sewer system would all be sized up to 4 inches in diameter. This would allow for the conveyance of 3-inch solids, while minimizing head loss in the pipes, thereby reducing pumping requirements. Main line gravity pipes in the sewage collection system would be up to 6 inches in diameter to adequately convey solids and prevent clogging within the system. Building sewer lateral pipes connecting buildings to main lines are assumed to be 4 inches in diameter. Six-inch gravity pipes in the collection system can be used with a 0.5 percent minimum slope to avoid deeper excavations, where feasible. Pipes are anticipated to be installed in open trenches with ~3' depths and ~3-ft widths. Construction trench dimensions for private building sewers are accounted for in the cut and fill quantities provided above.

Private (Non-municipal) Sewage Pump Stations

Due to the topography in the area, at least one pump station would be necessary for the on-lot system to convey wastewater to the treatment works site. Private sewage ejector pump station(s) (up to 4-ft diameter and 10-ft deep, or wider and shallower vaults as needed to protect resources) would be used to transport raw wastewater from buildings on park lands to the treatment works area. Also, at least one facility-grade sewage pump station would be necessary to convey treated wastewater effluent to the effluent dispersal site (seepage pits and/or subsurface drip irrigation). A typical larger facility-grade private sewage pump station for the TCB force main is shown on Figure 3. Typical dimensions for this are similar to a municipal pump station.

Above Ground

- Transformer: 4.5-ft (L) x 6-ft (W) x 4.5-ft (H)
- Electrical panel: 2.5-ft (L) x 1-ft (W) x 4.5-ft (H)
- Vent: 4-in diameter x 3-ft (H)

Underground

- Vault: 6-ft diameter; 12.5-ft (D)
- Valve box: 6-ft diameter; 5-ft (D).

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The force main along the side of TCB would be approximately 3,000 feet long, with an approximately 450-ft section installed above-ground on a slope below (to be regraded), on State Parks property. This force main would include one highway crossing at the "horseshoe corner" (near the ½ mile marker on Highway 27). Use of a gravity pipeline in this force main segment (from treatment works to seepage pits) is considered infeasible due to the goal of constructing the pipeline outside of the Caltrans right-of-way (this leaves only the identified sloped area below TCB). Sewage ejector pump stations would also be needed to convey sanitary waste (under pressure) from building drainage plumbing to the building sewer and treatment works. In all cases, the pump systems would be sized so that it would provide a minimum required velocity for the conveyance of solids while minimizing head loss, thereby conserving electric power use. Construction trench dimensions for private pump stations are accounted for in the cut and fill quantities provided above.

In order to provide private wastewater service to the beach park, the proposed building sewer for the onsite wastewater system would cross State Highway 1 in two locations (see Attachment 2). These crossings would occur below (deeper than) the public water distribution main (at least 5.5-ft pipe burial) and would require CalTrans approval. Staging areas for OWS construction are shown on Attachment 2.

4.0 References

Technical Memoranda and Report:

EPD Consultants, Inc. (EPD), 2022(a). Technical Memorandum. Conceptual Wastewater Feasibility Study and Alternatives Analysis for Topanga Lagoon Restoration. Draft, Revision 1, dated January 19, 2022.

EPD, 2022(b). Technical Memorandum. Draft Topanga Lagoon Project Ons- and Off-site Wastewater Systems Analysis, Alternatives Evaluation, and Conceptual Level Engineering Technical Report, dated June 15, 2022.

EPD, 2022(c). Cost Analysis of Conceptual Wastewater Management Alternatives for Topanga Lagoon Restoration. Draft report, dated July 8, 2022.

EPD, 2023. Percolation Test Report for Topanga Lagoon Restoration, Horseshoe Area, dated August 21, 2023.

GeoConcepts, 2023. Proposed Onsite Wastewater Treatment System, dated August 16, 2023

Meetings:

Los Angeles County Department of Public Works, Geologic and Materials Engineering Division. Project Meeting held on July 13, 2022.

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Los Angeles County Department of Public Works, Sewer Maintenance Division. Project Meeting held on July 19, 2023

Los Angeles County Department of Public Health, Environmental Health, Land Use Program. Project Meeting held on July 21, 2022.

Los Angeles County Sanitation Districts. Project Meeting held on July 13, 2022.

Personal Communication:

Teleconference between Andrew Sheldon (Sheldon Engineering, Inc.) with Jared Streets (Blois Construction, Inc.; Oxnard, CA) held on September 7, 2023.

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5.0 Limitations

Consultant has performed these services within the limits described by Client. Percolation rates are wastewater disposal capacity projections based upon Los Angeles County Plumbing Code (LACPC) guidelines. This Report has been prepared in accordance with generally accepted practice. This Report relates only to the requirements of the LACPC. The conclusions and recommendations in this Report are based upon data obtained from the field percolation testing performed according to the County/State agencies' standards and requirements. It should not be assumed or expected that the conditions between tested locations are similar to those encountered at the individual locations. It is possible that conditions between sampling locations may vary. Should conditions be encountered in the field that appears different from those described in this Report, Consultant should be contacted immediately in order that Consultant might evaluate their effect. No warranties, either expressed or implied, are made as to the professional advice provided under the terms of the agreement and included in this report.

The data and conditions presented herein are generally considered valid for one year from the date of this Report. Reports and system designs older than one year can be updated to assure compliance with current regulations. Consultant will be available to make a final review of the project plan and specifications to assist in assuring correct interpretation of this Report's recommendations for use in applicable sections. It is the responsibility of Client and/or Clients' Contractor to ensure that all recommendations are carried out properly and all backfill of trenches and excavations are periodically checked as well as restored to acceptable conditions.

If this Report or portions here of are provided to contractors or included in specifications, it should be understood by all parties that they are provided for preliminary information only and should be used as such. Any variance from Consultants prescribed requirements and/or recommendations would nullify this Report and Client and/or Clients' Contractor would indemnify Consultant and its representatives from any and all liabilities and/or obligations.

This report has been prepared for the Resource Conservation District of the Santa Monica Mountains and its authorized agents and is not intended for transfer or use by other parties without written review by Consultant. Please contact the undersigned if there are any questions concerning this Report or the recommendations included herein.

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Respectfully submitted,
EPD Consultants, Inc.

Kevin Poffenbarger, PE
RCE 69089
Senior Project Engineer

Attachments:
1. Exhibit: Proposed Sewer Pipeline Corridor for Environmental Analysis, Revision 3, dated September 14, 2023
2. Exhibit: Proposed Onsite Wastewater Treatment System and Corridor, Revision 1, dated September 13, 2023

xc: Addressee (Report in PDF via Email)
GeoConcepts, Inc. (Attn: Mark Barrett) (Report in PDF via Email)
File (1 Report)

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PRELIMINARY
NOT FOR CONSTRUCTION

REFERENCES AND TRACINGS

1. LOS ANGELES COUNTY ENTERPRISE GIS, PARCELS SHAPEFILE, 2023
2. LOS ANGELES COUNTY WATERWORKS DISTRIBUTION MAPS, VARIOUS DATES
3. CALTRANS PLANS FOR TIE–BAK WALL, DATED 12–19–2003
4. BIG AERIAL PHOTO BACKGROUND 2023

NOTES

1. MAPPING OF SEWER CORRIDOR SHOWN HEREON IS FOR ENVIRONMENTAL ANALYSIS AND PLANNING PURPOSES ONLY
2. THIS MAP MAY NOT BE USED FOR PURPOSES OF ENGINEERING OR CONSTRUCTION
3. BOUNDARY, HIGHWAY CENTERLINE, TOPOGRAPHY, AND UTILITY SURVEYS MUST BE USED FOR DEVELOPMENT OF AN ENGINEERING DRAWING OF THE PROPOSED PIPELINE CORRIDOR SHOWN HEREON
4. ANY RELIANCE ON THIS MAP FOR ENGINEERING PURPOSES IS AT USER–ENGINEER'S SOLE RISK

LEGEND

PROPOSED BUILDING SEWER FORCE MAIN ON PARK LANDS (TWO OPTIONS)

PROPOSED HIGHWAY CROSSING (STATE ROUTE 1)

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PROPOSED MUNICIPAL PUMP STATION; CALIFORNIA STATE PARKS, GATEWAY CORNER

PROPOSED PUBLIC SEWER PIPELINE CONSTRUCTION STAGING AREA 1 (EXISTING PARKING LOT)

PROPOSED MUNICIPAL PUMP STATION; BEACH PARKING LOT OWNED AND ADMINISTERED BY LOS ANGELES COUNTY DEPARTMENT OF BEACHES AND HARBORS

PROPOSED PUBLIC SEWER PIPELINE CORRIDOR; TO BE LOCATED BY SURVEY 40' FROM S. EDGE OF HWY 1 RIGHT–OF–WAY (MEDIAN) AND NORTHBOUND LANE 1

PROPOSED PUMP STATION REPLACEMENT

PROPOSED PUBLIC SEWER PIPELINE CONSTRUCTION STAGING AREA 2 (EXISTING PARKING LOT; WILL ROGERS STATE BEACH, ADMINISTERED BY LOS ANGELES COUNTY DEPARTMENT OF BEACHES AND HARBORS)

DETAIL 1: PROPOSED PUBLIC SEWER PIPELINE CORRIDOR AND PIPELINE CONSTRUCTION STAGING AREAS

(FOR IN-CONCEPT PLANNING REVIEW AND ENVIRONMENTAL ANALYSIS ONLY)

N

1"=200'
0 200 400

Notes

First Issued	Sep-1 2023
Revision 1	Sep-7 2023
Revision 2	Sep-13 2023
Revision 3	Sep-14 2023
Revision 4	Sep-20 2023

TOPANGA LAGOON RESTORATION
LOS ANGELES COUNTY

PROPOSED PUBLIC SEWER PIPELINE CORRIDOR MAP FOR ENVIRONMENTAL ANALYSIS

Septemper 2023

EXHIBIT
ATTACHMENT

REFERENCES AND TRACINGS

1. LOS ANGELES COUNTY ENTERPRISE GIS, PARCELS SHAPEFILE, 2023
2. LOS ANGELES COUNTY WATERWORKS DISTRIBUTION MAPS, VARIOUS DATES
2. TOPOGRAPHICAL SURVEY CAD FILE, ISSUED ON MAY 9, 2023 BY PSOMAS, INC.
3. RIGHT OF WAY SURVEY CAD FILE, ISSUED ON JULY 31, 2023 BY PSOMAS, INC.
4. ELEVATIONS AND BOUNDARIES ARE APPROXIMATE PER THE REFERENCED TRACINGS.

LEGEND

PROPOSED OWTS CONSTRUCTION AREA (TREATMENT WORKS WITH SEEPAGE PITS ONLY)

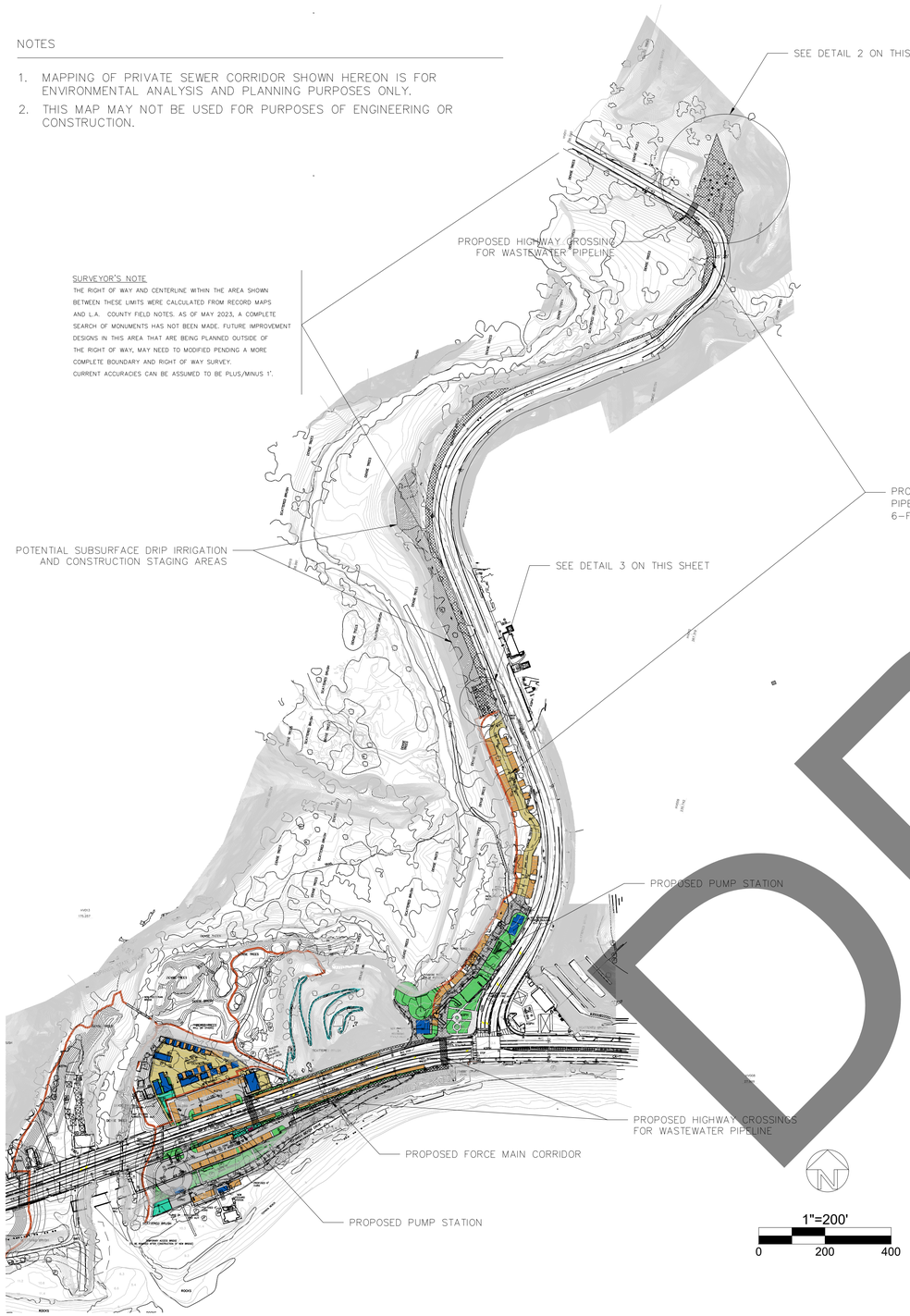
POTENTIAL ADDITIONAL OWTS CONSTRUCTION AREA (ADDING SUBSURFACE DRIP IRRIGATION)

PROPOSED HIGHWAY CROSSING (STATE ROUTE 1)

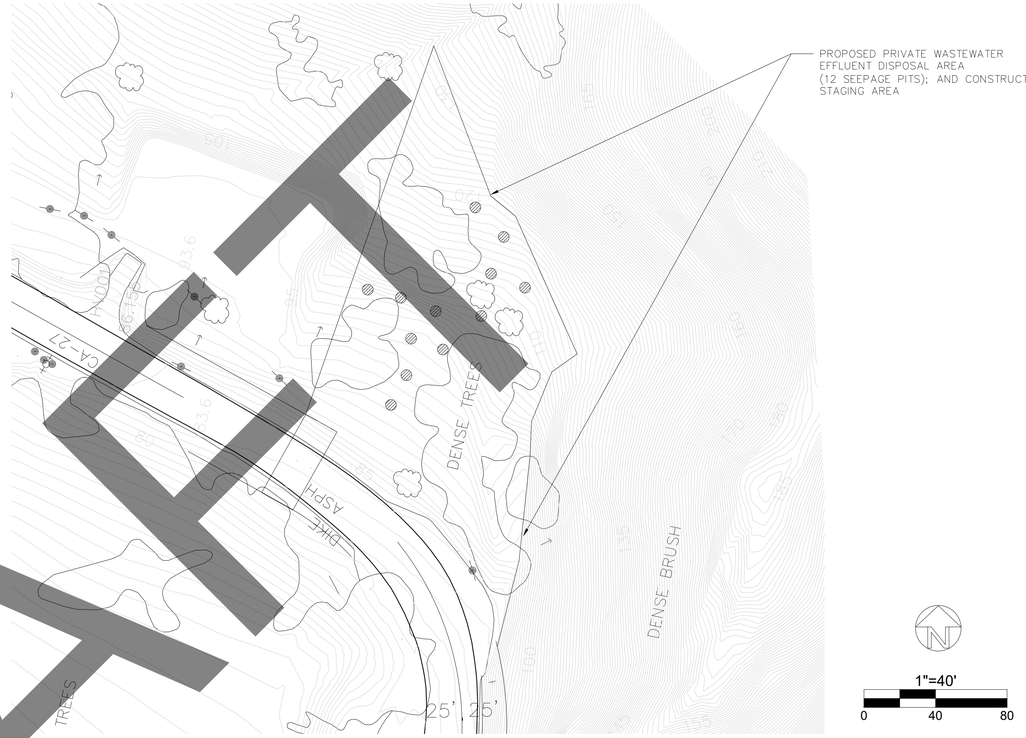
NOTES

1. MAPPING OF PRIVATE SEWER CORRIDOR SHOWN HEREON IS FOR ENVIRONMENTAL ANALYSIS AND PLANNING PURPOSES ONLY.
2. THIS MAP MAY NOT BE USED FOR PURPOSES OF ENGINEERING OR CONSTRUCTION.

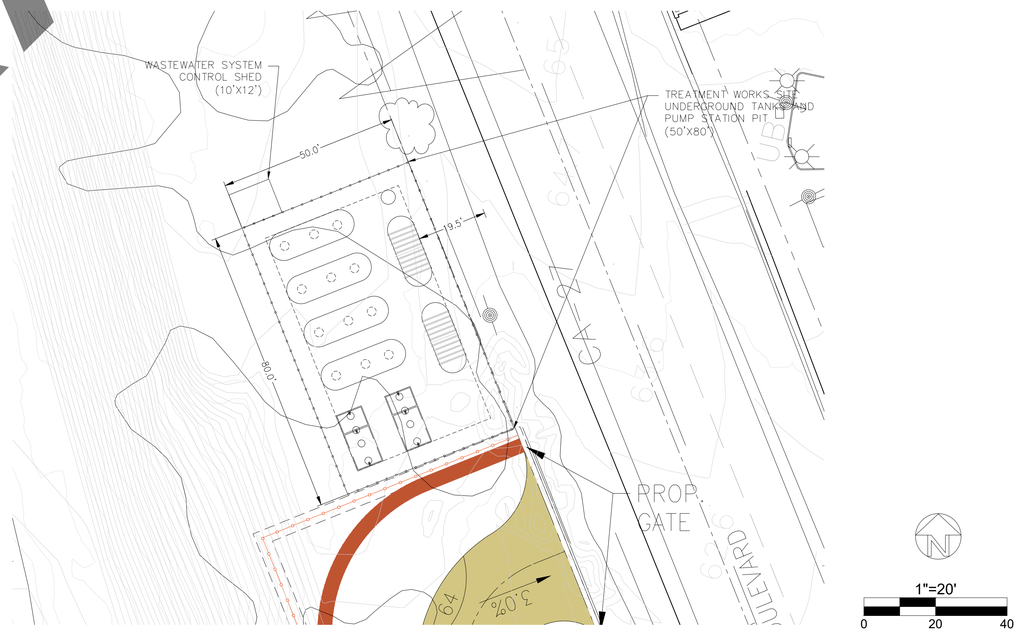
PRELIMINARY
NOT FOR CONSTRUCTION



DETAIL 1: PROPOSED ONSITE WASTEWATER TREATMENT SYSTEM CORRIDOR



DETAIL 2: PROPOSED HORSESHOE AREA SEEPAGE PITS



DETAIL 3: PROPOSED WASTEWATER TREATMENT WORKS

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Notes	
First Issued	Sep-9 2023
Revision 1	Sep-13 2023

TOPANGA LAGOON RESTORATION
LOS ANGELES COUNTY

PROPOSED ONSITE WASTEWATER TREATMENT SYSTEM AND CORRIDOR FOR ENVIRONMENTAL ANALYSIS

August 2023

EXHIBIT
ATTACHMENT
2 of 2

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FIGURE 1

TYPICAL MUNICIPAL PUMP STATION
(GREEN AND SILVER CABINETS [AT GRADE] AND UNDER GREY MANHOLES [BELOW GRADE])

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FIGURE 2

TYPICAL ADVANCED ONSITE WASTEWATER TREATMENT WORKS UNDER CONSTRUCTION
(CONTROL SHED [TOP] AND FINISHED CONSTRUCTION [BELOW])

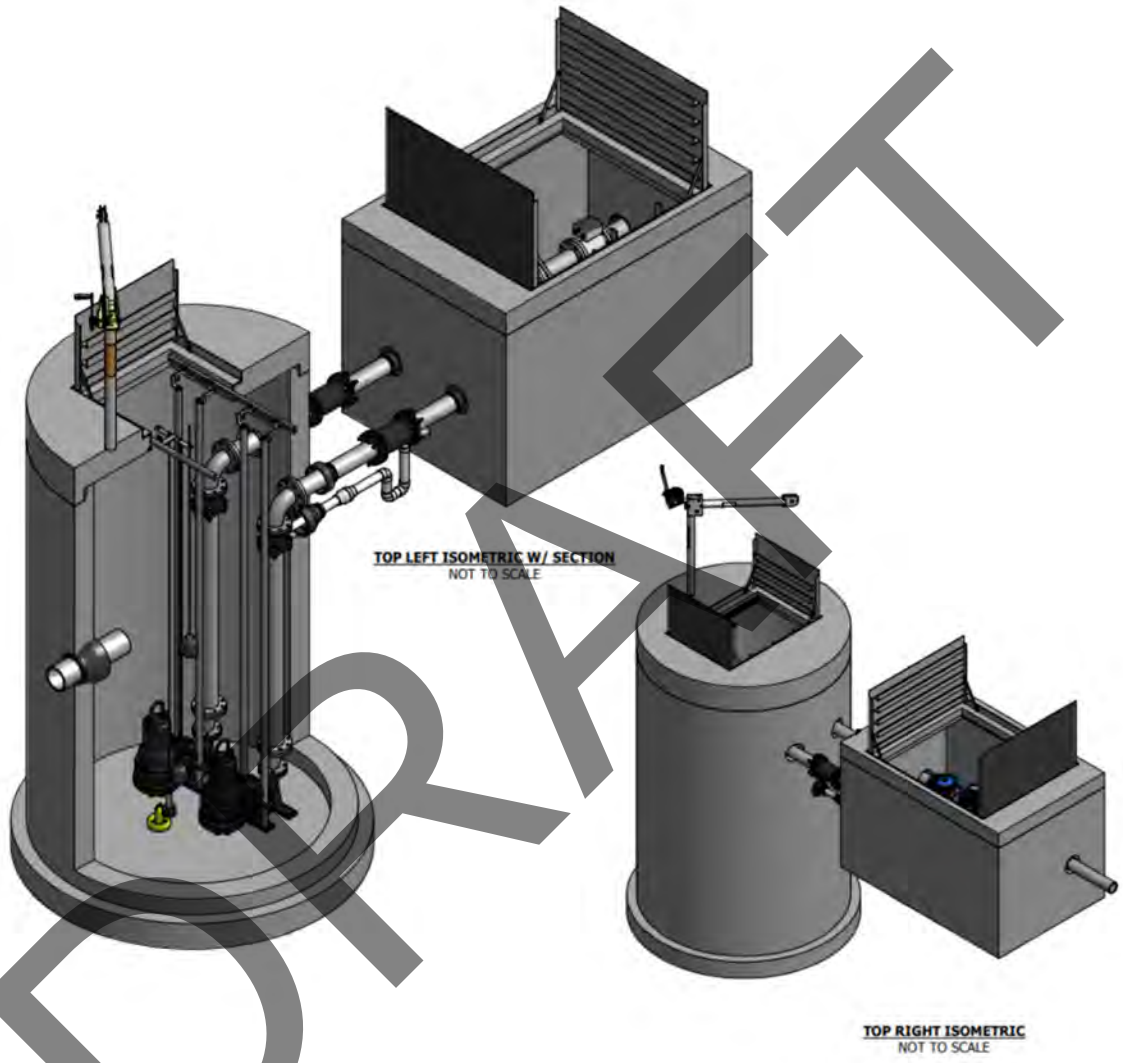

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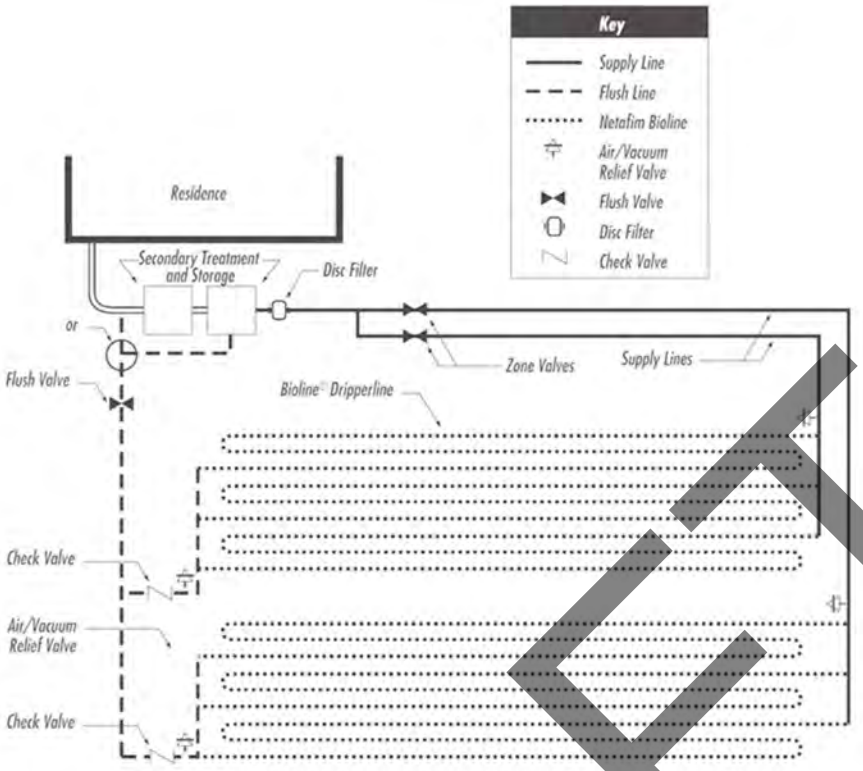
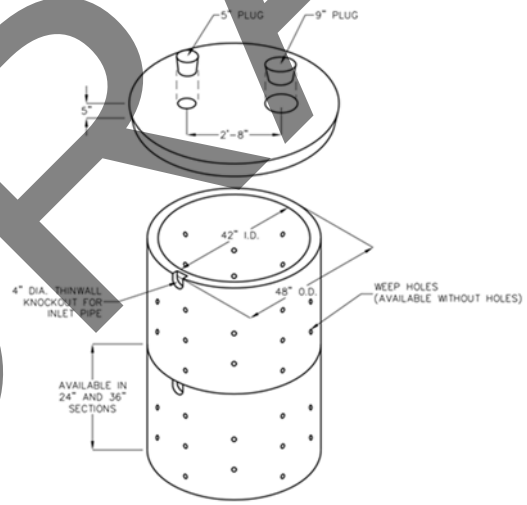
FIGURE 3

TYPICAL PRIVATE PUMP STATION



Subsurface Drip Irrigation



Seepage Pit Liner and Cap

FIGURE 4

TYPICAL SEEPAGE PITS AND SUBSURFACE DRIP EFFLUENT DISPERSAL

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Appendix J

Draft Construction Traffic and Emergency Management Plan (LLG 2023)

The Appendices herein contain supporting information. These Appendices contain highly detailed figures and other graphic information, which are difficult to translate for screen reading software; therefore, the Appendices have not been translated into an auditory format. If you have a disability and/or have difficulty accessing any material in this document, please contact us by mail, email, or telephone, and we will work with you to make all reasonable accommodations. Please indicate 1) the nature of the accessibility need; 2) your preferred format; 3) the material you are trying to access and its location within this document; and 4) how to reach you if questions arise while fulfilling your request. You can direct your requests to:

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Woodland Hills

MEMORANDUM

To:	Rosi Dagit Resource Conservation District of the Santa Monica Mountains	Date:	October 5, 2023
From:	David S. Shender, P.E. Alfred C. Ying, P.E., PTP Linscott, Law & Greenspan, Engineers	EA: LLG Ref:	23930 1-22-4487-1
Subject:	**Topanga Lagoon Restoration Project – Updated Draft Construction Traffic and Emergency Management Plan**		

Linscott, Law & Greenspan, Engineers (LLG) has prepared this Draft Construction Traffic and Emergency Management Plan for the Topanga Lagoon Restoration project (the "Project"). This memorandum includes a description of the proposed Project, a discussion on the various construction activities, construction circulation, a summary of intersection and roadway operations, as well as emergency response and access.

This Draft Construction Traffic and Emergency Management Plan has been prepared in conjunction with Mitigation Measure TRA-1 recommended in the Draft Environmental Impact Report (Draft EIR) prepared for the Project. Mitigation Measure TRA-1 recommends the preparation of a Construction Traffic Management and Emergency Response Plan during final design and prior to issuance of demolition, grading, or any construction permits issued for the Project. This document is intended to serve as a preliminary/draft plan for informational purposes only and does not represent the final plan recommended for preparation through Mitigation Measure TRA-1. The final plan can only be prepared in conjunction with the preparation of final design when additional details related to the construction of the Project are known and therefore suitably addressed through the Construction Traffic Management and Emergency Response Plan.

Project Description

The Topanga Lagoon Restoration Project is located along Pacific Coast Highway (PCH, State Route 1 or SR-1[1]) in the Malibu area of Los Angeles County. The Project area is understood to be generally between the SR-1 intersection with Coastline Drive to the east and the boundary of the City of Malibu just west of the current Cholada Thai restaurant. In addition, it is understood the Project area extends northerly along Topanga Canyon Boulevard (TCB, State Route 27 or SR-27) from SR-1 by approximately 0.5 miles.

The Projects consists of the proposed restoration of Topanga Lagoon and will include the replacement of the SR-1 bridge over the lagoon. The new bridge will have similar features in terms of roadway width as compared to the existing bridge. In addition,

[1] While SR-1 is a north-south highway through California, this plan references SR-1 as an east-west roadway based on its orientation in the Project area.

some changes may be proposed related to vehicle access to the commercial properties located along the north side of SR-1 in the Project area, as well as the vehicle parking area on the south side of SR-1. All existing uses will be removed from the north side of SR-1 west of the Topanga Lagoon. The area north of SR-1 and east of the Topanga Lagoon will be redeveloped with visitor serving uses. Finally, new parking areas may be developed along the west side of SR-27 north of SR-1.

Four Project alternatives are being examined as part of the environmental review process, including the no action/ no build alternative (i.e., Alternative 1) and three build alternatives (i.e., Alternatives 2, 3, and 4). It is noted that Alternatives 2 and 3 follow the existing PCH alignment while Alternative 4 proposes to realign PCH to the north. Construction of the Topanga Lagoon Restoration is expected to commence in the year 2027 and continue for approximately 60 months.

It is noted that if an offsite sewer option is selected for wastewater management, the process for acquiring right of way, inclusion into the required Los Angeles County sphere of influence for accepting the effluent, and actual construction are not detailed at this time. It is anticipated that it would take an additional two to three years to obtain the required permits and funds for this effort, with construction of the sewer extension expected to take approximately one year.

Purpose of the Construction Traffic and Emergency Management Plan

The purpose of the Construction Traffic and Emergency Management Plan is to facilitate timely completion of the Project, coordinate schedules with other potential construction activities within the immediate vicinity of the Project area, and to minimize any potential impact that may be experienced by the surrounding community in connection with construction of the Project. The Construction Traffic and Emergency Management Plan shall apply during all aspects of construction related to the Project, and the Lead Agency/Project Sponsor will coordinate with the appropriate agencies to ensure construction of the Project should be scheduled so as to not create adverse construction-related traffic effects in the area. A communication plan between local landowners/stakeholders, construction contractors, and emergency service providers will be established.

Public Outreach Plan

A public outreach campaign, including signage plans for public notification before and during the construction period, will also be prepared. The Lead Agency/Sponsor Project team will utilize appropriate communication means (Project website, social media, etc.) to provide information to the public as to status of construction and issues that may affect the public such as temporary travel lane closures or other roadway adjustments, available beach parking, access to local concessions, etc. This electronic media campaign will be accompanied by on-the-ground signage in the Project area,

such as identifying available public parking and any forthcoming travel lane closures on PCH and TCB. Appropriate signage will be provided prior to the start of construction activities to inform travelers and the public of such construction activities.

Construction Contact

The Lead Agency/Project Sponsor shall appoint a Construction Contact to respond to inquiries or concerns of surrounding residents, as well as the general public. There are three landowners for the Topanga Lagoon Restoration project: California Department of Parks and Recreation (CDPR), California Department of Transportation (Caltrans), and Los Angeles County Department of Beaches and Harbors (DBH). Each landowner will assign a point of contact to assist with coordination. The Construction Contact may be an employee or representative of either the General Contractor or Lead Agency/Project Sponsor. A Project Hotline will be provided for local neighbor complaints or any inquiries related to the construction process. A response to comments or inquiries shall be provided within 72 hours of receipt. The Project Hotline number shall be conspicuously posted at the construction site. The Construction Contact shall notify the Lead Agency/Project Sponsor if the Construction Contact is notified of any construction activities that potentially violate this plan or any of the construction-related conditions of approval.

Construction Activities

During Project bridge and lagoon construction, four lanes (i.e., two through lanes in each direction) of circulation will be maintained on PCH at all times. In addition, at least one lane in each direction on all other public roadways, and access to neighboring commercial and residential properties will be maintained.

The potential construction sequence and staging areas for Alternative 2 are provided in ***Figure 1***. The potential construction sequence and staging areas for Alternative 3 are provided in ***Figure 2***. The potential construction sequence and staging areas for Alternative 4 are provided in ***Figure 3***.

Construction of the aforementioned offsite sewer option for wastewater management would primarily be done in the center median of PCH on its segment from Coastline Drive to TCB. However, an adjacent travel lane on PCH may require closure to accommodate construction equipment and vehicles. To the extent feasible, any travel lane closures will be confined to the period of off-peak beach activity (Labor Day to Memorial Day). Further, travel lane closures on PCH will, to the extent feasible, avoid peak weekday commuter traffic flows (i.e., no travel lane closures in the eastbound direction during the 7:00 – 9:00 AM period and no travel lane closures in the westbound direction during the 4:00 – 6:00 PM period).

Construction Hours

Since the Project area is located in unincorporated Los Angeles County, Project construction shall take place in accordance with Title 12, Chapter 12.12 of the Los Angeles County Code. In order to ensure timely completion of the Project while minimizing impacts on the surrounding community, exterior noise-generating construction shall be limited to Monday through Saturday from 7:00 AM to 8:00 PM. No construction activities shall occur on Sundays or on any federal holiday without a separate permit. Management, supervisory, administrative, and inspection activities shall take place within the designated construction hours to the extent feasible; however, such activities may take place outside of the designated construction hours if approved by the appropriate agencies.

Construction Phasing/Staging

The anticipated sequence and approximate duration of the proposed Project construction are summarized in ***Table 1***.

TABLE 1

LAGOON RESTORATION CONSTRUCTION SEQUENCE[2]

Sequence	Activity
1	Building Demo & Temporary Parking Provisions Construct Municipal Bus Stop and Beach Access Stairs Construct Gateway Corner Parking Facilities
2	Relocate Utilities (Includes Work by Utility Owners)
3	Construct Temporary Road / Bridge (Stage 1) Install Protection of Wetted Areas as Required Remove Concrete Embedded in East Bank Fill from 1920's Bridge
4	Demo NB Half of Existing Bridge
5	Construct NB Road / Bridge (Stage 2)
6	Demo SB Half of Existing Bridge
7	Construct SB Road / Bridge (Stage 3)
8	Demo Temporary Bridge (Stage 4) Construct Helipad and New DBH Parking Grade for Garage, Roadway, Lifeguard/Restroom Building. Create Temporary Access for Trucks Moving Excavated Fill for Either Beneficial Reuse or to Landfills

[2]*Construction Sequencing Report Topanga Lagoon Restoration Project*, Moffatt & Nichol, September 13, 2023.

9	Lagoon Grading Starts on West and Moves East. Construct New Parking on Southwest DBH Lot. Construct Lifeguard/Restroom Building, then Demo Old Building.
10	Restore Beach Area
Total Construction Duration: 60 months	

It is noted that prior to the start of construction, existing building demolition, provision of temporary parking within the Project area, as well as relocation of utilities will first occur. Refer to the Draft Parking Management Plan for further details regarding temporary vehicle parking which will be provided during Project construction. After the initial phase is completed, a temporary roadway/bridge will be constructed south of PCH across the Topanga Lagoon during Stage 1 Project construction. This temporary roadway/bridge will provide two travel lanes and will facilitate eastbound travel along PCH. Next, the westbound half of the existing bridge will be demolished. Construction of the new westbound roadway/bridge will then follow during Stage 2 Project construction. After completion, the new westbound roadway/bridge will provide two travel lanes and will facilitate westbound travel along PCH. Next, the eastbound half of the existing bridge will be demolished. Construction of the new eastbound roadway/bridge will then follow during Stage 3 Project construction. After completion, traffic accommodated by the temporary roadway/bridge will be moved to the new eastbound roadway/bridge. This is followed by the demolition of the temporary roadway/bridge during Stage 4 Project construction. Lagoon grading will occur next and finally restoration of the beach area will take place. As summarized in *Table 1*, Project construction is expected to take a total of approximately 60 months to complete. It is anticipated that development of the commercial components of the Project may also take place during this time period. Additionally, if the offsite sewer option is selected for wastewater management, the associated construction could begin during Sequence 9 and is expected to take an additional 12 months. During sewer installation, periodic closure of the Number 1 westbound travel lane on PCH between Coastline Drive and TCB is anticipated, as previously noted.

Barricades

All construction barriers will be maintained in accordance with the appropriate State and County regulations and their appearance will be maintained in a visually attractive manner throughout the construction period. The General Contractor will coordinate installation, maintenance and removal of these barriers with each landowner.

Signs will be posted along the fencing stating that no unauthorized materials are permitted to be posted. The General Contractor will ensure with daily morning walks by designated personnel that no unauthorized materials are posted on any

temporary barricades or any temporary fencing. Graffiti on barricades will be removed or covered at the earliest possible time after the General Contractor is aware of its existence.

Construction Site Security

The Lead Agency/Project Sponsor in coordination with all landowners will utilize all appropriate security measures, including, but not limited to security guards, lighting, fencing, and locks at all entrances as deemed appropriate to maintain safety in and around the construction site.

Construction Circulation

Traffic Control Plans (Caltrans)

Worksite traffic control plans (TCP) will be prepared and submitted for review/approval by Caltrans for any potential temporary lane closures, detours, on-street staging areas and/or temporary changes in street traffic control that may be required during construction on State highways (PCH and TCB). Temporary traffic control procedures will be employed as appropriate to address circulation requirements. These procedures could include, but are not limited to, traffic cones, temporary signs, changeable message signs, and flagmen. The TCP will prescribe the specific measures to be taken with respect to implementation of the temporary traffic control devices throughout the construction period.

All traffic control procedures on State highways shall be undertaken in accordance with the standards in the latest edition of the *California Manual on Uniform Traffic Control Devices* (California Department of Transportation [Caltrans]), Caltrans Standard Plans (2010), and current standards and best practices of the reviewing and approving agencies. The General Contractor will be responsible for replacing any signs missing or damaged due to construction activities according to Caltrans and LA County specifications, where applicable. In addition, the General Contractor will be responsible for roadway striping (existing and proposed) to be visible and in good condition. Any faded existing striping would be repainted as directed by Caltrans and the County, where applicable.

Construction Access (Caltrans, DBH and CDPR)

Construction-related vehicular access to the Project area is provided via PCH or TCB. Ingress and egress movements to/from the staging areas on County (DBH) and State (CDPR) property during Project construction are shown on *Figures 1 through 3* for the three build alternatives for the bridge/lagoon portion of the Project.

Where necessary, flagmen with communication devices shall be used to coordinate hauling activities. The General Contractor will be responsible to submit the necessary documents to Caltrans and LA County in order to get an approved haul route to be used during construction. Additionally, if deemed necessary, permits will be obtained from Caltrans for any oversized or overweight load traveling on a State highway (e.g., SR-1 or SR-27). Such permit loads will be subject to the conditions of the permit and the time of issuance.

Any temporary speed limit reduction on PCH or TCB for any traffic detour approaches and exits will conform to safe highway design speeds. Directions will be provided to flagmen to coordinate north-south traffic during those limited times that only a single lane is open. Every effort will be made by the General Contractor and all construction contractors to minimize any potential detours and impacts to pedestrians and bicyclists during Project construction.

Construction Truck Hours

To the extent feasible, the arrival and departure of construction trucks shall occur outside of the weekday morning (7:00 AM to 9:00 AM) and afternoon (4:00 PM to 6:00 PM) peak commuter hours. Haul truck trips shall be scheduled within the hours of the permitted construction work period and avoid generating trips during the weekday morning and afternoon peak commuter periods, to the extent feasible.

Equipment and material deliveries and pick-ups shall be coordinated to reduce the potential for trucks to wait to load or unload on roadways for protracted periods of time to ensure that trucks are not impeding traffic flow on the surrounding streets while waiting to enter the Project area.

Construction Employee Parking and Material Staging (DBH and CDPR)

It shall be the responsibility of the General Contractor to minimize on-street employee parking during the construction periods. It is anticipated that construction-related vehicles will park at the identified staging areas on DBH and CDPR property. On average, 20 construction workers will be on-site on a daily basis. Employees will be encouraged to carpool to minimize vehicle trips generated to and from the Project area. All material staging will occur within the Project area at the staging areas. If required, the General Contractor can provide the desired parking and staging information to the satisfaction of LA County, CDPR and Caltrans prior to the issuance of any permits.

The General Contractor shall provide all construction contractors with written information on where their workers and subcontractors are permitted to park, including identification of clear consequences to violators for failure to comply with these regulations.

The General Contractor shall be responsible for informing subcontractors and construction workers of these requirements and will monitor the compliance of the subcontractors.

Intersection and Roadway Operations

As summarized in the *Transportation Assessment*[3] prepared for the Topanga Lagoon Restoration Project, the SR-1/SR-27 study intersection is presently operating at LOS B during both the weekday PM peak hour and Saturday mid-day peak hour under existing conditions. Vehicle trips related to construction of the Project – including trips generated by construction workers, trucks and other commercial vehicles – are forecast to be fewer than 100 trips per day. Since no adverse effects are anticipated related to vehicle trips generated by construction of the Project, an acceptable level of traffic flow throughout the surrounding roadway system (including the SR-1/SR-27 intersection, and the PCH and TCB corridors) will be maintained during project construction.

Emergency Response and Access

The County's Office of Emergency Management (OEM) has the responsibility of comprehensively planning for, responding to, and recovering from large-scale emergencies that impact Los Angeles County. Duties of the OEM include:

- Maintaining the County/Operational Area Emergency Operations Center (EOC) in a state of operational readiness.
- Staffing the Watch Center Duty Officer program to provide coverage to maintain situational awareness and provide support and coordination for incidents during the period between when an incident occurs and when the EOC can be formally activated.
- Issuing Emergency Alert and Warning messages to inform the public of a hazardous situation and provide guidance on protective actions being issued by Incident Commanders.
- Facilitating Unified Coordination Group (UCG) meetings and activities during incidents. UCGs are variable groups of senior County leaders, generally department heads or designee(s), who are assembled to provide strategic level guidance during an incident. Composition of a UCG is determined on a case-by-case basis.
- Deploying Agency Representatives to field Incident Command Posts to maintain situational awareness and enhance coordination efforts between the field and EOC, when activated; and

[3] *Topanga Lagoon Restoration Project – Transportation Assessment*, LLG Engineers, February 3, 2023.

- Managing the County/Operational Area EOC when activated in support of an incident(s) and staffing critical roles within the EOC organizational chart.

The Los Angeles County Operational Area includes the County of Los Angeles and all 88 cities within the County. The cities are divided into eight Disaster Management Areas that vary in size from one to 25 cities. The Project area is located in Disaster Management Area B. As of the preparation of this plan, it is noted that the County of Los Angeles Operational Area Emergency Operations Plan is currently being updated.

Topanga Coalition for Emergency Preparedness (TCEP) is an all-volunteer, non-profit public benefit corporation that provides emergency preparedness education and disaster status information to Topanga and other Santa Monica mountains communities. TCEP's mission is to gather, verify, and provide incident information to the public. Topanga Canyon is divided into nine zones (i.e., Zones 1 through 9). It is noted that although the Project area is technically located outside the nine Topanga zones, it's been included/added as part of Zone 10 (i.e., Zone SSM-U010 of TCEP) because this zone traverses over TCB which is the major southbound evacuation route out of the canyon. In an emergency, information will be posted in real time for the affected/impacted zone.

The City of Malibu is located just west of the Project area. The City of Malibu has developed the *Mass Evacuation Plan*[4] through a collaborative, multi-agency process. To maximize the efficiency of any evacuation and to minimize congestion, the City of Malibu has been divided into four evacuation zones (i.e., Zones 11, 12, 13, and 14). These zones provide clearly defined evacuation areas that can be activated quickly, and can also be used to implement phased evacuations. It is noted that the Project area is located near the easterly portion of Evacuation Zone 11 which covers the area from Malibu Pier on the west to Sunset Boulevard on the east, outside of the Malibu city limit. In addition, in the event of a mandatory evacuation, the nearest safe refuge area (as identified in the City's *Mass Evacuation Plan*) is the Topanga State Beach Parking Lot located on the south side of Pacific Coast Highway within the Project area, at 18700 Pacific Coast Highway, which is operated by the DBH. However, as noted above, the DBH parking lot will not be available during Project construction due to the need to construct the temporary bridge over the Topanga Lagoon. The Lead Agency/Project Sponsor and contractor will coordinate with the County and City of Malibu to identify an alternative refuge area in close proximity to the Project during the period of construction which causes the DBH parking lot to be unavailable.

Emergency access to the Project Site and adjacent areas shall be kept clear and unobstructed during all phases of construction. As required by the California Vehicle Code (Section 21806, authorized Emergency Vehicles), motorists are required to pull

[4] *City of Malibu Mass Evacuation Plan*, City of Malibu, August 2020.

to the right side of the highway and stop to allow an emergency vehicle to pass. If required, drivers of emergency vehicles are trained to utilize center turn lanes, or travel in opposing through lanes to pass through and traverse crowded or tight areas. Thus, the respect entitled to emergency vehicles and driver training allow emergency vehicles to negotiate typical as well as atypical street conditions. Emergency services for helipad and lifeguard, as well as ADA access will continue to be provided/maintained at all times. Operation of PCH for use as an emergency evacuation route will be maintained at all times during Project construction. Grading and hauling activities shall be discontinued during Red Flag days as determined by the Los Angeles County Fire Department (LACoFD). The Lead Agency/Project Sponsor and General Contractor will cooperate with LACoFD to ensure that the Project adheres to all fire safety measures and minimizes fire hazards during construction.

N

SOURCE: RCDSMM

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LINSCOTT LAW & GREENSPAN
engineers

ALT 2
CDPR
TCB/GATEWAY CORNER LOTS = 115
NE OF CREEK LOT = 20
CALTRANS TCB ON-STREET = 40
DBH = 70 to 100
TOTAL = 245 to 275

Figure 1
Potential Construction Sequence
Alternative 2

Topanga Lagoon Restoration Project

N

SOURCE: RCDSMM

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LINSCOTT LAW & GREENSPAN
engineers

ALT 3
CDPR
TCB/GATEWAY CORNER LOTS = 115
NE OF CREEK LOT = 20
CALTRANS TCB ON-STREET = 40
DBH = 70 to 100
TOTAL = 245 to 275

Figure 2
Potential Construction Sequence
Alternative 3

Topanga Lagoon Restoration Project

SOURCE: RCDSMM

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LINSCOTT LAW & GREENSPAN
engineers

ALT 4
CDPR
TCB/GATEWAY CORNER LOTS = 115
CALTRANS TCB ON-STREET = 40
DBH = 70
TOTAL = 225

Figure 3
Potential Construction Sequence
Alternative 4

Topanga Lagoon Restoration Project

Appendix K
Biological Resources Assessment (RCDSMM 2023)

The Appendices herein contain supporting information. These Appendices contain highly detailed figures and other graphic information, which are difficult to translate for screen reading software; therefore, the Appendices have not been translated into an auditory format. If you have a disability and/or have difficulty accessing any material in this document, please contact us by mail, email, or telephone, and we will work with you to make all reasonable accommodations. Please indicate 1) the nature of the accessibility need; 2) your preferred format; 3) the material you are trying to access and its location within this document; and 4) how to reach you if questions arise while fulfilling your request. You can direct your requests to:

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Biological Resources Assessment Report
Topanga Lagoon Restoration Project

APNs: 4416-009-903, 4443-001-901, 4448-001-900, 4448-002-900 to 903, 4449-009-006
,

Project Addresses:
Cholada: 18763 Pacific Coast Highway (PCH)
Wylie's Bait and Tackle: 18757 PCH
Rosenthal's Wine Bar and Patio:18741 PCH
Topanga Ranch Motel: 18711 PCH
Topanga Beach: 18700 PCH
Reel Inn: 18661 PCH
Oasis Imports and Malibu Feed Bin: 3931 S. Topanga Canyon Boulevard

Project #: xxx
Permit #: xxx

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TABLE OF CONTENTS

1 INTRODUCTION AND BACKGROUND 5
1.1 Introduction 5
1.2 Background 5
2 PROJECT LOCATION 6
3 PROJECT DESCRIPTION 9
3.1 Alternative 1, No Project/Managed Decline 11
3.2 Alternative 2, Maximum Lagoon Habitat, Removal of Motel. 11
3.3 Alternative 3, Limited Lagoon Habitat Expansion, Retention of Motel 14
3.4 Alternative 4, Maximum Managed Retreat, Partial Motel Retention 16
4 METHODOLOGY 18
4.1 Nomenclature 18
4.1.1 Scientific Names 18
4.1.2 Potential for Species Presence. 18
4.2 Literature Review and Agency Coordination 19
4.2.1. Literature Review. 19
4.2.2 Agency Coordination 21
4.3 Project Specific Field Surveys 33
4.3.1 Vegetation Communities, Rare Plants and General Wildlife. 34
4.3.2 Jurisdictional Waters and Wetlands. 35
4.3.3 Wetland Conditions-California Rapid Assessment Method (CRAM). 36
4.3.4 Protected Trees. 39
4.3.5 Invertebrate Surveys. 39
4.3.6 Fish Surveys. 41
4.3.7 Reptiles and Amphibians 45
4.3.8 Birds. 47
4.3.9 Mammals. 48
4.3.10 Marine Resources. 50
5 RESULTS 53
5.1 Physical Characteristics 53
5.1.1 Climate 53
5.1.2 Landforms and Geomorphology. 54
5.1.3 Soils. 54
5.1.4 Wildfire History. 54
5.2 Jurisdictional Wetlands and Waters. 55
5.2.1 Waters of the U.S.: Non-Wetland Waters, Wetlands, and Tidal Waters 56
5.2.2 Waters of the State. 58
5.2.3 CDFW and CCC Jurisdictions. 59
5.2.4 Impact Analysis- Jurisdictional Wetlands and Waters 60
5.3 Wetland Conditions-California Rapid Assessment Method (CRAM). 63
5.4 Vegetation Communities and Land Cover Types 67
5.4.1 Woodland Communities 67
5.4.2 Scrub / Shrublands Communities 81
5.4.3 Herbaceous Communities. 82
5.4.4 Waterways. 83
5.4.5 Other/ Developed Areas 84
5.4.6 Impact Analysis-Vegetation Communities. 84
5.5 LCP Habitats and SERA 87
5.5.1 County Mapped. 88
5.5.2 CDPR Ground-truthed and Mapped. 88
5.5.3 Impact Analysis-LCP Habitats and SERA 89
5.6 Protected Trees 90
5.6.1 Existing Conditions. 93
5.6.2 Existing Conditions. 94
5.7 Plant and Animal Observations. 99
5.7.1 Plants. 99
5.7.2 Impact Analysis-Common Plants. 101

5.7.3 Animals. 102
5.8 Special-status Biological Resources 108
5.8.1 Sensitive Natural Communities. 108
5.8.2 Critical Habitat 111
5.8.3 Special-status Plants 112
5.8.4 Special Status Animals. 113
5.9 Marine Resources 134
5.9.1 Bottom Habitat Classifications 135
5.9.2 Biological Habitats. 138
5.9.3 Observed Marine Species 144
5.9.4 Special-Status Marine Resources 148
6. REFERENCES 153

LIST OF TABLES

Table 1 Summary of CRAM Attributes 38
Table 2 Potential Waters of the U.S. Acreages 58
Table 3 Potential Waters of the State Acreages 59
Table 4 Potential CDFW and California Coastal Act Acreages 59
Table 5 Impacts to Jurisdictional Waters of the US and Wetlands Per Alternative. 61
Table 6 Impacts to Jurisdictional Waters of the State Per Alternative 61
Table 7 Impacts to Potential CDFW and California Coastal Act Acreages Per Alternative 62
Table 8 CRAM Results Per Assessment Area. 66
Table 9 Results for Previous CRAM Assessments Onsite. 66
Table 10 Summary of Vegetation/Land Cover Acreages Per Alternative, Existing and Anticipated Disturbance 79
Table 11 Restoration and Enhancement Acreages 86
Table 12 SLR Impacts on Habitat acreages, Topanga Lagoon Restoration Project Area 86
Table 13 Santa Monica Mountains LCP SERA Impacts Per Alternative 89
Table 14 Trees Documented within Project Area. 92
Table 15 Species and Size Classes of Protected Native Trees. 92
Table 16 Species and Size Classes of Non-Native Trees 93
Table 17 Summary of Proposed Native Tree Removal & Encroachment Mitigation 94
Table 18 Invasive Plant Species Observed within the BSA 100
Table 19 Marine Subtidal Habitat Types 2022-2023. 135
Table 20 Marine Intertidal Habitat types 2022-2023. 136
Table 21 Marine Biological Habitats. 139

LIST OF FIGURES

Figure 1 Historic Topography 5
Figure 2 Photo of Historic Development 6
Figure 3 Photo of Current Development 6
Figure 4 Project Location and Planning Area 8
Figure 5 Ownership Map. 9
Figure 6 Alternative 1: No Project?Managed Decline 11
Figure 7 Alternative 2: Maximum Lagoon Habitat 12
Figure 8 Alternative 2: Maximum Lagoon Habitat, Gateway Corner Area 13
Figure 9 Alternative 3: Limited Lagoon Habitat Expansion 14
Figure 10 Alternative 3: Limited Lagoon Habitat Expansion, Gateway Corner Area 15
Figure 11 Alternative 4: Maximum Managed Retreat 16
Figure 12 Alternative 4: Maximum Managed Retreat, Gateway Corner Area 17
Figure 13 Biological Survey Area(BSA) and Project Area 34
Figure 14 CRAM SAssessment Areas 37
Figure 15 BMI Sampling Locations. 40
Figure 16 Tidewater Goby Survey Areas 42
Figure 17 Steelhead Survey Area 43
Figure 18 Stream Survey for Herpetofauna 46
Figure 19 Terrestrial Herpetofauna Survey Area and Coverboard Locations 46
Figure 20 Bird Survey Locations 47
Figure 21 Small Mammal Trapping Sites 48

Figure 22 Mammal Camera and Bat Detector Sites 49
Figure 23 Marine Survey Area 2022-23, Topanga and Ratner Beach 50
Figure 24 Transect Locations Intertidal and Subtidal Dive Surveys 2022-23, Topanga & Ratner Beaches 51
Figure 25 Depth Contours in the Project Area 52
Figure 26 Sediment Sampling Dive Survey, 2022 53
Figure 27 Soils Map 55
Figure 28 Onsite Drainages 56
Figure 29 Potential Waters of the U.S. 57
Figure 30 Potential Tidal Waters of the U.S. and State 57
Figure 31 Potential Waters of the State 58
Figure 32 Potential CDFW Section 1600 Jurisdiction 60
Figure 33 Potential Coastal Wetlands and Waters 60
Figure 34 Site AA1, Bar Built and AA2, Riverine Location and Site Photos 64
Figure 35 Site AA3 and AA4, Riverine Location and Site Photos 65
Figure 36 Site AA5, Riverine Location and Site Photos 66
Figure 37 Site Key of Landcover Photographs 68
Figure 38 Landcover Photographs 69
Figure 39 Vegetation Communities and Land Cover Map 78
Figure 40 County Mapped LCP Habitats/SERA 88
Figure 41 CDPR Mapped LCP Habitats/SERA 89
Figure 42 Trees within LCP Habitat Designations, Fuel Modification and Protected Zones-Existing Condition 91
Figure 43 Onsite Trees within LCP Habitat Designations-Alternative 2 95
Figure 44 Tree Fuel Modification and Protected Zones-Alternative 2 96
Figure 45 Onsite Trees within LCP Habitat Designations-Alternative 3 96
Figure 46 Tree Fuel Modification and Protected Zones-Alternative 3 97
Figure 47 Onsite Trees within LCP Habitat Designations-Alternative 4 97
Figure 48 Tree Fuel Modification and Protected Zones-Alternative 4 98
Figure 49 Monarch Butterfly Overwintering Zone 114
Figure 50 Critical Habitat Within the Project Area. 110
Figure 51 GPS Locations for Subadult Femal Mountain Lion P75 131
Figure 52 Bottom Habitat Classifications 136
Figure 53 Photographs of Bottom Habitats 137
Figure 54 Marine Biological Habitats 138
Figure 55 Photographs of Biological Habitats 142
Figure 56 Historical Distribution of Giant Kelp and Surfgrass Near the Project Area 148
Figure 57 Critical Habitat Within the Project Area 151

LIST OF APPENDICES

Appendix A Jurisdictional Delineation Report
Appendix B 2020 Wetland Condition Assessment
Appendix C Native Tree and Oak Tree Report
Appendix D Fuel Modification Memo RCDSMM 2023
Appendix E BMI Surveys and Assessment
Appendix F California Grunion Technical Report
Appendix G Tidewater Goby Technical Report
Appendix H Southern Steelhead Trout (*Oncorhynchus mykiss*) Technical Report
Appendix I Aquatic Herpetofauna Stream Surveys Technical Report
Appendix J Terrestrial Herpetofauna Surveys Technical Report
Appendix K Least Bell's Vireo Surveys Technical Report
Appendix L Terrestrial Mammal Surveys Technical Report
Appendix M Bat Surveys Technical Report
Appendix N Marine Surveys
Appendix O Plant Species Observed
Appendix P Animal Species Observed
Appendix Q Potential for Occurrence – Special Status Plants
Appendix R Potential for Occurrence – Special Status Wildlife

1 INTRODUCTION AND BACKGROUND

1.1 Introduction

This Biological Resources Assessment Report (report) describes the biological resources known and anticipated to be present within the footprint and adjacent areas of the Topanga Lagoon Restoration Project. It also provides a project description, including integrated resource protection measures, impact analysis, and anticipated mitigation measures. This report complies with the Standards for Biological Reports for Los Angeles County Santa Monica Mountains Local Coastal Program (SMM LCP) as defined in Section 22.44.8400 of the County's local Implementation Plan (LIP), and Caltrans Natural Environment Study (NES) template. This report is also intended to provide relevant information on biological resources associated with the project for use in preparation of project permits and documents required under the California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA), and project permits.

1.2 Background

Like other coastal wetlands in the state, the Topanga Lagoon is a pale image of its former glory. Once almost 30 acres in size, the current Topanga Lagoon footprint is less than 1 acre (Figures 1-3). It is a naturally bar-built lagoon, disconnected from the ocean by a beach sand berm for extended periods of time. The greater lagoon area is divided into a patchwork development, with many of the existing facilities showing signs of damage and is projected to further deteriorate into the future.

Figure 1. Historic Topography. 1876 T- sheet map of Topanga Lagoon. Image from the University of California at Santa Barbara Library.

Figure 2.Photo of Historic Development. Looking west over the Topanga Lagoon in the 1900's prior to extensive development. Photo from the Santa Monica Public Library.

Figure 3. Photo of Current Development. Same view of the Topanga Lagoon in 2019. Photo from RCDSMM Stream Team

Despite the existing use patterns and problems, Topanga Lagoon still hosts resources considered important at the regional, state, and national levels. A robust population of the federally endangered tidewater goby (*Eucyclogobius newberryi)* has been documented in the Topanga Lagoon since 2000. The only currently reproducing population of the federally endangered and state candidate endangered steelhead trout (*Onchorynchus mykiss,* Southern California DPS) within the Santa Monica Mountains is also present, although at very low levels. A wide range of other important species use the greater area such as protected nesting birds, state sensitive species like the arroyo chub (*Gila orcuttii*), western pond turtle (*Actinemys marmorata*), and two-striped garter snake (*Thamnophis hammondii*), among others. The beach supports a significant run of California grunion *(Leuresthes tenuis*).

Significant cultural sites are found in the uplands above and around the lagoon, underlining the importance of the greater area. These include sites associated with the Gabrielino/Tongva peoples and more recently, the historic Topanga Ranch motel. The beach adjacent to the lagoon hosts millions of visitors per year and is an important regional coastal access and recreation location, which is unfortunately seeing significant beach loss due to storm surge and erosion. The resources within the Topanga Lagoon Restoration Project area are varied and unique, and clearly worthy of protecting and enhancing.

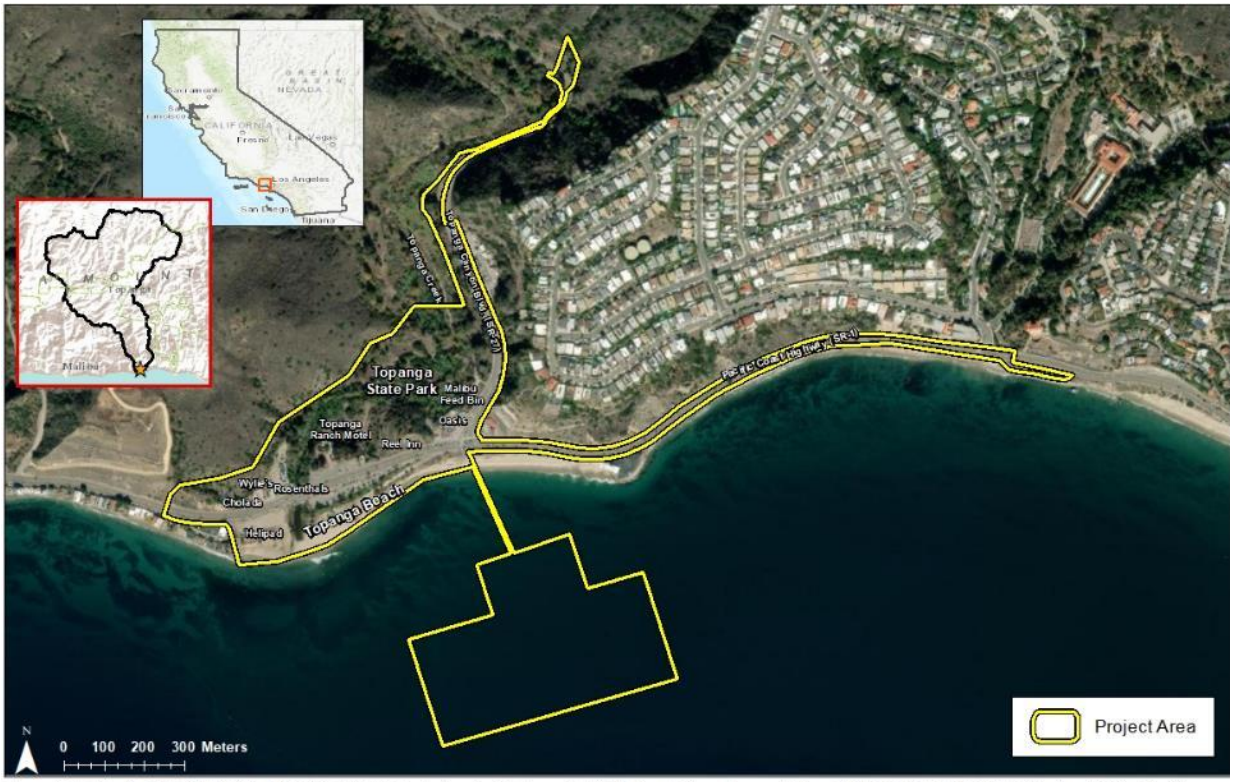
The Topanga Lagoon is clearly a place of significant biological, cultural, and recreational resources. These assets are threatened not only by current use patterns, but also by projected climate change and associated sea level rise. The Topanga Lagoon Restoration Project is a coordinated multiagency plan that seeks to expand the existing lagoon footprint from ½ acre, to 7-10 acres, dependent upon the selected project alternative. This is a sizable portion of its former extent. The project will address the current causes of resource damage, while proactively building resilience to future environmental challenges. The project also seeks to improve coastal access and recreation in a way that supports and enhances biological and cultural values. Finally, the project includes a beneficial nearshore nourishment element to better protect and enhance Topanga Beach and areas down coast.

2 PROJECT LOCATION

The project encompasses approximately 56 acres of Topanga State Park, Caltrans Right of Way (ROW) and Topanga Beach located on the coastal slope of the Santa Monica Mountains, west of the intersection of Topanga Canyon Boulevard and Pacific Coast Highway (State Route 1) in unincorporated Los Angeles County (Figure 4). An additional 1-7 acres would be included depending on the type of wastewater treatment option (offsite sewer vs onsite wastewater treatment, OWTS) option that is developed to support the project. This is within the Topanga, CA U.S. Geological Survey (USGS) 7.5-minute quadrangle, Township 1S, Range 16W, unsectioned.

The project area is located within the Santa Monica Mountains National Recreation Area (SMMNRA) but is owned and managed by three public entities: CA Department of Parks and Recreation (CDPR or State Parks), County of Los Angeles Department of Beaches and Harbors (DBH) and California Department of Transportation (Caltrans). A single private parcel is included in the project boundary within the City of Malibu in the event slope stabilization is required via a retaining wall on the N shoulder of the PCH. See Figure 5.

The northern portion of the lagoon area is owned by the CDPR as part of Topanga State Park (APN 4448-002-900, 4448-002-901). It includes remnants of the historic Topanga Ranch Motel and associated beach parking. Visitor services include a parking lot and restroom along with a number of active businesses located along the Pacific Coast Highway (PCH) that are State Park business leases (from W to E: Cholada-18763 PCH; Wylie's Bait and Tackle-18757 PCH; Rosenthal's Wine Bar and Patio-18741 PCH; Topanga; Topanga Ranch Motel-18711 PCH; Reel Inn-18661 PCH; Oasis Imports and Malibu Feed Bin-3931 S. Topanga Canyon Boulevard, TCB).



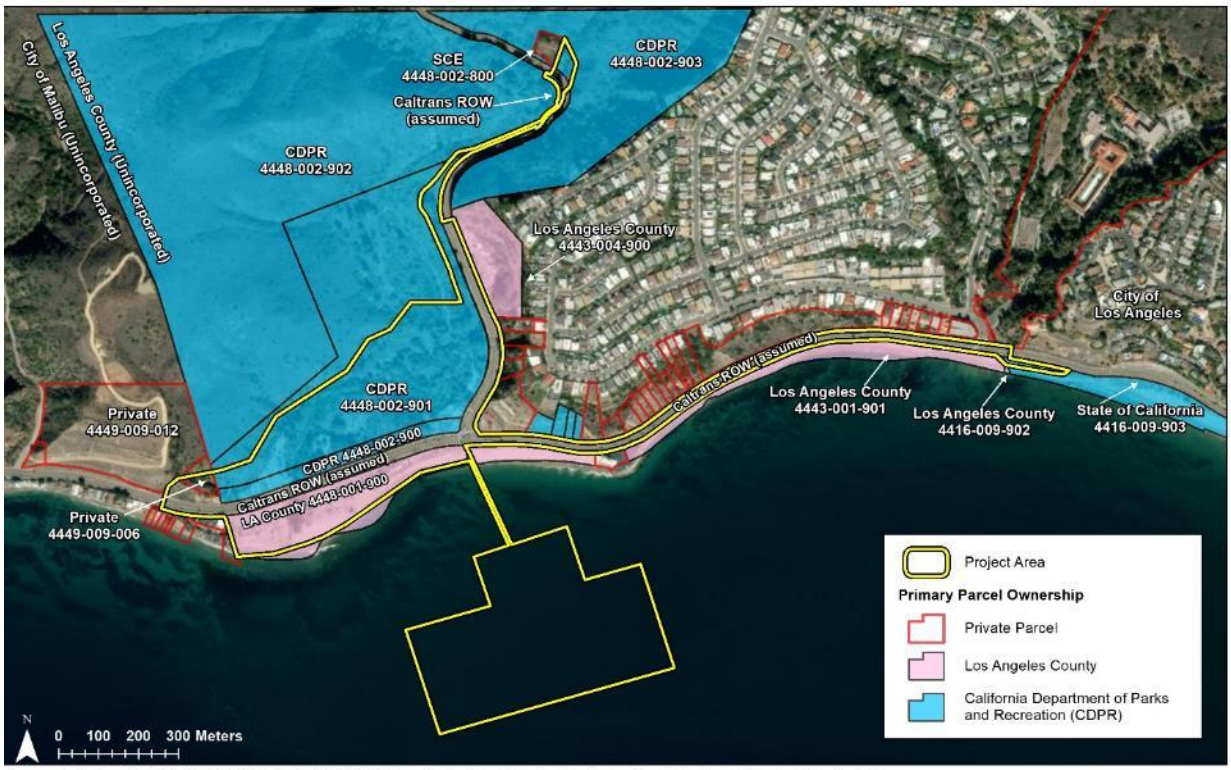
Sources: Project Boundary (EPD, Moffatt & Nichol, RCDSMM 9/20/2023), Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Figure 4. Project Location and Planning Area

The aging PCH bridge owned by Caltrans bisects the lagoon and constrains the size of its mouth and channel. The lifeguard and public restroom building, beach, and parking areas south of the PCH are managed by DBH (18700 PCH, APN 4448-001-900), and are currently experiencing significant impacts from coastal erosion and storm surges, which is projected to increase with sea level rise (SLR).

The open water areas of the lagoon are managed by both CDPR and DBH and are significantly degraded due to impaired/limited habitat and water quality concerns; unmanaged human use-syringes, human feces, and trash. The limited size of the open water area also exposes sensitive species to significant temperature changes with few retreat areas to use during drought, heat waves, and other extreme weather events, and is subject to flooding during storms. There is no coordinated coastal access and visitor services plan for the greater lagoon area, resulting in some facilities contributing to onsite degradation. Improved parking and overnight accommodations are in high demand locally along the coast.

Development of CDPR visitor services will require upgrades to onsite wastewater treatment options. If an OWTS option is selected, the CDPR parcels 4448-001-902 to -903 in Topanga State Park and Caltrans ROW along TCB would be involved. Development of a sewer extension would involve PCH Caltrans ROW and paved areas of the Will Rogers State Beach parking lot owned by CDPR and DBH, but managed by DBH (44416-009-903, 4443-001-901).



Sources: Project Boundary (EPD, Moffatt & Nichol, RCDSMM 9/20/2023), Los Angeles County Parcels – (Los Angeles County Department of Regional Planning, 2023)
Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c)

Figure 5. Ownership Map.

3 PROJECT DESCRIPTION

With help from the Topanga Lagoon Restoration Project Technical Advisory Committee (TAC) and community stakeholders, we identified four alternatives to restore the Topanga Lagoon. A range of alternatives allows us to consider the benefits and challenges of the different restoration approaches. This allows a final alternative to be chosen at the end of the environmental review process that best meets the project's needs.

The overall project area that is included in restoration of the lagoon, bridge and beach and beneficial nearshore deposition area covers approximately 90 acres. This includes 10 acres potentially associated with development of a wastewater treatment option.

Alternative 1 is the "No Project/Managed Decline" alternative. This alternative assumes no investment or changes that would require a Coastal Development Permit and associated infrastructure upgrades and costs. As such, this alternative assumes only that limited resource activities such as arundo removal and current business services would continue, that the condition of the unused Ranch Motel structures would continue to decline, and the lifeguard and public restroom building would remain in its current location subject to continued undermining of its foundation and sea level rise.

Alternatives 2-4 are the Project "Build Alternatives". Each of these alternatives provides a different road map to restoring the lagoon area and adjacent seasonally wetted and riparian habitats, buffering its resources from future sea level rise, providing visitor serving functions and meeting the project goals. However, these build alternatives have many things in common.

Under Alternatives 2-4, the seasonally wetted and riparian habitat areas is anticipated to be expanded from the existing 3.6 acres to 7.5 to 9.5 acres. The more upland/transition areas would increase from the 21.4 existing acres of mixed non-native vegetation to between 23 and 24 acres of native-dominated vegetation,

depending on the alternative selected. This would require removing much of the existing historically imported fill, between 160,000-260,000 CY, onsite to create a more natural topography and expanded open space areas. The fill material would either be trucked off site for disposal or beneficially reused in a near-shore placement location, subject to approval by the U.S. Army Corps of Engineers (USACE).

The existing wetted lagoon area and riparian habitats would be protected with grading starting at the outer edge of existing riparian trees, preserving the current lagoon banks and the majority of the existing riparian willows and native hardwoods. The natural breaching pattern of the lagoon would be protected by grading outside the footprint of the existing wetted lagoon and below the mean higher high tide (MHHT) line on the beach. The current beach is approximately 4 acres, and depending on the alternative selected could increase the depth of the beach in areas between 50-90 feet to provide an estimated one additional acre of beach habitat.

The 90-acre project area would be vastly improved by creating more natural topography and replacing invasive plants with native wetland, riparian and upland vegetation within it. Of the 46 acres of non-marine habitat within the project area not associated with wastewater option development, an estimated 15-16 acres of disturbance would occur during restoration from grading, structure demolition and construction, infrastructure improvements, and fuel clearance zones.

The length of the existing 79-foot-long Caltrans bridge would be expanded to accommodate a widened lagoon riparian area, which would lower flow velocities to improve adult steelhead migration opportunities, increase refugia areas for tidewater gobies and juvenile steelhead and the quantity/quality of lagoon habitats. The primary bridge span would increase to 200 feet, with secondary/side spans of 130 ft on either side, increasing the total bridge span length to 460 feet.

A plan for determining the future configuration of the Topanga Ranch Motel is included in each alternative, as are improved locations for concession opportunities and parking. Prehistoric cultural sites would be protected in place, retaining an appropriate cover over the prehistoric surface of not less than 2 to 4 ft and necessarily limiting the lowering of the riparian bottomland surface to actual historic elevations.

Coastal access and interpretive elements would be included in all alternatives. This includes pedestrian access under the PCH on the east and west sides of the lagoon, a loop trail through the project area that connects to the California Coast Trail, improved amenities around the bus stops, picnic areas, and an interpretive pavilion. Parking at the beach level would be like the existing conditions, and only for staff, emergency vehicles, and disabled visitor parking spaces.

The lifeguard and public restroom building and helipad are currently threatened by coastal erosion. To protect from future damage, all project alternatives provide for them to be demolished and rebuilt closer to the realigned access road, and at a higher elevation.

It should be noted that some of the options included in a specific alternative could be “mixed and matched” between the alternatives to create the best feasible final alternative in the next phase of project design, evaluation and permitting. These include: expanded Caltrans bridge built on the same alignment or expanding the beach area by realigning the bridge further inland; retention of the Topanga Ranch Motel and onsite concessions in whole or in part; inclusion of more than one wetted lagoon channel on the west side; implementation of living shoreline elements; alternative emergency access routes to the beach; and final placement of relocated beach facilities. The array of alternatives was chosen to show the full range of options available, and the evaluation of each subset will be more fully developed and provided in subsequent design and during the CEQA/NEPA environmental review process.

Depending on the alternative selected, relocating some visitor services (interpretive pavilion, ranger residence, park maintenance facility~~,~~ parking, etc.) to the upper terraced zone adjacent to the west side of Topanga Canyon Boulevard is proposed. The potential for wastewater services, slope stabilization, etc. are currently being evaluated and will determine the capacity and intensity of visitor serving uses based on a suite of potentially feasible approaches to wastewater treatment.

3.1 Alternative 1, No Project/Managed Decline

This alternative restores 0 acres, and has 3.6 wetted acres, 21.4 riparian/transitional/upland acres and 4.18 beach acres. Under this alternative, existing conditions throughout the project area would remain "as-is" in terms of existing functions (or lack thereof) and conditions (Figure 6). Therefore, there would be no change to the lagoon footprint or habitat quality, and no new bridge would be constructed. Damage to the lifeguard and public restroom building due to coastal erosion would continue to occur and no relocation is included in this "No Project" alternative. The currently unusable majority of the Topanga Ranch Motel structures would continue to deteriorate without restoration with the potential for pollutants to move into adjacent habitat areas, and existing non-conforming businesses and septic systems would remain in current operation but may be subject to future restriction or cessation of use in the future by enforcement of recent statewide wastewater policy changes. No improvements to habitat would occur. Sea level rise would continue to reduce beach area available, threaten beach facilities and the integrity of the Pacific Coast Highway, and compress coastal habitats upgradient.

Figure 6. Alternative 1: No Project/Managed Decline.

3.2 Alternative 2, Maximum Lagoon Habitat

This alternative results in 9.5 wetted acres, with 23 riparian/transitional upland acres restored and beach expansion to 4.39 acres.

This alternative provides the maximum increase in lagoon, wetland, and riparian bank habitats. It includes restoration of more natural side channels connected to the western side of the existing lagoon based on historic topography and would allow the lagoon system to evolve to accommodate changing sea level and storm surge conditions. The Topanga Ranch Motel and onsite business leases would be removed from the project area and be replaced with riparian and transitional habitats. Relocation and replacement of public parking, concession opportunities and overnight accommodations from the current location on the north side of PCH to the west side of Topanga Canyon Boulevard (TCB) in the expanded project area will be developed in the next design phase. 314 parking spaces are provided. See Figures 7-8.

To provide for a wider lagoon and improve fish migration and refugia, the existing Caltrans bridge would be replaced with a longer one along the same road alignment. The span of the new bridge would total 460 feet (200-foot primary span, with secondary/side spans of 130 feet each). This alternative includes ADA disabled parking spaces on the beach level, with additional recreational parking at the PCH upper level on the south side of PCH only.

The lifeguard and public restroom building, beach restroom and helipad would be demolished and rebuilt closer to the realigned access road and to each other on the same beach level.

A sewer extension, or OWTS could be used for development of CDPR visitor services in previously developed areas. A sewer extension would be developed with Caltrans ROW from TCB/PCH intersection, east ~ 1 mile to Coastline Drive. OWTS on CDPR property along TCB could take the form of onsite seepage pits or via subsurface drip irrigation (SDI). DBH would likely connect to a sewer extension, if selected, but would likely continue to use their existing OWTS system located in the Topanga Beach parking lot.

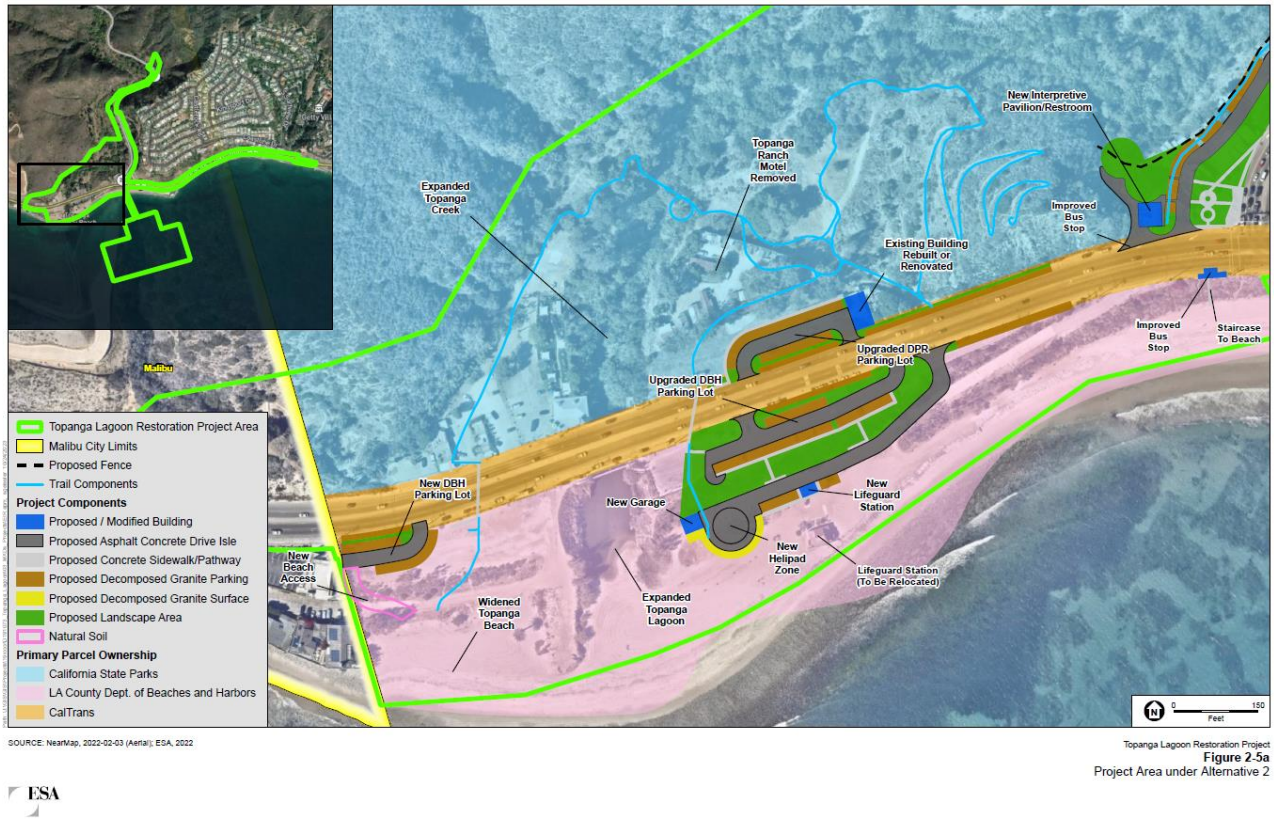


Figure 7. Alternative 2: Maximum Lagoon Habitat. This figure shows proposed development along the PCH corridor within Topanga State Park and Topanga Beach.

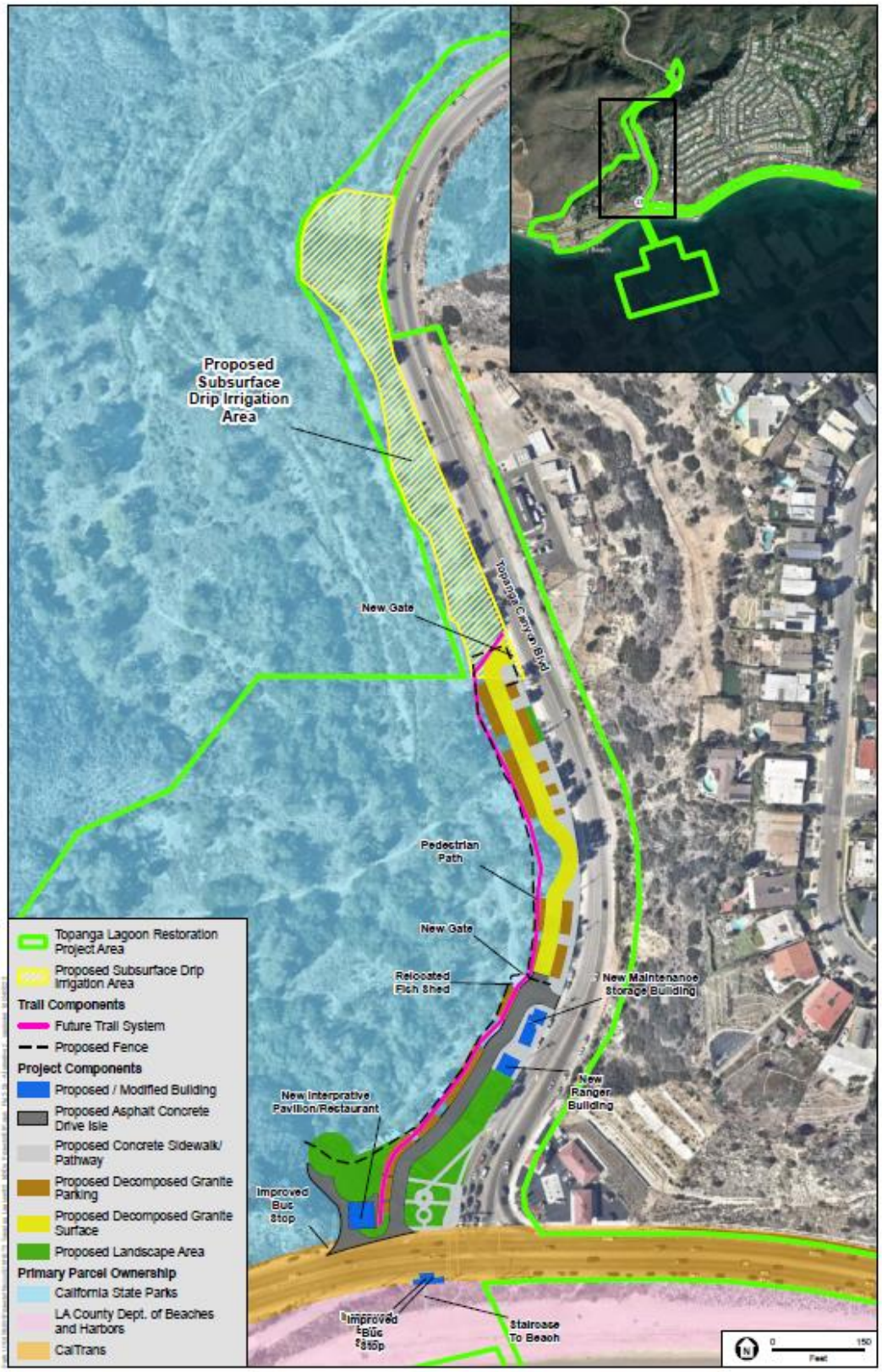


Figure 8. Alternative 2: Maximum Lagoon Habitat, Gateway Corner Area. This figure shows proposed development along the TCB corridor within Topanga State Park.

3.3 Alternative 3, Limited Lagoon Habitat Expansion

This alternative provides 7.7 wetted acres, with 23.7 riparian/transitional/upland acres restored and beach expansion to 4.42 acres. This alternative also provides expanded lagoon, wetland, riparian and transitional habitat in the west part of the existing creek channel but allows for only the existing main channel within the lagoon area itself. Twenty Topanga Ranch Motel structures are restored in their historic configuration, including relocation of some of the structures from the west side that is currently experiencing flood and bank erosion. One existing business (restaurant lessee) would be remodeled and be available for a CDPR concession. No other existing business leases remain. Partial relocation of public parking, and visitor services from the current location on the north side of PCH to the west side of Topanga Canyon Boulevard (TCB) in the expanded project area will be developed in the next design phase. 332 parking spaces are included. See Figures 9-10.

All the changes to the new 460 ft. Caltrans bridge (200-foot center span, with secondary/side spans of 130 feet each), are the same as for Alternative 2.

Connection to an off-site sewer system is anticipated to be required to accommodate this level of development as the threshold for OWTS capacity would likely be exceeded. CDPR and DBH facilities are anticipated to connect to the sewer system. A potential routes has been identified to tie into the Los Angeles County District 27 system, along the central median of PCH from TCB to connect with the system at Coastline Drive.

The lifeguard and public restroom building would be rebuilt closer to the realigned access road moving slightly east to enhance sight lines along the beach, and the helipad would be located at PCH with a gated separation from the west end of the parking lot on the same level.

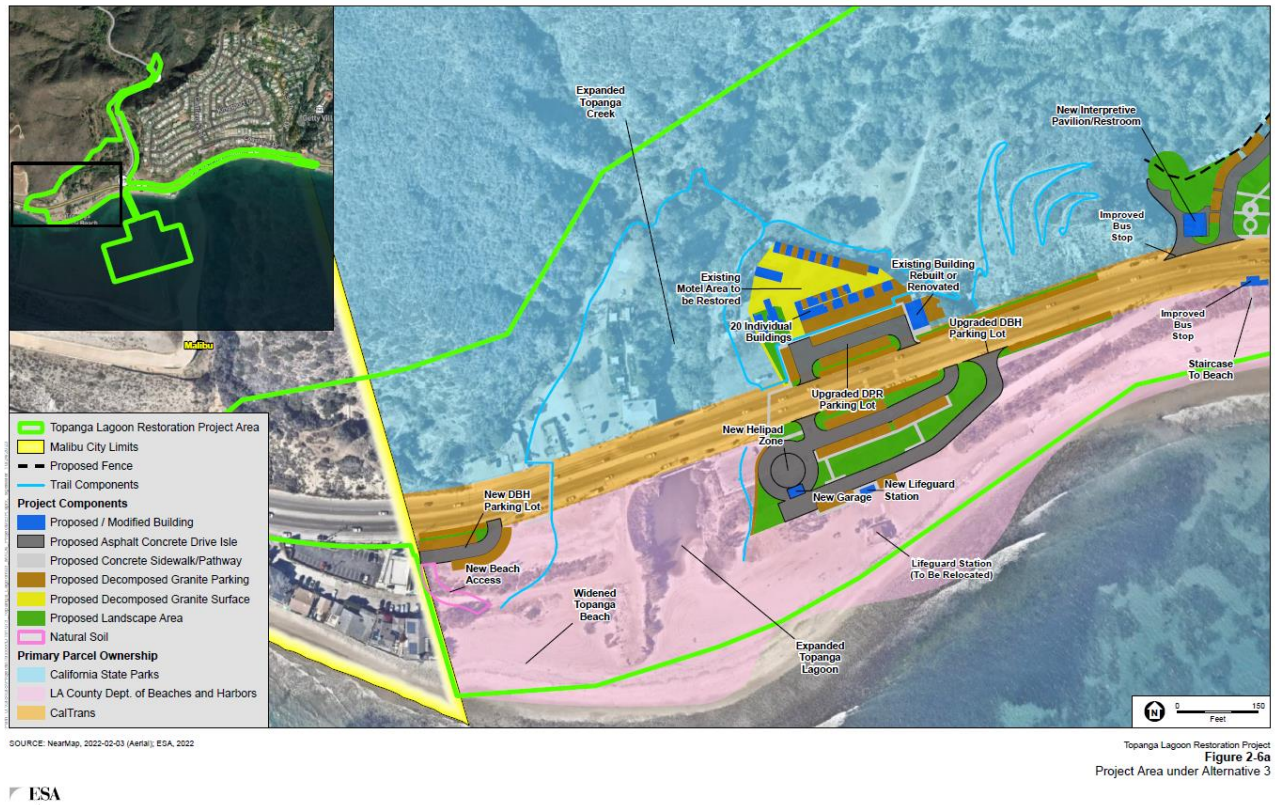


Figure 9. Alternative 3: Limited Lagoon Habitat Expansion. This figure shows proposed development along the PCH corridor within Topanga State Park and Topanga Beach.

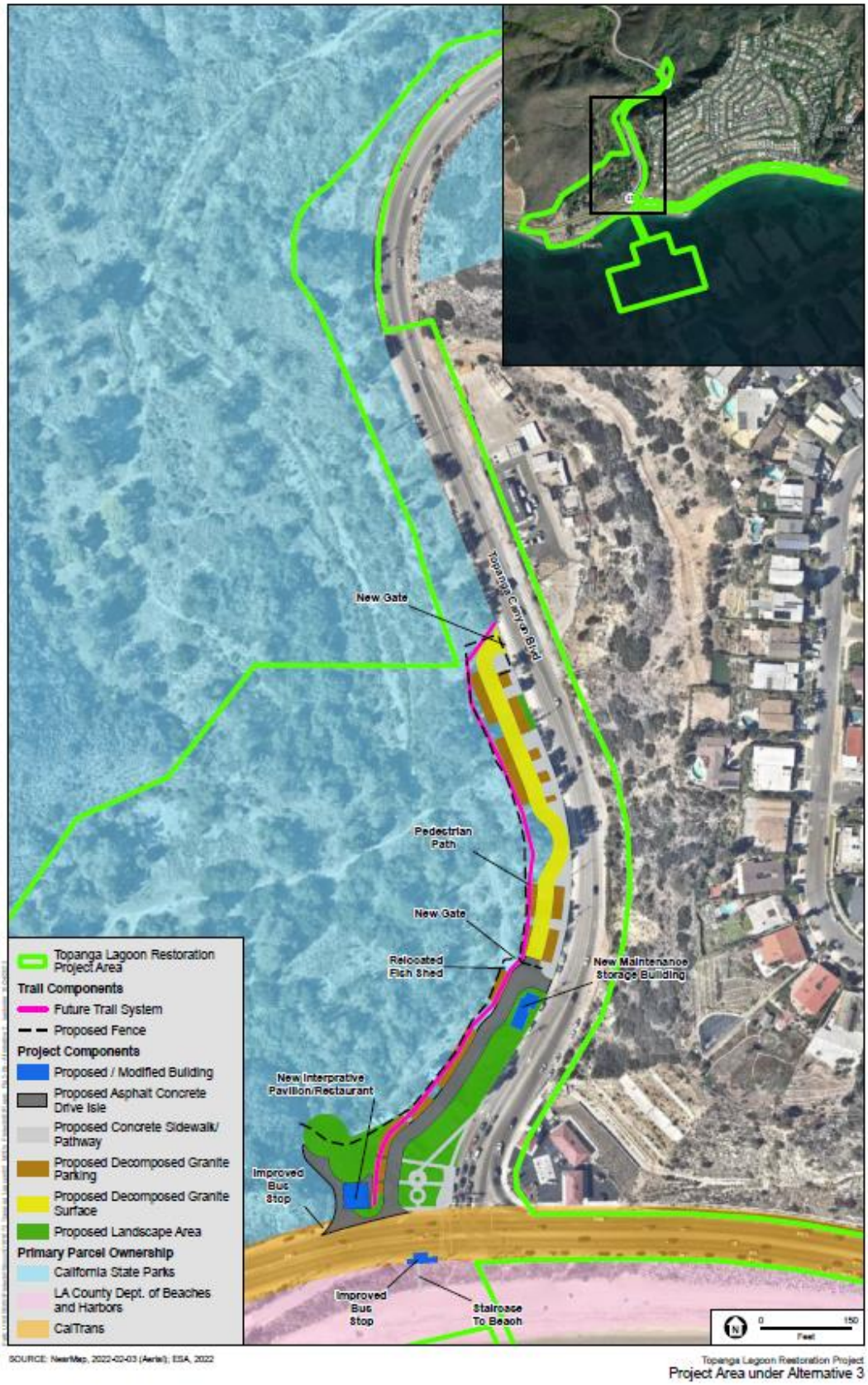


Figure 10. Alternative 3: Limited Lagoon Habitat Expansion, Gateway Corner Area. This figure shows proposed development along the TCB corridor within Topanga State Park.

A sewer extension, or OWTS could be used for development of CDPR visitor services in previously developed areas. A sewer extension would be developed with Caltrans ROW from TCB/PCH intersection, east ~ 1 mile to Coastline Drive. OWTS on CDPR property along TCB would be via onsite seepage pits. DBH would likely connect to a sewer extension, if selected, but would likely continue to use their existing OWTS system located in the Topanga Beach parking lot.

3.4 Alternative 4, Maximum Managed Retreat, Partial Motel Retention

This alternative provides for 7.6 wetted acres, with 23.7 riparian/transitional upland acres restored and beach expansion to 4.56 acres.

The alignment of PCH moves north expanding the maximum amount of beach area and managed retreat from SLR. The portion of the historic Topanga Ranch Motel east of the current motor court access lane, which includes 15 structures, is retained. Adjacent parking is adjusted, and one business would be remodeled or replaced. No other businesses remain. This alternative will provide expanded lagoon, wetland, riparian and transitional habitats, primarily on the west side of the existing channel due to removal of all fill in that western area. Partial relocation or replacement of public parking, and visitor services from the current location on the north side of PCH to the west side of Topanga Canyon Boulevard (TCB) in the expanded project area is developed. 343 parking spaces are developed. See Figures 11-12.

The alignment of PCH would move north, expanding the maximum amount of beach area and managed retreat, and would also lengthen the Caltrans bridge from 79 to 460 feet. 760 feet of 4 to 12-foot-high retaining walls would be required along the northern shoulder of PCH to accommodate adjacent slopes.

The anticipated connection to an off-site sewer system or use of onsite OWTS is the same as proposed for Alternative 3.

Figure 11. Alternative 4: Maximum Managed Retreat. This figure shows proposed development along the PCH corridor within Topanga State Park and Topanga Beach.

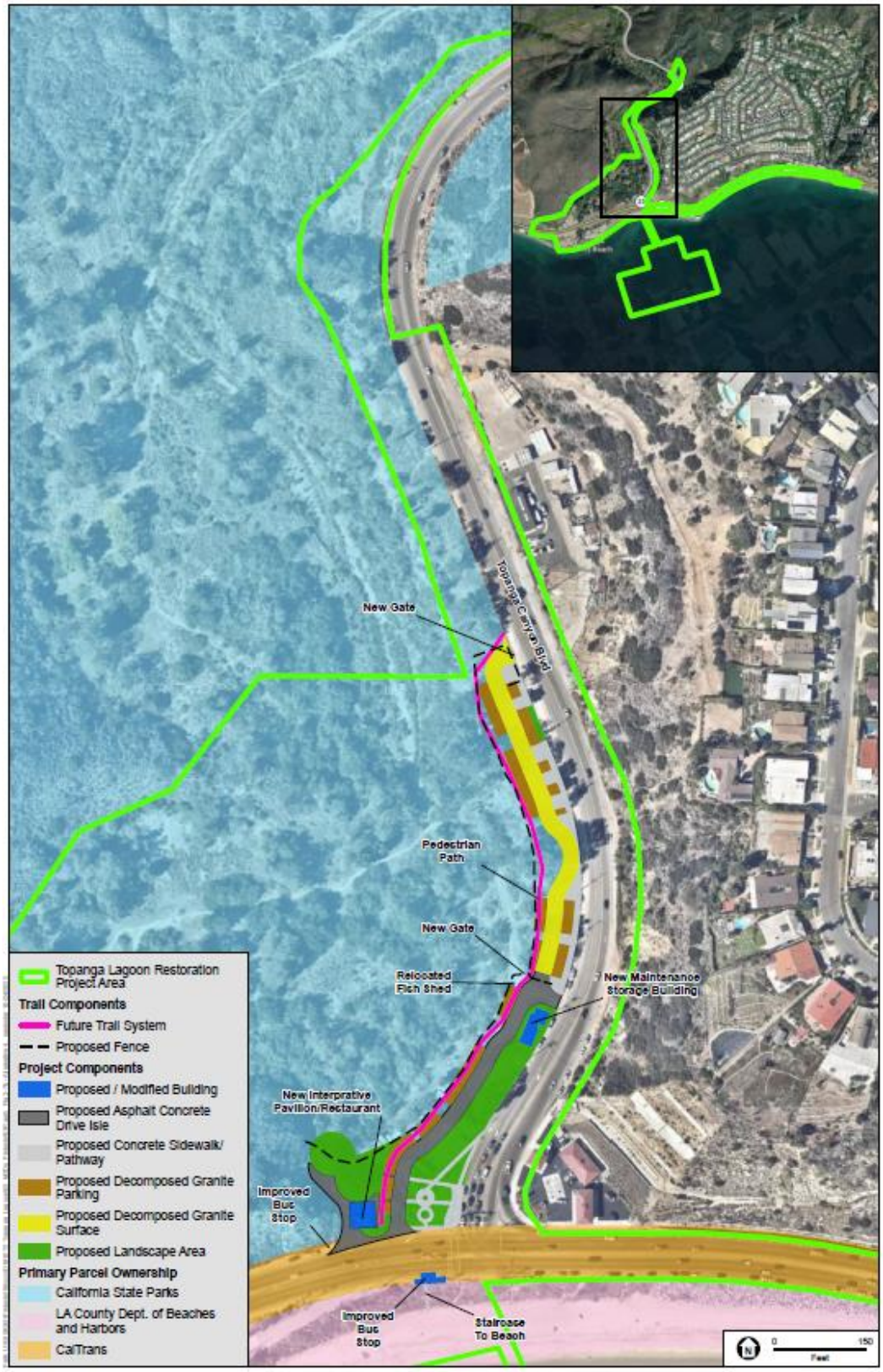


Figure 12. Alternative 4: Maximum Managed Retreat, Gateway Corner Area. This figure shows proposed development along the TCB corridor within Topanga State Park.

The helipad and lifeguard/public restroom building are arranged with staff, emergency, and ADA disabled parking between these two functions and accommodate sight lines required for the expanded recreational beach area. This alternative maximizes managed retreat, recreational beach area (and/or living shoreline features such as dunes) and provides the most SLR resilience.

4 METHODOLOGY

4.1 Nomenclature

4.1.1 Scientific Names. The following sources are the basis for the scientific nomenclature used in this report:

- **Wetlands and Deepwater Habitats:** Cowardin, L. M., V. Carter, F. C. Golet, E. T. LaRoe. **1979**. Classification of wetlands and deepwater habitats of the United States. USFWS.
- **Vegetation:** Sawyer, J.O., T. Keeler-Wolf, and J.M. Evens. 2009. A Manual of California Vegetation. Second Edition. California Native Plant Society, Sacramento. Online at: https://vegetation.cnps.org
- **Plants:** Baldwin, B.G., D.H. Goldman, D.J. Keil, R. Patterson, T.J. Rosatti, and D.H. Wilken, editors. 2012. The Jepson Manual. TJM2: The Jepson manual: vascular plants of California, second edition. as updated on the Jepson Online Interchange for California Floristics: http://ucjeps.berkeley.edu/interchange.html
- **Aquatic Invertebrates:** Merritt, R.W., and K.W. Cummins. 1995. An introduction to the aquatic insects of North America. Second Edition. Kendall/Hunt Publishing Co., Dubuque, IA.
- **Terrestrial Invertebrates:** Hogue, C. L., and J. Hogue. 2015. Insects of the Los Angeles Basin. Third Edition. Natural History Museum of Laos Angeles County, Los Angeles, CA
- **Fishes**: Miller, D. J., and R. N. Lea. 1972. Guide to the Coastal Marine Fishes of California. California Fish Bulletin #157. State of California Resources Agency, Department of Fish and Game.
- **Reptiles and Amphibians:** Nafis, Gary. A Guide to the Amphibians and Reptiles of California. Online at http://www.californiaherps.com.
- **Birds:** American Ornithologist's Union. AOU Checklist of North American Birds, 7th edition. Online at: http://www.californiabirds.org/ca_list.asp
- **Mammals:** Smithsonian National Museum of Natural History. North American Mammals. Online at: http://www.mnh.si.edu
- **Marine Resources:** Coastal Resources Management (CRM), Inc. 2022 and 2023 marine reports for the project area.

4**.1.2 Potential for Species Presence.** The following criteria were used to determine the potential for species not observed, but with potential to occur within the project area.

- **Present –** The species was observed onsite during 2020-2022 surveys, or as otherwise documented.
- **High Potential –** All of the habitat components meeting the species requirements are present and/or most of the habitat within the project area is highly suitable and within the known range of the species. The species has a high probability of being found onsite.
- **Moderate Potential –** Some of the habitat components meeting the species requirements are present, and/or only some of the habitat within the project area is unsuitable, and the project is within the known range for the species. Plants requiring specific habitat (e.g., scrub) found on-site were assigned to the moderate category.
- **Low Potential –** Few of the habitat components meeting the species requirements are present, and/or the majority of habitat is unsuitable or of very poor quality, and/or it is somewhat outside of the known range of the species. Plants were assigned to the low category if a specific soil type (e.g., sand), but not the specific habitat (e.g., scrub), was found within the project area. These species are not likely to be present.
- **Absent –** Presumed absent. The habitat onsite is clearly unsuitable for the species requirements (foraging, breeding, cover, substrate, elevation, hydrology, plant community, site history, disturbance

regime) and/or is clearly out of the known range for the species. The potential for plant species to occur was categorized as "none" in situations where the CNDDB or CNPS databases stated the species is extirpated within the project area.

Some species are considered special-status only during specific life stages (e.g., nesting, nesting colony, wintering, communal roosts). When the species was present, or had the potential to be present, but not during its protected life stage, it is noted.

4.2 Literature Review and Agency Coordination

4.2.1. Literature Review. Prior to conducting field surveys, CDPR and RCDSMM staff, and consultants reviewed state and federal databases and historic reports to identify special-status biological resources potentially present within the project areas. The literature review covered the USGS Topanga 7.5-minute quadrangle map and all adjacent quadrangles (Topanga, Malibu Beach, Beverly Hills, Venice, Van Nuys, Canoga Park, and Calabasas; USGS June 2021), as well as nearshore areas adjacent to the project site. Specific data resources and literature reviewed in 2020-2023 included:

- Cal Fire's Fire Hazard Severity Zone Web Map Application Located at: https://hub.arcgis.com/datasets/d2ea45d15c784adfa601e84b38060c4e.
- California Central Habitat Connectivity Project. Located online at: https://wildlife.ca.gov/Conservation/Planning/Connectivity/CEHC.
- California Department of Fish and Wildlife (CDFW) Marine Region 7 GIS Data Downloads (kelp, surfgrass, eelgrass, and artificial reefs).
- California Department of Fish and Wildlife (CDFW). Special Animals List. January 2024. Located online at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109406&inline.
- California Department of Fish and Wildlife. Special Vascular Plants, Bryophytes and Lichens List. January 2023. Located online at: https://www.dfg.ca.gov/wildlife/nongame/list.html.
- California Department of Parks and Recreation. Topanga State Park General Plan. 2012. Located online at: https://www.parks.ca.gov/?page_id=25956.
- California Essential Habitat Connectivity Project. Located online at: https://wildlife.ca.gov/Conservation/Planning/Connectivity/CEHC.
- California Natural Diversity Database (CNDDB) for special-status plants and animals. Located online at: https://wildlife.ca.gov/Data/CNDDB/Maps-and-Data.
- California Native Plant Society (CNPS) Inventory of Rare and Endangered Plants. Located online at: https://rareplants.cnps.org/.
- Current and historical aerial photography. Google Earth 7.3.4.8248. July 16, 2021.
- EBird. Bird observations at Topanga Lagoon 2000-2022. Located online at: https://ebird.org/hotspot/L8197.
- iNaturalist. https://www.inaturalist.org/.
- Kelpwatch.org Online database of kelp bed distribution for the Topanga Beach area.
- Los Angeles County, Department of Regional Planning (LA Co., RCP). Santa Monica Mountains LCP Sensitive environmental resource areas. Located online at: https://www.arcgis.com/home/item.html?id=594c161b58b547428ffd00911824c773.
- Marine Biological Surveys:
    - 1974 Los Angeles County Underwater Resources Inventory, by Glen H., Egstrom
    - 1994 Cal Trans District 7 Malibu Marine Biological Inventory and Impact Assessment Dive and Intertidal Survey Report prepared by Coastal Resources Management, Inc. in October 1994 for LSA Associates, Inc.
    - 1997 County of Los Angeles Department of Public Works Marine Biological Resources Inventory and Environmental Assessment-Evaluation of Proposed Malibu Placement Sites

Study, Los Angeles County, CA. Prepared by Coastal Resources Management, Inc. October 1997.
    - 2023 Drone and Video Footage by Bernard Yin.
- NMFS Recovery Plan: National Marine Fisheries Service (NMFS). 2012. Southern California Steelhead Recovery Plan Summary. Southwest Regional Office, Long Beach, CA.
- NOAA Fisheries Species Directory. Located online at https://www.fisheries.noaa.gov/species-directory/threatened-endangered?title=&species_category=any&species_status=any&regions=1000001126&items_per_page=25&sort=.
- RCDSMM Fish Research located online at: https://www.rcdsmm.org/.
    - Dagit, R., K. Adamek, D. Alvarez, S. Contreras, R. Dauksis, B. Demercie, D. Hofflander, J. Mongolo and E. Montgomery. 2018. Santa Monica Bay Anadromous Adult and Juvenile Steelhead Monitoring 2013-2018. Prepared for CDFW Contracts P1250013 and P1450013, Prepared by Resource Conservation District of the Santa Monica Mountains, Topanga, CA
    - Dagit, R., D. Alvarez, R. Dauksis, B. Demerci, H. Nuetzel, Stillwater Sciences and J. C. Garza. 2018. Comprehensive Lifecycle monitoring of *Oncorhynchus mykiss* in Topanga Creek, California. Final Report 2008-2018. Prepared for CA Department of Fish and Wildlife Contract No. P1550012. Resource Conservation District of the Santa Monica Mountains, Topanga, CA.
    - Dagit, R., D. Alvarez, A. Della Bella, S. Contreras, B. Demirci, A. Kahler, E. Montgomery, H. Nuetzel and J. C. Garza. 2019. Steelhead abundance monitoring in Santa Monica Bay, January 2017 – November 2019. Prepared for California Department of Fish and Wildlife Contract No. 1650904. Prepared by the Resource Conservation District of the Santa Monica Mountains, Topanga, CA.
    - Dagit, R., M. T. Booth, M. Gomez, T. Hovey, S. Howard, S.D. Lewis, S. Jacobson, M. Larson, D. McCanne, and T. H. Robinson. 2020. Occurrences of steelhead trout (*Oncorhynchus mykiss*) in southern California 1994-2018. California Fish and Wildlife 106(1):39-58.
- Riparian and Upland Bird Communities at Lower Topanga Canyon, Topanga State Park, California. USGS 2006.
- Rodeo Grounds Berm Restoration: Dagit, R. 2009. Topanga Creek Restoration: Rodeo Berm Removal Urban Coast Vol 1:37-41.
- Santa Monica Mountains LCP Sensitive environmental resource areas as defined by the. Located online at: https://www.arcgis.com/home/item.html?id=594c161b58b547428ffd00911824c773.
- Santa Monica Mountains Wildflowers. *SMM Wildflowers*, https://www.smmflowers.org/.
- Topanga State Park General Plan. 2012. Located online at: https://www.parks.ca.gov/?page_id=25956.
- U.S. Fish and Wildlife (USFWS) Critical Habitat Portal. Located online at: https://ecos.fws.gov/ecp/report/table/critical-habitat.html.
- USFWS Information for Planning and Consultation (IPaC). Protected USFWS resources for project area were identified. Located online at: https://ipac.ecosphere.fws.gov/location/NYBI6EPYIVENBMIHWPC4CP6FDA/resources.
- United States Geologic Service (USGS) 2006. Riparian and Upland Bird Communities at Lower Topanga Canyon, Topanga State Park, California. USGS 2006.
- Web Soil Survey. Located at: https://websoilsurvey.sc.egov.usda.gov/.

Most of the project area north of the PCH has been under the management of CDPR since 2001. Since this time, it has been periodically surveyed by CDPR staff, and scientists associated with the RCDSMM, SMMNRA, Pepperdine University, California State University Channel Islands (CSUCI), and other institutions. As such, the preparers of this report have long-term familiarity with the site and have access to significant historic information regarding the site via direct onsite experience, the documents listed above and personal communications with researchers.

4.2.2 Agency Coordination

4.2.2.1 Authorities and Discretion. This project is subject to federal, state and local environmental review requirements. As such project documents are being prepared per the requirements of CEQA and NEPA. Key discretionary actions and authorities considered in preparing this report include the following:

4.2.2.2 Federal.

Clean Water Act. The federal Clean Water Act (CWA) and subsequent amendments, under the enforcement authority of the United States Environmental Protection Agency's (USEPA), was enacted "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." The purpose of the CWA is to protect and maintain the quality and integrity of the nation's waters by requiring states to develop and implement state water plans and policies. The CWA established several programs to regulate and reduce discharges of pollutants into waters of the United States, including wetlands. The USACE and California State Water Resources Control Board (SWRCB) administer the various applicable sections of the CWA with the oversight of the USEPA as follows:

- Section 404 of the CWA, administered by USACE, established a permit program to regulate the discharge of dredged and fill material into waters of the U.S.
- Section 404 of the CWA, administered by USACE, established a permit program to regulate the discharge of dredged and fill material into waters of the U.S.
- Section 401 of the CWA, administered by the State, requires that before a 404 permit can be issued for an activity, the State in which the activity will occur must certify that the activity will not violate State water quality standards.
- Section 402 of the CWA, administered by the State, established the National Pollutant Discharge Elimination System (NPDES) Program. This requires a permit for sewer discharges and storm water discharges from developments, construction sites, or other areas of soil disturbance.
- Section 303, administered by the State, requires states to identify "impaired waters" and to establish total maximum daily loads (TMDLs). A TMDL establishes the maximum amount of a pollutant allowed in a waterbody and serves as the starting point or planning tool for restoring water quality.

Coastal Zone Management Act. Section 307 (16 United States Code section 1456(c)) of the CZMA mandates that federal agency activities be "consistent to the maximum extent practicable with the enforceable policies of approved state management programs," and that this consistency be documented and coordinated with the state. Applicants for a federal license or permit must submit their own consistency certification to the California Coastal Commission (CCC) and then provide the coastal commission's concurrence via an approved Coastal Development Permit or other approval to the federal agency issuing the permit. After receipt of the consistency determination, the state agency informs the federal agency of its concurrence with, or objection to, the federal agency's consistency determination.

The CCC is the state agency charged with administering the federal act within the California Coastal Zone. Within the commission's areas of concern, the Coastal Zone consists of all areas located within the commission's authority, which extends 3 miles seaward and inland generally 1,000 yards (but can extend up to 5 miles) from the mean high tide line. Any federal activity that affects any natural resources (including wetlands and other waterbodies), land uses, or water uses within commission's area of concern will be subject to the consistency requirement. Obligations under the act must be met through the federal consistency determination process that is outlined in the act's Federal Consistency Regulations, 71 Federal Regulation 787-831 at 15 Code of Federal Regulations 930. The commission and the California Coastal Act are further discussed in Section 3.3.2.2, State, below.

Clean Water Act. The Clean Water Act (CWA) of 1973 established the basic structure for regulating discharges of pollutants into water of the United States. The CWA operates on the principle that all discharges into the nation's waters are unlawful unless specifically authorized by a permit.

Section 303 of the CWA, administered by the State, requires states to identify "impaired waters" and to establish total maximum daily loads (TMDLs). A TMDL establishes the maximum amount of a pollutant allowed in a waterbody and serves as the starting point or planning tool for restoring water quality.

Section 401 of the CWA requires that applicants for a federal permit to conduct activities that may result in the discharge of a pollutant into waters of the United States must also apply for water quality certification from the State.

Section 402 of the CWA, administered by the State, established the National Pollutant Discharge Elimination System (NPDES) Program. This requires a permit for sewer discharges and storm water discharges from developments, construction sites, or other areas of soil disturbance.

Section 404 of the CWA protects waters of the United States (including wetlands). Waters of the United States are defined to encompass navigable waters of the United States, interstate waters, and all other waters where their use, degradation, or destruction could affect interstate commerce. This includes any tributaries of any of these waters, and wetlands that meet any of these criteria or are adjacent to any of these waters or their tributaries. Wetlands are defined under Section 404 as those areas that are inundated or saturated by surface water or groundwater at a frequency and duration to support, and that under normal circumstance do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Any activity that involves a discharge of dredged or fill material into waters of the United States, including wetlands, is subject to regulation by the US Army Corp of Engineers (USACE).

Jurisdictional wetland and non-wetland waters of the US are present within the project area. This includes placement of ~ 160,000-260,000 CY of native fill material from adjacent upland areas of the site into the nearshore for the purposes of beneficial reuse. Based on project activities, a CWA Section 401 Water Quality Certification will be required from the Los Angeles Regional Water Quality Control Board (RWQCB) and a CWA Section 404 permit from USACE. Discharges during construction though such actions as dewatering are anticipated to require a NPDES permit and comply with local TMDL limits.

Endangered Species Act. The Endangered Species Act (ESA) of 1973 provides regulation**s** for the conservation of endangered and threatened species, as well as critical habitat for said species. The ESA is overseen by both the US Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS), with USFWS maintaining jurisdiction over plants, wildlife, and resident fish, and NMFS maintaining jurisdiction over marine mammals, marine fish, and anadromous fish.

Section 7 of the ESA mandates all federal agencies to consult with USFWS and NMFS if they determine that a proposed project may negatively impact a listed species or its designated critical habitat. As a CWA 404 permit from USACE will be required for this project, Section 7 consultations will also be required. Species that could be potentially adversely affected by the project include steelhead trout (NMFS) and tidewater goby (USFWS). If the project is likely to adversely affect steelhead or tidewater goby (even if just temporarily), then formal consultation (i.e., preparation of a Biological Assessment and receipt of a Biological Opinion) will be required. Otherwise, informal consultation will be required with receipt of a Letter of Concurrence from USFWS/NMFS.

Section 9 of the ESA prohibits the take of an endangered fish or wildlife species. Take is defined as any action which attempts to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect an endangered species.

A potential overwintering site for one invertebrate, the candidate endangered monarch butterfly (*Danaus plexippus*) was observed onsite. Two federally endangered fish and their critical habitat are present in the project area: tidewater goby and steelhead - southern CA. Critical habitat for one federally threatened reptile, green sea turtle (*Chelonia mydas*) is present in the project area.

Executive Order 13112 (02/03/1999). On February 3, 1999, Executive Order 13112 was signed by President Clinton, establishing the National Invasive Species Council (Council). The Executive Order requires that a Council of Departments dealing with invasive species be created. Executive Order 13312 revokes the preceding Executive Order 11987 of May 24, 1977. Per Section 2 of the Executive Order (Federal Agency Duties) each federal agency shall support the prevention of invasive species introduction, and the detection, monitoring, removal, public education and research of invasive species in coordination with the Invasive Species Council, consistent with the Invasive Species Management Plan and in cooperation with stakeholders, as appropriate, and, as approved by the Department of State, when Federal agencies are working with international organizations and foreign nations.

Fish and Wildlife Conservation Act. The Fish and Wildlife Conservation Act declares that fish and wildlife are of ecological, educational, aesthetic, cultural, recreational, economic, and scientific value to the United States. The purposes of this Act are to encourage all federal departments and agencies to utilize their statutory and administrative authority, to the maximum extent practicable and consistent with each agency's statutory responsibilities and to conserve and to promote conservation of non-game fish and wildlife and their habitats. Another purpose is to provide financial and technical assistance to the states for the development, revision, and implementation of conservation plans and programs for nongame fish and wildlife.

Fish and Wildlife Coordination Act. The Fish and Wildlife Coordination Act (FWCA) provides the basic authority for the USFWS and NMFS involvement in evaluating impacts to fish and wildlife from proposed water resource development projects. The FWCA requires that fish and wildlife resources receive equal consideration as other project features. The FWCA also requires federal agencies that construct, license or permit water resource development projects to first consult with the USFWS or NMFS as appropriate, and state fish and wildlife agency regarding the impacts on fish and wildlife resources and measures to mitigate these impacts.

Magnuson-Stevens Fishery Conservation and Management Act. The Magnuson-Stevens Fishery Conservation and Management Act applies to fisheries resources and fishing activities in federal waters. Federal waters extend to 200 miles offshore. Conservation and management of U.S. fisheries, development of domestic fisheries, and phasing out of foreign fishing activities are the main objectives of the legislation.

The Magnuson-Stevens Fishery Conservation and Management Act defines essential fish habitat as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. The act, as amended through 2007, sets forth a number of new mandates for the NMFS, regional fishery management councils, and federal action agencies to identify essential fish habitat and to protect important marine and anadromous fish habitat. The act provided the NMFS with legislative authority to regulate fisheries in the United States and established eight regional fishery management councils that manage the harvest of the fish and shellfish resources in these waters. The councils, with assistance from the NMFS, are required to develop and implement fishery management plans, which include the delineation of essential fish habitat for all managed species.

A fisheries management plan is developed to achieve specified management goals for a fishery and is comprised of data, analyses, and management measures. Essential fish habitat that is identified in a management plan applies to all fish species managed by that plan, regardless of whether the species is a protected species or not. Federal agency actions that fund, permit, or carry out activities that may adversely affect essential fish habitat are required under section 305(b), in conjunction with required Section 7 consultation under the FESA, to consult with the NMFS regarding potential adverse effects of their actions on essential fish habitat and to respond in writing to the NMFS's recommendations.

The waters off Topanga Lagoon are designated as essential fish habitat for fish managed under four fisheries management plans: the Pacific Coast Groundfish fisheries management plan, the Coastal Pelagic Species

fisheries management plan, the Pacific Coast Salmon fisheries management plan, and the West Coast Highly Migratory Species fisheries management plan.

Marine Mammal Protection Act. The Marine Mammal Protection Act (MMPA) establishes a federal responsibility for the protection and conservation of marine mammal species by prohibiting their take. The MMPA defines "take" as the act of hunting, killing, capture, harassment or death of any marine mammal. The MMPA also imposes a moratorium on the import, export, or sale of any marine mammals, parts, or products within the United States. These prohibitions apply to any person in U.S. waters and to any U.S. citizen in international waters. All project-related construction activities are prohibited from disturbing marine mammals or disrupting their activities or behavior in known migration routes, feeding areas, or breeding areas. The NMFS is the federal agency responsible for enforcing the MMPA's provisions.

The primary authority for implementing the MMPA belongs to the USFWS and the NMFS. The USFWS is responsible for the protection of sea otters, marine otters, walruses, polar bears, manatees, and dugongs. The NMFS is responsible for protecting pinnipeds (seals and sea lions) and cetaceans (whales and dolphins). As amended, the MMPA provides for the "incidental take" of marine mammals during marine activities—such as dredging, construction, boating, and transport—as long as the NMFS finds the take would only affect a small number of individuals and only negligibly impact marine mammal species not listed under FESA, would not result in the regional depletion of a population protected by the MMPA, and would not have an unmitigable adverse impact of subsistence harvest of these species. For example, no permitted subsistence harvesting of whales or marine mammals occurs offshore central California.

The project includes the potential to deposit up to 160,000-260,000 CY of fill material into the nearshore for the purposes of beneficial reuse. California grey whales (*Eschrichtius robustus)* and their calves have some potential to migrate through or close to the project area. Common bottlenose dolphin (*Tursiops truncates*) and harbor seal (*Phoca vitulina*) have been observed mobbing through the project area.

Marine Protection, Research, and Sanctuaries Act (16 U.S.C. Section 1431 et seq. and 33 U.S.C. Section 1401 et seq.). The Marine Protection, Research, and Sanctuaries Act (MPRSA), also known as the Ocean Dumping Act, generally prohibits: (1) transportation of material from the United States for the purpose of ocean dumping; (2) transportation of material from anywhere for the purpose of ocean dumping by U.S. agencies or U.S.-flagged vessels; and (3) dumping of material transported from outside the United States into U.S. territorial seas. Ocean dumping cannot occur unless a permit is issued under the MPRSA. Under MPRSA, the standard for permit issuance is whether the dumping will "unreasonably degrade or endanger" human health, welfare, or the marine environment. In the case of dredged material, the decision to issue a permit is made by USACE, using the USEPA environmental criteria and subject to USEPA concurrence.

Migratory Bird Treaty Act. The Migratory Bird Treaty Act (MBTA) is the domestic implementation of international treaties that provide for the protection of migratory birds. The act provides that it is unlawful, except as permitted by regulations, to pursue, take, or kill any migratory bird, or any part, nest or egg of any such bird. This includes both direct and indirect acts, although harassment and habitat modification are not included unless they result in a direct loss of birds, nests, or eggs. The current list of species protected by the MBTA comprises several hundred species, including essentially all native birds. The proposed project has the potential to adversely affect birds subject to the MBTA. The project proponents will avoid violation of the MBTA by implementing measures to protect birds and bird nests, which will be formalized in the CEQA document being prepared for this project.

National Invasive Species Act. Under the National Invasive Species Act of 1996, the U.S. Coast Guard (USCG) established national voluntary ballast water guidelines. The USCG published regulations on June 14, 2004, establishing a national ballast water management program with mandatory requirements for all vessels equipped with ballast water tanks that enter or operate in U.S. waters. The regulations carry mandatory reporting requirements to aid in the USCG's responsibility, under the National

Invasive Species Act, to determine patterns of ballast water movement. The regulations also require ships to maintain and implement vessel-specific ballast water management plans.

Protection of Wetlands, Executive Order No. 11990, as amended by Executive Order No. 12608. Under this Executive Order No. 11990, each Federal agency takes action to minimize the destruction, degradation, or modification of wetlands and enhance the natural and beneficial values of wetlands. The Executive Order also directs the avoidance of direct or indirect support of new construction in wetlands and public involvement throughout the wetland protection decision-making process.

Rivers and Harbors Appropriation Act. The Rivers and Harbors Appropriation Act of 1899 (RHA) regulates activities that involve the construction of dams, bridges, dikes, and other structures across any navigable water. Placing obstructions to navigation outside established federal lines and excavating from or depositing materials in such waters require permits from the USACE.

Section 10 of the RHA prohibits the unauthorized obstruction or alteration of any navigable water of the United States. These actions can include the building of structures, excavation, fill, and alterations or modifications to navigable waters.

Section 10 jurisdictional waters were determined as present in the project area.

4.2.2.3 State.

California Coastal Act. The California Coastal Act formally authorized the California Coastal Commission (CCC) in conjunction with the federal Coastal Zone Management Act (CZMA), with the goals of coastal conservation and development aimed at protecting, enhancing, and restoring coastal environmental quality and resources, giving priority to coastal dependent development, and maximizing public access to the coast. The CCC coastal zone generally extends 1,000 yards inland from the mean high tide line. In significant coastal estuarine habitat and recreational areas, it extends inland to the first major ridgeline or five miles from the mean high tide line, whichever is less. Projects within the coastal zone require a coastal development permit (CDP), from either the CCC or the Local Coastal Programs (LCPs).

The project area is within the coastal zone and will require a CDP. CCC Environmentally Sensitive Habitat Area (ESHA) is present in the project area. CCC, CDPR, and Los Angeles County have agreed to process this project under a consolidated CDP with the CCC.

Key policies relevant to the project include: Section 30230 Marine resources; maintenance; Section 30231 Biological productivity; water quality, Section 30233 Diking, filling or dredging; continued movement of sediment and nutrients; Section 30235 Construction altering natural shoreline; and Section 30240 Environmentally sensitive habitat areas; adjacent developments.

California Endangered Species Act. The California Endangered Species Act (CESA) establishes state policy to conserve, protect, restore, and enhance threatened or endangered species and their habitats. CESA mandates that state agencies should not approve projects that jeopardize the continued existence of threatened or endangered species if reasonable and prudent alternatives are available that would avoid jeopardy. CESA protections extend to species which are under review as candidates for listing.

Two CESA candidate species, mountain lions (*Puma concolor*) and steelhead, are known to be present in the project area. One has the potential to be present: Crotch bumble bee (*Bombus crotchii*).

California Environmental Quality Act. CEQA is the regulatory framework by which California public agencies identify and mitigate significant environmental impacts. A project normally is considered to cause a significant environmental impact on biological resources if it would

substantially affect a rare or endangered species or the habitat of that species, substantially interfere with the movement of resident or migratory fish or wildlife, or substantially diminish habitat for fish, wildlife or plants. CEQA guidelines define rare, threatened, and endangered species as those listed under the ESA and CESA and any other species that meets the criteria of the resource agencies or local agencies, such as CDFW designated species of special concern. CEQA guidelines state that the lead agency preparing an Environmental Impact Report (EIR) must consult with and receive written findings from CDFW concerning project impacts on species listed as endangered or threatened.

California Fish and Game Code. Several sections of the California Fish and Game Code (CFGC) apply to the proposed project.

Section 1600-1616 of the CFGC authorizes CDFW to regulate activities that would interfere with the natural flow of, or substantially alter the channel, bed, or bank of, a lake, river, or stream, including disturbance of riparian vegetation. CDFW requires a Lake or Streambed Alteration Agreement (LSAA) permit for these activities. Requirements to protect the integrity of biological resources and water quality often are conditions of LSAAs. It has been determined that jurisdictional streams and vegetated streambeds occur within the project area. An LSAA will be required.

Sections 3503, 3503.5, 3513, and 3800. Under these sections, a project proponent is not allowed to conduct activities that would result in the taking, possessing, or destroying of any birds of prey or their nests or eggs; the taking or possessing of any migratory nongame bird as designated in the MBTA; the taking, possessing, or needlessly destroying of the nest or eggs of any bird; or the taking of any nongame bird pursuant to CFGC Section 3800.

Typical violations include destruction of active bird and raptor nests because of tree removal, and failure of nesting attempts as a result of disturbances of nesting pairs caused by nearby human activity. The proposed project has the potential to adversely affect birds and raptors.

Sections 3511, 4700, 5050, and 5515. These sections of the CFGC prohibit take or possession of fully protected species. CDFW does not have the authority to permit incidental take of fully protected species when activities are proposed in areas inhabited by those species. No fully protected species have been identified onsite in their protected life stage.

California Native Plant Protection Act. The California Native Plant Protection Act of 1977 (CNPPA) prohibits the take of rare and endangered plants. CESA defers to the CNPPA, which ensures that state-listed plant species are protected when state agencies are involved in projects subject to CEQA.

One special status plant species, Southern California black walnut *(Juglans californica*) is listed as a California Native Plant Society (CNPS) Watch List species and was documented in the project area.

California Ocean Plan. The California Ocean Plan establishes water quality objectives and beneficial uses for waters of the Pacific Ocean adjacent to the California Coast (SWRCB 2019). The California Ocean Plan is a key tool employed by the SWRCB to ensure CWA and Porter-Cologne Act compliance for waters of the state and United States. NPDES waste discharge permits set discharge limits that are required to prevent exceedances of the water quality objectives in the California Ocean Plan. The proposed Project would discharge into Santa Monica Bay and therefore is subject to all California Ocean Plan water quality objectives and NPDES requirements. The most relevant objectives to this Project include:

- Marine communities, including vertebrate, invertebrate, and plant species shall not be degraded.
- Waste management systems that discharge into the ocean must be designed and operated in a manner that will maintain the indigenous marine life and a healthy and diverse marine community.

- Waste discharged to the ocean must be essentially free of substances that will accumulate to toxic levels in marine waters, sediments, or organisms.
- The basis for water quality objectives established in the California Ocean Plan is the protection of beneficial uses designated for each section of coastline by Regional Water Quality Control Boards (RWQCBs). The designated beneficial uses relevant to marine resources in the study area are as follows:
- Marine Habitat – Uses of water that support marine ecosystems including, but not limited to, preservation or enhancement of marine habitats, vegetation such as kelp, fish, shellfish, or wildlife (e.g., marine mammals, shorebirds).
- Shellfish Harvesting – Uses of water that support habitats suitable for the collection of filter-feeding shellfish (e.g., clams, oysters, and mussels) for human consumption or commercial or sport purposes. This includes waters that have in the past, or may in the future, contain significant shellfisheries.
- Commercial and Sport Fishing – Uses of water for commercial or recreational collection of fish, shellfish, or other organisms including, but not limited to, uses involving organisms intended for human consumption or bait purposes.
- Rare, Threatened, or Endangered Species – Uses of water that support habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under state or federal law as rare, threatened, or endangered.

Clean Water Act Section 401 Certification and Porter-Cologne Water Quality Control Act. The State of California regulates discharge of fill material into waters of the state pursuant to Section 401 of the CWA. Section 401 compliance is a federal mandate implemented by the state. Where a Section 404 permit is required, a Section 401 water quality certification from the Regional Water Quality Control Board (RWQCB) is also required.

In addition, the state regulates water quality for all waters of the state, including isolated wetlands, as defined under the Porter-Cologne Water Quality Control Act (California Water Code §13000 et seq.). The state regulates all discharges that can affect water quality, even if there is no significant nexus to waters of the United States. In such instances, a waste discharge permit may be required even though federal CWA Section 404 permits are not required.

The project may require a WDR dependent upon the proposed location of any dewatering or other project related water discharges.

Marine Invasive Species Act. All shipping operations that involve major marine vessels are subject to the Marine Invasive Species Act (MISA) of 2003 (PRC Sections 71200 through 71271), which revised and expanded the California Ballast Water Management for Control of Nonindigenous Species Act of 1999 (Assembly Bill [AB] 703). This Act is administered by the State Lands Commission. The MISA regulates the handling of ballast water from marine vessels arriving at California ports to prevent or minimize the introduction of invasive species from other regions. Marine vessels used during construction and monitoring of the project would be required to comply with MISA.

Marine Life Management Act. Within California, most of the legislative authority over fisheries management is provided by the Marine Life Management Act. This law directs the CDFW and the Fish and Game Commission to issue sport and commercial harvesting licenses, as well as license aquaculture operations. The department, through the commission, is the state's lead biological resource agency and is responsible for enforcement of the state's endangered species regulations and the protection and management of all state biological resources.

The CDFW prepared the Nearshore Fishery Management Plan (NFMP) in 2002. The management plan establishes a hierarchical framework within which adjustments to the management of the nearshore fishery can be made in a responsible and timely manner in order to meet the 1999 Marine Life Management Act mandate for adaptive management. A total of 19 species are managed under the NFMP.

Marine Life Protection Act. The Marine Life Protection Act (MLPA) was adopted in 1999 to protect ecosystem structure and function. Specific mandates of the MLPA are to sustain, conserve, and rebuild depleted populations. The MLPA works in concert with the Marine Life Management Act (MLMA). Within California, most of the legislative authority over fisheries management is enacted within the MLPA. This law directs CDFW and the Fish and Game Commission to issue sport and commercial harvesting licenses, as well as license aquaculture operations. The CDFW, through the commission, is the State's lead biological resource agency and is responsible for enforcement of the state endangered species regulations and the protection and management of all state biological resources.

An important part of MLPA enactment has been the establishment of Marine Protected Areas (MPAs) along the California coast. Fishing and other consumptive activities are strictly regulated in MPAs to provide refuges within which healthy stocks can be maintained to ensure propagation along the entire coast. Three types of designated (or recognized) MPAs occur in California: State Marine Reserves (SMRs), State Marine Parks (SMPs), and State Marine Conservation Areas (SMCAs). The area between Point Conception and the U.S./Baja California border includes 35 South Coast Region MPAs. Additionally, an SMCA and an SMR are located at Point Dume in the Malibu region, and an SMCA and an SMR are located at the Palos Verdes Peninsula.

Native Plant Protection Act. California's Native Plant Protection Act (NPPA) requires all state agencies to use their authority to conduct programs to conserve endangered and rare native plants. Provisions of the NPPA prohibit the taking of listed plants from the wild and require notification of CDFW at least 10 days in advance of any change in land use. This allows CDFW to salvage listed plant species that otherwise would be destroyed. Landowners are required to conduct botanical inventories and consult with CDFW during project planning to comply with the provisions of this act and sections of CEQA that apply to rare or endangered plants.

Nearshore Fisheries Management Plan. The five goals of the Nearshore Fisheries Management Plan are to ensure long-term resource conservation and sustainability, to employ science-based decision-making, to increase constituent involvement in management, to balance and enhance socioeconomic benefits, and to identify implementation costs and sources of funding. The following measures are employed to meet the primary goal of sustainability: a fishery control rule including size limits, time/area closures, or gear restrictions; regional management tailored to conditions specific to each of four regions; MPAs; restricted fishery access; and allocation of total allowable catch (CDFG 2001). All the species regulated by the Nearshore Fisheries Management Plan are primarily associated with rocky substrate.

4.2.2.4 Local.

Los Angeles County General Plan. A General Plan is a basic planning document that, alongside the zoning code, governs development in a city or county. The State requires each city and county to adopt a General Plan with seven mandatory elements: land use, open space, circulation, housing, noise, conservation, and safety, along with any number of optional elements as appropriate. Within the Land Use and Conservation and Natural Resources Elements of the County General Plan, there are goals and policies that are relevant to the Proposed Project and described within Section 3.10 Land Use and Land Use Planning. These relevant goals and policies include:

- Goal C/NR 1: Open space areas that meet the diverse needs of Los Angeles County.
    - Policy C/NR 1.2: Protect and conserve natural resources, natural areas, and available open spaces.
    - Policy C/NR 1.5: Provide and improve access to dedicated open space and natural areas for all users that considers sensitive biological resources.

- Goal C/NR 2: Effective collaboration in open space resource preservation.

- Policy C/NR 2.2: Encourage the development of multi-benefit dedicated open spaces.
- Policy C/NR 2.3: Improve understanding and appreciation for natural areas through preservation programs, stewardship, and educational facilities.

- Goal C/NR 3: Permanent, sustainable preservation of genetically and physically diverse biological resources and ecological systems including: habitat linkages, forests, coastal zone, riparian habitats, streambeds, wetlands, woodlands, alpine habitat, chaparral, shrublands, and SEAs.
  - Policy C/NR 3.1: Conserve and enhance the ecological function of diverse natural habitats and biological resources.
  - Policy C/NR 3.6: Assist state and federal agencies and other agencies, as appropriate, with the preservation of special status species and their associated habitat and wildlife movement corridors through the administration of the SEAs and other programs.
  - Policy C/NR 3.7: Participate in inter-jurisdictional collaborative strategies that protect biological resources.
  - Policy C/NR 3.11: Discourage development in riparian habitats, streambeds, wetlands, and other native woodlands in order to maintain and support their preservation in a natural state, unaltered by grading, fill, or diversion activities.

Los Angeles County Santa Monica Mountains Local Coastal Program (LCP).

The Los Angeles County Santa Monica Mountains Coastal Zone is the unincorporated portion of the Santa Monica Mountains west of the City of Los Angeles, east of Ventura County, and south of the coastal zone boundary, excluding the City of Malibu. The Coastal Zone extends inland from the shoreline approximately five miles and encompasses approximately 81 square miles.

The Santa Monica Mountains Local Coastal Program (LCP), a component of the Los Angeles County General, consists of the Land Use Plan (LUP) and implementing actions included in the Local Implementation Program (LIP). The LIP establishes district-wide, zone-specific, and area-specific regulations for new development and for the protection and management of the Coastal Zone's unique resources. The zoning consistency program is also necessary to implement the LUP. Zoning changes, which included a new zone (Rural-Coastal), ensure that zoning designations for properties are consistent with the land use categories of the LUP. These changes were mandated by State law to eliminate potential conflicts between the Plan and zoning designations. Relevant goals and policies of the LCP include:

- Goal CO-1: Maintain and restore biological productivity and coastal water quality appropriate to maintain optimum populations of marine and freshwater organisms and to protect human health.
  - Policies CO-1 through CO-31 are provided in support of Goal CO-1.

- Goal CO-2: Sensitive Environmental Resource Areas shall be protected against any significant disruption of habitat values. Development in areas adjacent to Sensitive Environmental Resource Areas shall be sited and designed to prevent impacts which would significantly degrade these areas and shall be compatible with the continuance of the habitat.
  - Policies provided in support of Goal CO-2 include policies CO-33 through CO-67 related to Sensitive Environmental Resource Areas and H3 Habitat Protection; policies CO-68 and CO-69 related to stream protection; policies CO-70 through CO-73 related to environmental review policies; policies CO-74 through CO-95 related to new development; policies CO-96 through CO-98 related to fuel modification; policies CO-99 and CO-100 related native tree protection; and policies CO-101 related to restoration.

- Goal CO-4: An integrated open space system that preserves valuable natural resources and provides a variety of recreational opportunities, within a program coordinated among federal, State, local and non-profit agencies.
  - Policies CO-117 through CO-123 are provided in support of Goal CO-4.

- Goal CO-7: Shoreline and beaches that are accessible to the public and protected to the greatest extent possible from the impacts of beach sand erosion, development, conflicting uses, sea level rise, and other possible threats.
    - Policies CO-187 through CO-203 are provided in support of Goal CO-7. Policies CO-191 to CO-195 also correspond to Section 30230 Marine resources; maintenance of the Coastal Act.

Topanga State Park General Plan. The portion of the Project area north of PCH is located within Topanga State Park. The Topanga State Park General Plan was developed by CDPR and directs the long-range management, development, and operation of the Park by providing broad policy and program guidance including goals, guidelines, and objectives for Park management. The Plan sets aside a number of management zones including a Lower Topanga and Lagoon Zones, Wildlands Zone, Cultural Preserve, and Historic Zone, as well as other zones for resource management, visitor use, and accessible interpretive and recreational programs. The Plan also contains specific proposals to consolidate the Park's trail system through eliminating duplicate trails and relocating trails away from sensitive resources (CDPR, Southern Service Center 2012). The General Plan provides the following Park-wide goals and guidelines for biological resources potentially relevant to the Project:

Hydrology

- Protect, enhance, and restore the Park's wetlands and hydrologic resources:
    - Perform Wetland delineation in accordance with the 1987 U.S. Army Corps of Engineers Wetland Delineation Manual prior to development near any wetland site.
    - Support and work towards the preservation, protection, and restoration of the lagoon at the mouth of Topanga Canyon.

Vegetation Management

- Promote and restore the sustainability of natural ecosystem processes by actively managing plant community health and development, while maintaining the protection of cultural resources.
- Perpetuate wildlife assemblages by protecting, restoring, and interpreting the native plant communities within the park.
    - Protect sensitive plant species, including those that are legally listed under Federal and state laws as rare, threatened, or endangered, or that are considered rare by the CDFG. In addition, CSP will protect those species that meet the legal requirements for listing but are not yet listed (i.e., California Native Plant Society List 1B taxa) and those considered locally sensitive or endemic to the area.
    - Avoid or minimize human activities that cause imbalances in the natural ecological system. Additionally, CSP shall conduct management activities, such as habitat restoration, which foster ecological balance.
- Reduce the presence and further invasion of exotic species in the Park.

Wildlife

- Perpetuate wildlife assemblages by protecting, restoring, and interpreting the native terrestrial and aquatic animals within the park.
    - Ensure that the conservation of native wildlife is incorporated into all future developments, management plans, and visitor-use patterns throughout the Park, and that the protection of sensitive species and habitats receives high urgency.
- Protect all sensitive wildlife species occurring in the Park including those legally listed under federal and state law as threatened or endangered, those that are Species of Concern, and those considered locally sensitive or endemic to the area.
    - Preserve sensitive species and habitats to encourage their recovery. Comply with state and federal environmental legislation, Recovery Plans, and Critical Habitat designations enact to protect this disappearing biota.
    - Protect sensitive habitats and species from visitor uses such as equestrian activity, mountain biking, hiking, and other uses not yet established in the park. These activities will be

appropriately planned such that the integrity of the habitat and the sensitive species is given highest priority.

- Work to control exotic animals that are found to upset natural ecological dynamics of native species.

Biocorridors

- Maintain high standards for ecosystem health and biodiversity by protecting plant and animal habitat and dispersal corridors within the park.

Within Lagoon, Lower Topanga, and Watershed Conservation Zones

- Restore, maintain, and protect the lagoon/estuarine ecosystem and allow for scientific research as needed to reach these goals.
    - Do not allow development or modification within the Lagoon Zone other than infrastructure that will improve the lagoon wildlife corridor, specifically the steelhead and tidewater goby populations.
- Restore, maintain, and protect the native ecosystem of the Watershed Conservation Zone, especially the riparian vegetation and wildlife corridor.

Santa Monica Mountains National Recreation Area, Final General Management Plan and Environmental Impact Statement. The Final General Management Plan and Environmental Impact Statement for the National Park Service (NPS) Santa Monica Mountains National Recreation Area (SMMNRA) (USDOI-NPS 2002) provides a framework for managing development, visitation, and natural and cultural resources for the next 15 to 20 years. It also addressed impacts to natural and cultural resources caused by development, growing visitation and demand for outdoor recreation, lack of public transportation to and within the national recreation area, and increasing awareness about the national recreation area among residents of the metropolitan Los Angeles area. The following restoration goals were identified in the General Plan:

- Protect and enhance species, habitat diversity and natural processes.
- Protect and restore estuaries and wetlands.
- Enact programs to combat and remove the encroachment of exotic flora and fauna into natural ecosystems where feasible.
- Maintain or improve water quality and manage riparian communities, natural stream characteristics, estuaries and coastal waters for their significant ecological value.
- Implement collaborative scientific research and innovative resources management programs among federal, state and local agencies and the private sector to manage, restore, and maintain natural processes.
- Develop scientific geographic information data to inform decision-making concerning appropriate parkland development. Share geographic information data with private landowners and local agencies to promote and support sustainable development in the Santa Monica Mountains.

4.2.2.5 Consultation History. No formal consultations under the California or Federal Endangered Species Acts (CESA/FESA) have occurred to date for the proposed project.

4.2.2.6 Resource Agency Coordination and Professional Contacts. All relevant resource agencies, and associated landowners have been contacted regarding the project, and feedback solicited about biological resources and other concerns. This has occurred primarily during the Technical Advisory Committee meetings with additional communications via email and phone calls. Documented coordination on biological resources issues include:

- **Technical Advisory Committee Meetings** on (November 19, 2019; June 4, 2020; May 20, 2022, April 27, 2023) were attended by representatives of relevant regulatory agencies, utilities, emergency services and technical experts. A complete list of the current TAC participants is available upon request from the RCDSMM.

- **EIR Public Scoping Meeting** on June 11, 2022.

- **California Coastal Commission**. Coordination on the consolidated Costal Development Permit process and nearshore nourishment concerns.
  - Barbara Carey. District Manager, South Central Coast District
  - Deanne Christianson District Supervisor, South Central Coast District
  - Walt Deppe, Coastal Program Analyst
  - Jonna Engel, Senior Ecologist/Group Leader
  - Shannon Fiala, Coastal Program Manager
  - Jordan Sanchez, Sr. Transportation Program Analyst
  - Jeremy Smith, PE, Coastal Engineer

- **Caltrans**. Coordination on biological and archaeological reviews/information required by Caltrans.
  - Rimma Tebeleva, Project Manager
  - Alonso Plater, Asst. Project Manager
  - Karl Price, Sr. Environmental Planner
  - Paul Caron, Sr. District Biologist
  - Peter Champion, Associate Environmental Planner-Natural Science
  - Sean Herron, Associate District Biologist
  - Anna Johnson, Environmental Planner
  - Melinda Molnar, Fish Passage Liaison
  - Mariam Dahdul, Associate Environmental Planner Archaeology

- **California Department of Fish and Wildlife**. Coordination on streambed alternation agreement and state special-status species.
  - Mary Larson, Sr. Environmental Scientist
  - Christian Rhomberger, Sr. Environmental Scientist (Specialist)
  - Kyle Evans, Sr. Environmental Scientist Supervisor
  - Amanda Canepa, Permitting
  - Julisa Portugal, Permitting

- **California State Lands Commission**. Coordination on areas under the jurisdiction of CSLC and approvals needed for project.
  - Ken Foster, Public Lands Management Specialist
  - Kelly Connor, Public Lands Management Specialist

- **Los Angeles County**
  - **Department of Beaches and Harbors.** Plan coordination for Topanga Beach.
    - Maral Tashjian, Planning and Environment Section Manager
    - Bertha Ruiz-Hoffman, Planner
    - Kenneth Forman, Division Chief, Operational Services Division
    - Warren Ontiveros, Planning Division Chief
    - Porsche Nauls, Departmental Facilities Planner II, Planning Division

  - **Department of Regional Planning.** County role as responsible agency for consolidated CDP, coordination of LCP and coastal requirements, required avoidance measures and monitoring for percolation testing.
    - Amy Bodek, Director of Regional Planning
    - Martin Gies, Principal Regional Planner

        - Nathan M. Merrick, Principal Regional Planner, Coastal Development Services
        - Rob Glaser, Supervising Regional Planner, Coastal Development Services.

    - **Vector Control District.**
        - Robert Saviskas, Director. Coordination on vector control issues.

    - **Fire Department**
        - Fernando Boiteux, Chief Lifeguard
        - Drew Smith, Assistant Fire Chief

- **NOAA Fisheries/National Marine Fisheries Service.** Coordination on fish passage concerns, potential benefits and impacts to steelhead trout from project, Section 10 and compliance with the NOAA Restoration Center Programmatic Biological Opinion requirements.
    - Brittany Struck, Natural Resource Management Specialist
    - Bryant Chesney, Senior Marine Habitat Resource Specialist, West Coast Region

- **Regional Water Quality Control Board**. Coordination on Section 401 approvals, waters of State and water quality concerns .
    - LB Nye, Regional Programs Section Manager
    - Celine Gallon, Senior Environmental Scientist

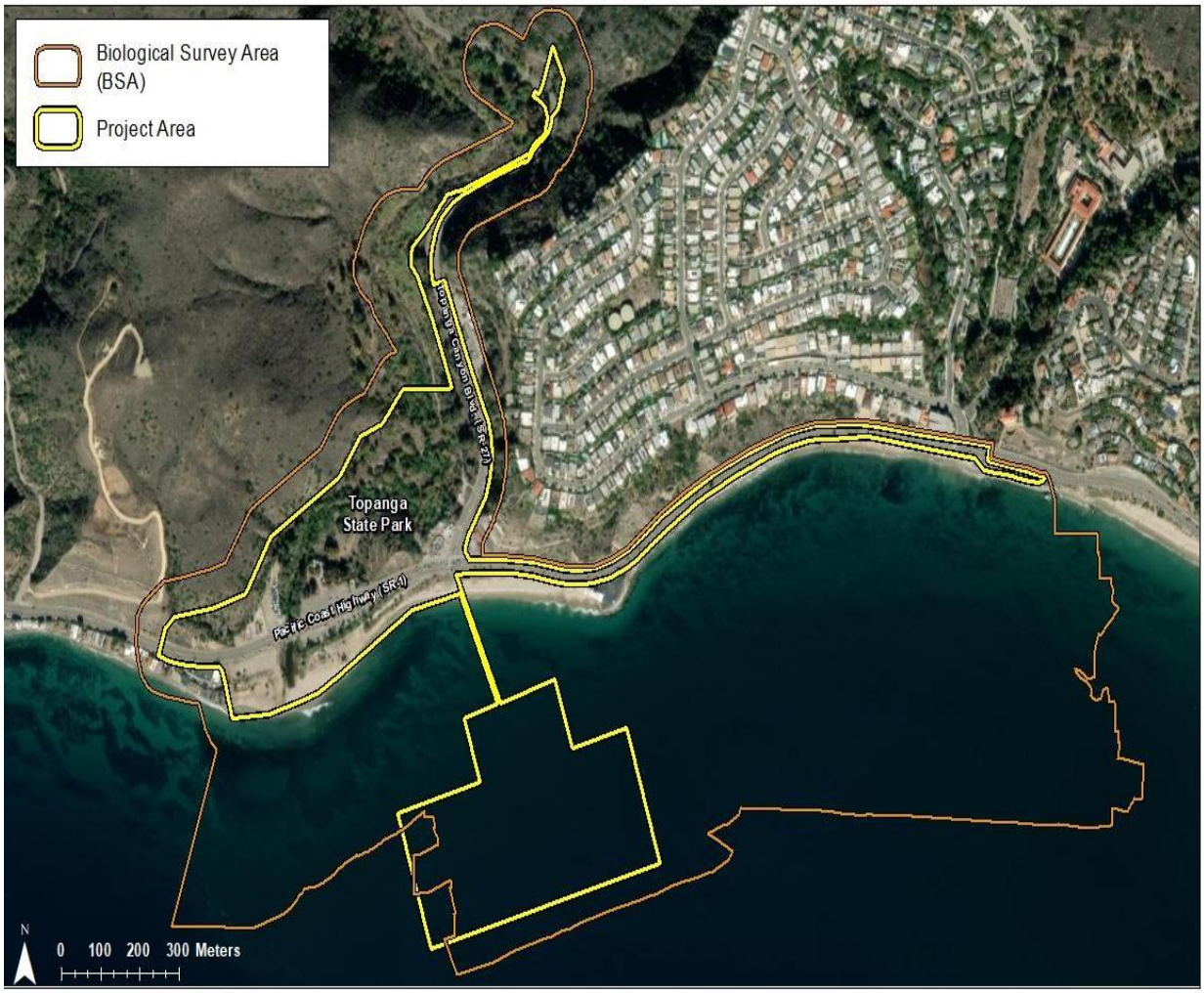
- **U.S. Fish and Wildlife Service**. Discussion on protocol surveys needed for project for tidewater goby, Least Bell's vireo surveys recommended, Section 7 permit.
    - Chris Dellith, Senior Fish and Wildlife Biologist
    - Eric Morrissette, Senior Fish and Wildlife Biologist

- **U.S. Army Corps of Engineers**. Coordination on USACE wetland delineation, 404 permit, NEPA requirements, and nearshore sediment deposition.
    - Theresa Stevens, Sr. Project Manager
    - Amanda Wagner, Sr. Project Manager
    - Stephanie Hall, Sr. Environmental Protection Specialist
    - Lia Protopadakis, Project Manager

- **Southern-California Dredged Material Management Team (DMMT)**. Review of proposed nearshore nourishment plan and associated sampling by multi-agency body.

4.3 Project Specific Field Surveys

A suite of biological field surveys specific to this project was completed between June 2019-November 2023 to provide updated information regarding biological resources known or anticipated to be present onsite. We use the term Biological Survey Area (BSA) to denote the terrestrial, freshwater/brackish aquatic and marine areas surveyed, which includes the entire ~90-acre project area, plus additional buffer zones. A buffer of at least 200 feet around all potential ground disturbance was included in the BSA for terrestrial areas. The exception is for the potential sewer alignment located along the PCH between TCB and Coastline Drive as this area is limited to paved areas within the PCH ROW and Will Rogers State Beach parking lot. See Figure 13.



Sources: Project Boundary (EPD, Moffatt & Nichol, RCDSMM 9/20/2023), Biological Survey Area (CDPR, CRM 9/21/2023)
Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c)

Figure 13. Biological Survey Area (BSA) and Project Area

A summary of these surveys are below, while the original reports are attached to this document for reference (or available for viewing on the RCD website at: https://www.rcdsmm.org/resources/topanga-lagoon-restoration.)

4.3.1 Vegetation Communities, Rare Plants and General Wildlife. Spring, early summer and late summer surveys were conducted for terrestrial areas to maximize plant detection during their blooming season for all project areas W of TCB. by California State Parks environmental scientists Noa Rishe Khalili and David West, RCDSMM Conservation Biologist Parker House and RCDSMM Watershed Steward Rachel Kieffer conducted an early summer survey for habitat types, rare plants, and encountered wildlife on June 1-2, 2020, from 7 am-3 pm, June 3, 2020 at dawn (Noa Rishe Khalili), and the afternoon of December 18, 2020 (David West). Spring surveys were conducted by David West, State Parks environmental scientist John Ota, RCDSMM biologists Jamie King and Akosa Ibekwe from 8am to 3pm on April 11 and 13, 2022. Late-summer surveys were conducted by David West, John Ota, Jamie King, Akosa Ibekwe, and National Parks Service biologist Mark Mendelsohn from 8:30am to 2:30pm on August 9 and 10, 2022. A late-summer survey was conducted by David West and John Ota from 9:30am to 1:00 pm on August 24, 2023. Surveys covered the entirety of potential ground disturbance and a minimum 200-foot buffer within terrestrial areas (excluding the PCH ROW E of TCB).

Additional surveys of the potential seepage pit and SDI OWTS sites that were added to the project boundary in 2023 were conducted by CDPR and RCDSMM biologists John Ota, David West, Jamie King,

and Danielle Picciano, RCDSMM Field Assistant on April 25, 2023, August 8, 2023, and August 24, 2023.

Field efforts were focused on identifying special-status plant and wildlife species, their sign, and potentially suitable habitat. Surveys were conducted by walking transects of convenience through all accessible areas. Areas not accessible were assessed using binoculars.

Vegetation community mapping followed the CDFW Natural Communities List (CDFW, July 2022).

The online database for the Santa Monica Mountains Local Coastal Plan (LCP) https://www.arcgis.com/home/item.html?id=594c161b58b547428ffd00911824c773) was reviewed by CDPR staff to identify mapped LCP habitat categories and Significant Environmental Resource Areas (SERA) onsite, and were subsequently ground-truthed to provide an updated vegetation/SERA map.

All plant species observed were documented and identified to the level necessary to determine any special status. General wildlife surveys were conducted concurrently with all other field efforts. Biologists recorded incidental wildlife observations and observations of sign, including burrows, middens, tracks, scat, and other evidence of activity by common and special-status wildlife species in the vicinity.

4.3.2 Jurisdictional Waters and Wetlands. On January 16, 2020, WRA, Inc. (WRA) conducted a jurisdictional delineation within the project area to identify regulated aquatic habitats onsite. Note the survey area did not include a small approximately 1.5-acre zone of imported fill located between the east bank of Topanga Creek and the western edge of TCB. ESA completed an updated delineation in October 2023.

Delineated areas included: federal wetlands/waters (Waters of the US) under the jurisdiction of the USACE per Section 404 of the Clean Water Act (CWA) and/or Section 10 of the Rivers and Harbors Act (RHA); Waters of the State under the jurisdiction of the California State Water Resources Control Board (SWRCB); aquatic habitats within the coastal zone regulated by the California Coastal Commission (CCC) as Environmentally Sensitive Areas; and CDFW jurisdiction of streams under Section 1600 of the CFGC. WRA also compared the delineated jurisdictional waters and wetlands to mapped Los Angeles County Santa Monica Mountains Local Coastal Program (LCP, February 2018) SERAs. SERAs are areas within the LCP that have the highest biological significance, rarity, and sensitivity.

WRA conducted the onsite "routine" delineation per the methodology outlined in the *U.S. Army Corps of Engineers Wetlands Delineation Manual* (Corps Manual; Environmental Laboratory 1987), the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (Arid West Supplement; Corps 2008), and *A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States* (OHWM Guide; Lichvar and McColley 2008). The jurisdictional limits of non-wetland waters were mapped based on a combination of field indicators such as Ordinary High Water mark (OHWM), and within tidally influenced areas, the limit of Mean High Water (MHW) elevation (NAVD 88), which was identified from local tide stations.

Both federal and state wetlands were identified using a combination of field indicators, which were often minor changes in topography and dominant vegetation. The three parameters required to define a federal or state wetland were the presence of hydrophytic vegetation, wetland hydrology, and hydric soils as outlined in the Corps Manual. CCC regulated wetlands are required to only meet one of the parameters. CDFW jurisdiction was delineated by identifying the top of bank or the outer edge of riparian vegetation, whichever distance is greater. In late 2021, the limits of ground disturbance in the project area were expanded to the north, along Topanga Canyon Boulevard, resulting in the need to delineate an additional section of creek. On April 19, 2022, State Parks Environmental Scientists David West and John Ota and Senior Environmental Scientist Brooke Sheridan extended the delineation to encompass the stream and associated wetland habitat to the new northern BSA boundary. Methods mirrored those used during the 2020 WRA survey.

In 2022-3 additional changes to the project boundary occurred associated with the nearshore nourishment area and wastewater analysis. ESA was requested to review previous delineations for

accuracy and update the jurisdictional delineation to cover the expanded project area. The delineation was conducted on May 31, June 1, and June 2, 2023, by ESA Biologists Amanda French and Robert Sweet using similar methodologies but utilizing March 2023 revised definitions of Waters of the US and findings of the May 2023 Sackett vs EPA suit.

Although the ESA 2023a updated delineation did not fully include recently added areas included in the project boundary for potential seepage pit and sewer wastewater development, no wetland or water features were observed in these areas during the 2022-23 general biological surveys as the wastewater areas involve the PCH pavement, TCB road shoulder, or disturbed upland areas at the seepage pit location. Once a final wastewater alternative is selected, associated areas not covered by the ESA 2023a delineation will be formally reviewed to confirm or update their findings as part of regulatory approvals.

Onsite waters, wetlands and associated riparian cover would be considered a SERA H1 Habitat under the LCP. H1 Habitat is the highest tier and includes the most sensitive and vulnerable habitat types. WRA estimated onsite H1 habitat via the available County maps. CDPR and RCDSMM subsequently ground-truthed the boundaries of the H1 Habitat to provide a more refined estimate. Observations on the project area, including onsite topography, plant communities and land use, were also noted. For more information see the detailed *Jurisdictional Delineation Report for the Topanga Lagoon Restoration* Project (WRA 2020) and *Aquatic Resources Delineation Update for the Topanga Lagoon Restoration Project* (ESA 2023a) attached in Appendix A.

4.3.3 Wetland Conditions-California Rapid Assessment Method (CRAM). On February 14 and 26, 2020, The Bay Foundation staff conducted a CRAM assessment for wetland areas within the Topanga Lagoon to provide a baseline of the overall condition of the area prior to construction and facilitate assessment of post construction success. California State Parks Environmental Scientists David West and John Ota and Senior Environmental Scientist Brooke Sheridan performed a CRAM assessment of an additional stream segment to the north to accommodate the expanded BSA on April 12, 2022. *Condition* can be defined as "the state of a wetland assessment area's buffer and landscape context, hydrology, physical and biological structure relative to the best achievable states for the same type of wetland" (CWMW 2013). The outcome of a CRAM analysis is a score that can be compared to scores of the same site at a different time, or another site within California of a similar wetland type. For any given wetland type, the higher the CRAM score, the higher the ecological functional capacity (CWMW 2019).

All work was conducted per the CRAM User Manual (CWMW 2013) and CRAM Field Books (CWMW 2013a, b). The site was preliminarily divided into four Assessment Areas (AA) based on the jurisdictional wetland delineation (WRA 2020), one bar-built estuary and three riverine wetland areas, and then further refined in the field (Figure 14). After the extension of the BSA to the north, a fifth AA (riverine) was added. Each AA was scored for four main attributes: 1) landscape and buffer context, 2) hydrology, 3) physical structure, and 4) biotic structure. Each wetland type or module had additional unique metrics and sub-metric assessments completed for them (Table 1).

A search of the online CRAM database was performed on February 24, 2020, and March 2, 2020, to identify previous CRAM surveys that occurred within or near the project area to help identify any changes in onsite conditions, and to compare site scores to reference sites.

The full report, *2020 Wetland Condition Assessment for the Topanga Lagoon Restoration Project* (The Bay Foundation 2020), is provided in Appendix B. Additional information on CRAM Methodology can be found online at www.cramwetlands.org.

Figure 14. CRAM Assessment Areas. Source: The Bay Foundation 2020 and CDPR 2022.

Table 1. Summary of CRAM Attributes

Attribute	Metric	Sub-metric	Description	Assessment Location
Landscape and Buffer Context	Aquatic Area Abundance	---	Spatial association to adjacent areas with aquatic resources	Office
	Buffer	Percent of AA with Buffer	Relationship between the extent of buffer and the functions it provides	Office
		Average Buffer Width	Extent of buffer width assesses area of adjacent functions provided	Office
		Buffer Condition	Assessment of extent and quality of vegetation, soil condition, and human disturbance of adjacent areas	Field
Hydrology	Water Source	---	Water source directly affects the extent, duration, and frequency of hydrological dynamics	Office/ Field
	Hydroperiod	---	Characteristic frequency and duration of inundation or saturation	Office/ Field
	Hydrologic Connectivity	---	Ability of water to flow into or out of a wetland, or accommodate flood waters	Office / Field
Physical Structure	Structural Patch Richness	---	Number of different obvious physical surfaces or features that may provide habitat for species	Field
	Topographic Complexity	---	Micro- and macro-topographic relief and variety of elevations	Field
Biotic Structure	Plant Community Composition	Number of Plant Layers	Number of vegetation stratum indicated by a discreet canopy at a specific height	Field
		Number of Co-dominant Species	For each plant layer, the number of species represented by living vegetation	Field
		Percent Invasion	Number of invasive co-dominant species based on Cal-IPC status	Field
	Horizontal Interspersion	---	Variety and interspersion of different plant "zones": monoculture or multi species associations arranged along gradients	Field
	Vertical Biotic Structure	---	Interspersion and complexity of plant canopy layers and the space beneath	Field

Source: The Bay Foundation 2020. Descriptions modified from the CRAM User Manual (CWMW 2013).

4.3.4 Protected Trees. Between March - November 2021, RCDSMM staff and Watershed Steward Project members completed a tree assessment for the a subset of the project area that had the potential for grading or other significant disturbance. All trees with a single trunk over five inches in diameter or having more than two trunks with a combined diameter of over eight inches, were tagged with round, stamped, numbered tags at approximately 54 inches above grade (DSH=diameter at standard height) on the north side of the tree (unless inaccessible). Native trees under 5-inch diameter were also tagged to document demography of the site and identify potential volunteer trees that could be used for mitigation. Tree height was visually estimated, number of trunks and DSH were measured, and canopy extent estimated in four cardinal directions.

Tree data were collected using ArcGIS Collector with location accuracy between 0.30 to 3 meters. Tree locations were mapped using the EOS Positioning Systems Arrow 100 in WGS 1984 using the Mercator Auxiliary Sphere projection and ESRI Arcmap 10.8. Quality Assurance/Quality Control review of the data fields and map locations was conducted by RCDSMM staff.

Trees were assigned a health and vigor rating based on a summary of the condition of roots, trunk, scaffold branches, small branches and twigs, and foliage according to the standards of the *International Society of Arboriculture Guide to Judging Plant Condition*. Each factor was given a point score according to the guidelines (5 being the highest score, 1 the worst). The total value was divided by 25 (the maximum number of points possible) and multiplied by 100 to obtain a percent rating. Notes on pests, disease, mechanical injury, constrained roots, or other potential impacts were also documented.

A preliminary impact analysis for Protected Trees was completed for each of the project alternatives based on the estimated areas of disturbance. The January 2022 preliminary 30% design was utilized for this. Trees removed and impacted were identified, as were the potential impacts of fuel clearance upon protected trees. This analysis will be completed upon finalization of the designs.

The full report summarizing the tree assessment is *Native Tree and Oak Tree Report* (Dagit and Demirci 2022), and is in Appendix C. Fuel clearance zones are summarized in Appendix D.

In April and August 2023, the presence of protected trees was assessed during general biological surveys for the expansion of the project boundary to include potential wastewater improvements along the PCH east of TCB and the pipeline alignment and seepage pit areas. These areas will be more formally surveyed once a wastewater alternative is selected as part of the preferred alternative.

4.3.5 Invertebrate Surveys

4.3.5.1 Benthic Macro Invertebrates (BMI). Detailed invertebrate surveys within the project area occurred in 2014, 2020, and 2023 and were limited to the sampling of the BMI within areas of Topanga Lagoon and Creek (Figure 15). Understanding the BMI composition is important as they are markers of water quality and ecosystem health at a specific point in time, and function as food resources for local fish and wildlife. Other invertebrate groups were noted when encountered as part of other onsite surveys.

On April 24 and July 19, 2014, BMI samples were collected according to California's Rapid Bioassessment protocols (Ode et al. 2005) within the project area at a site called Snake Pit (300 m upstream of PCH bridge). Starting at the downstream end of the site, a riffle within the reach was randomly selected and a total of nine 1 square ft. wide kick net samples were collected at each left, center, and right of three consecutive riffles, and combined for a composite sample of nine kicks Samples were preserved in 95 percent ethanol or frozen within eight hours from the collection time and processed and analyzed within a month from the collection date. Most BMI were identified by RCDSMM Conservation Biologist Salvador Contreras and other RCDSMM staff to the family or genus level using a 40x magnification, dissecting microscope. Results of this sampling are detailed in Dagit et al. 2014 and an excerpt of the relevant data is found in Appendix E.

Figure 15. BMI Sampling Locations. 2004 sampling occurred at the Snake Pit, and 2020 and 2023 sampling occurred as shown in the lagoon to capture both closed and open lagoon conditions.

In November 2020, Brenton Spies, Rosi Dagit, RCDSMM staff and California State University Channel Islands (CSUCI) students conducted a BMI survey while the lagoon was closed as part of an overall assessment of habitat and conditions supporting the federally endangered tidewater goby. This survey was repeated during open lagoon conditions in February 2023 by RCD staff Rosi Dagit, Jamie King, Alyssa Morgan, Danielle Picciano, and RCDSMM Watershed Stewards Nate Kamm. Both surveys used the same methodology.

Aquatic invertebrate assembly was assessed following two different collection methods: Turner and Trexler (1997) and the S.O.N.G.S. Wetland Mitigation Monitoring Protocol (2006). Algae and emergent vegetation were noted at each survey location, with particular importance of documenting any observed *Ruppia* spp. as its presence is strongly correlated with supporting tidewater gobies. Percent algal/vegetation cover was assessed by a randomly placed ½ m^2 quadrat three times at each site.

A conventional D-frame sweep net with 1.2 mm mesh size was used to survey epibenthic as well as epiphytic invertebrates by bumping the net horizontally along the bottom. This method works well in shallow water habitats where the mouth of the net spans most or the entire water column. One “sweep” of the net approximately 0.5 – 1.0 m in length was done at each sampling location. A benthic corer was used to assess infaunal invertebrate counts and sediment grain size and organic composition. Two or three sediment cores were collected from each sample location using a 4.8 cm diameter PVC corer inserted approximately 6 cm deep into the sediments (Flannagan 1970, Kajak 1971, Turner and Trexler 1997, S.O.N.G.S 2006). Samples from both collection methods were taken to the laboratory, washed through two stacked sieves, 0.5 mm and 0.125 mm mesh, and then manually separated from sediment and other organic materials. Specimens were preserved for identification and submitted to Aquatic Bioassay and Consulting Laboratories for identification and analysis in October 2021 and February 2023. The full results of BMI sampling are in Appendix E.

4.3.5.2 Overwintering Monarch Butterfly Surveys. Western populations of the monarch are known to overwinter along the California coast from October through March. Over 400 overwintering sites have been identified, of which 60 have been lost to development or tree mortality. On November 13, 28, and 30, 2023, Xerces Society for Invertebrate Conservation (XSIC) and CDPR staff biologists conducted an overwintering monarch butterfly survey of eucalyptus groves within the BSA as part of a greater survey effort on CDPR properties. Survey methods were consistent with the Western Monarch Count protocols (XSIC 2023).

4.3.6 Fishes. Snorkel surveys conducted by the RCDSMM Stream Team staff have occurred within Topanga Lagoon and Creek monthly since 2001 starting at the lagoon and extending upstream 5.3 river kilometers. Although these surveys have focused on a few species such as southern steelhead trout, tidewater goby, arroyo chub, and California grunion, all other fish species encountered are concurrently documented. As the target species cover the full array of aquatic habits present onsite (steelhead utilizes the entirety of the system as either a resident trout or anadromous migrant, tidewater goby primarily resides in the lagoon, and grunion spawns on the beach), these fish surveys adequately assess the potential for other fish species to be present onsite within the project area. Although the state Species of Special Concern arroyo chub was not specifically targeted during surveys, its habitat of primarily freshwater was intensely assessed during steelhead and goby surveys. Chub was documented and counted when encountered.

4.3.6.1 California Grunion. Seasonal runs of the locally-sensitive California grunion (*Leuresthes tenuis)* have been assessed annually at Topanga Lagoon since 2004 by volunteer citizen scientists under the direction of Dr. Karen Martin and others. During 2020-2023, this program at Topanga Lagoon was continued and involved twice a month surveys during peak spawning periods from March through July. The surveys occurred when grunion was likely to run - at night after the highest tides associated with a full or new moon. Surveys involved monitors surveying the beach during forecast runs and reporting on weather, natural predators, and human hunters, along with other features. Monitors submitted their observations during run events via an interactive web site at http://www.Grunion.Org or a "hotline" phone number. A detailed overview of grunion in the project area is included in the technical memo, *California Grunion and Topanga Beach* (Martin 2021), attached in Appendix F.

4.3.6.2 Tidewater Goby. The RCDSMM has been monitoring the population of tidewater gobies since 2008 as an ancillary part of the focused southern steelhead trout surveys (Figure 16). Additional surveys have been conducted in collaboration with partners at UCLA and CSUCI since 2020-2022 during which individual fish were sacrificed for gut analysis. All surveys were conducted under permits from USFWS TE-811188-4 expires 1/4/2024 CDFW (#S-200630009-20275-001, expires 12/11/2023), and CDPR Right of Entry and Scientific Collection Permits (expires in 2023). All surveys were conducted by RCDSMM biologists with assistance from USFWS staff, as well as Dr. David Jacobs and Brenton Spies.

Figure 16. Tidewater Goby Survey Areas.

Several survey methods have been used and included: 1) visual monitoring during visits to the lagoon that sometimes included snorkeling, and 2) both systematic (30 m intervals) and spot seining using a 3.2 meter by 1.2 meter x 3 mm mesh seine net affixed to poles with the weighted bottom of the net kept firmly along the substrate, and the net angled to prevent fish from escaping. At the end of each pull, the net was raised, and all fish were counted, sized, and released. Distances for each seine pull varied. A single pass was used to identify species composition, size, and abundance.

More detailed information on tidewater goby population trends is found in Appendix G.

4.3.6.3 Steelhead Trout. The RCDSMM has been surveying southern California Distinct Population Segment of southern steelhead trout (*Oncorhynchus mykiss,)*, a federally endangered species and state candidate endangered within Topanga Creek since 2001 (Figure 17). The species was assumed extirpated locally between 1980 and 1998, when a single individual was documented by Rosi Dagit, RCDSMM in Topanga Creek (Bell *et al*. 2011). More focused fish surveys were subsequently undertaken by the RCDSMM, and three adult *O. mykiss* were observed and confirmed by NMFS in April 2000 (Bell *et al.* 2011). The RCDSMM then initiated more consistent and almost monthly snorkel surveys within the limits of steelhead anadromy in 2001, followed by the addition of lifecycle monitoring in 2008. These surveys are projected to continue until at least 2023. An overview of the methods involved with the long-term steelhead monitoring are discussed below.

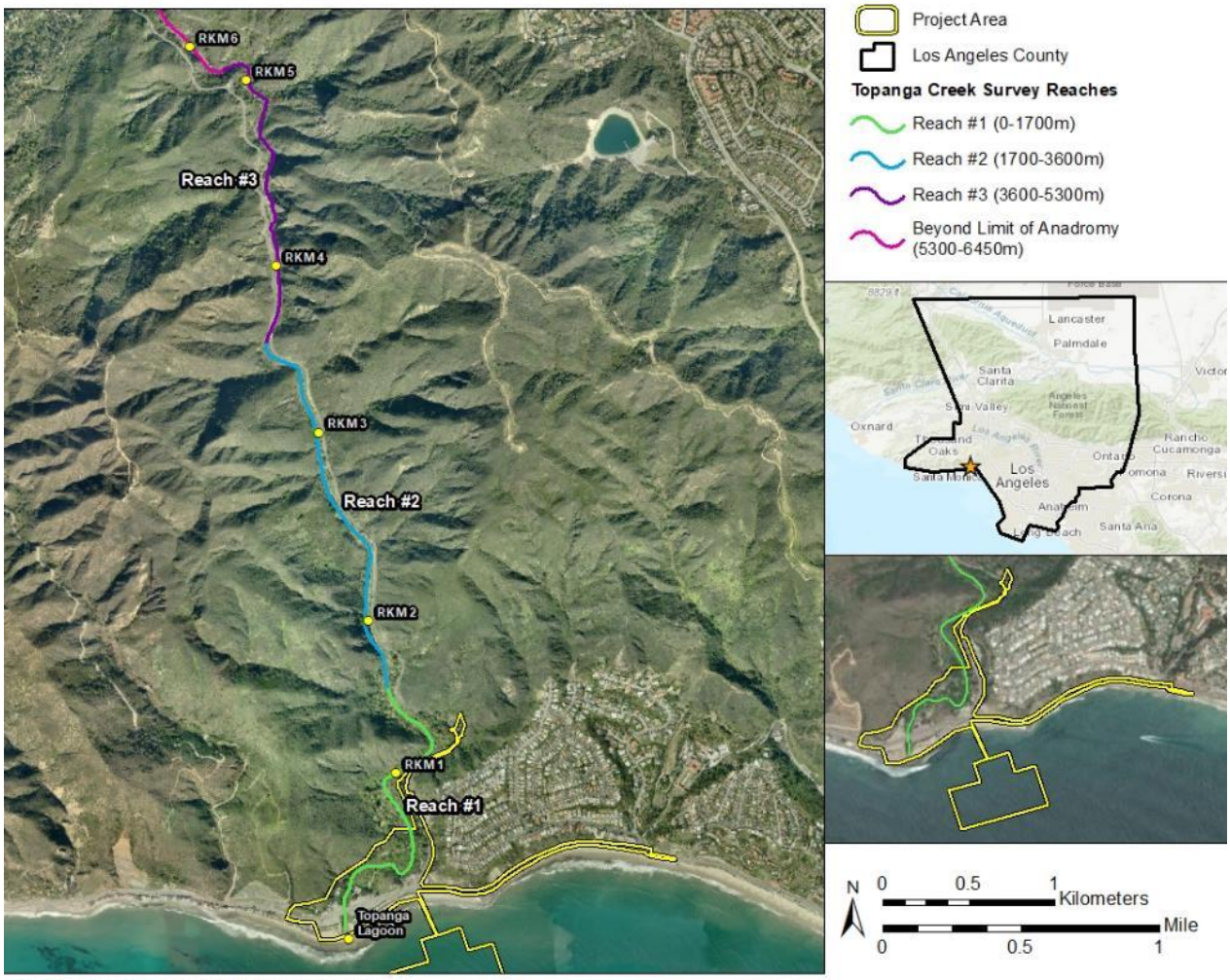


Figure 17. Steelhead Survey Area.

The RCDSMM and partners also completed several project specific analyses to inform us how the proposed Topanga Lagoon Restoration Project and its alternatives could affect steelhead trout. These include fish passage and genetics analyses.

All surveys were conducted under permits from CDFW (#S-200630009-20275-001, expires 12/11/2023), NMFS (Section 10 (a)(1)(A) #15390-2R, expires 12/31/2025, and CDPR Right of Entry and Scientific Collection Permits (expire in 2023). All surveys were conducted by RCDSMM biologists with assistance from CDFW and NMFS staff, as well as Stillwater Sciences Consultants.

For more detailed information, please see the technical report *Southern Steelhead Trout (Oncorhynchus mykiss) for the Topanga Lagoon Restoration Project* (Dagit 2022) in Appendix H.

Long-term Monitoring. Long-term monitoring provides an important lens through which to examine abundance and distribution population trends. By documenting changes in these metrics in combination with rainfall, lagoon-ocean connectivity, sedimentation impacts on spawning gravel and base flow, as well as catastrophic events like floods and wildfires, it is possible to get a better understanding of the dynamic biological responses exhibited.

Long-term monitoring surveys started at the ocean and extended to the limit of anadromy as shown in Figure 17. The study area was divided into three reaches based on distance from the lagoon and PCH bridge.

The survey area covers both areas directly affected by the restoration project, but also upstream areas that the species rely upon.

Long-term monitoring included snorkel surveys (2001-2023), redd surveys (2010-2023), lifecycle monitoring (2008-2023), with the latter including pit tagging, weir trap deployment, instream antenna, DIDSON surveys, tissue sampling and analysis. All surveys were conducted using California Department of Fish and Wildlife (CDFW), National Marine Fisheries Service (NMFS) protocols and Coastal Monitoring Program (CMP) methodologies (Adams *et al*. 2011). The goal of the CMP is to provide a statistically robust framework to characterize the abundance, productivity, diversity, and spatial distribution of salmon and steelhead. These parameters are used to help assess the viability of a population.

Trained field crews reliably documented fish in a consistent way as per O'Neal (2007). A team of at least two people (one or more snorkeling and one recording and observing from the bank with polarized sunglasses) walked the creek, snorkeling in all possible locations of any habitat type with enough depth to support fish.

Young of the year *O. mykiss* without clear parr marks were not counted, to avoid counting arroyo chub by mistake. Size of fish were estimated and provided to the data recorder independently, to have repeated counts to verify numbers of fish in each size class. If there were any inconsistencies between divers, a repeat pass was made.

Numbers of *O. mykiss*, size and life stage/maturation were recorded according to both size class and the Juvenile Steelhead Life-Stage Rating Protocol developed by the IEP Steelhead Project Work Team. Habitat characteristic data including habitat type, maximum and average depth, percent canopy cover, dominant substrate, percent algae cover, percent of instream cover, and shelter value were noted at each location where *O. mykiss* was observed. The presence of other fish species and invasive red swamp crayfish were also noted. Additional details on survey methods are found in Dagit *et al*. (2018) and Dagit *et al.* (2019).

Between 2008-18, the RCDSMM implemented a Lifecycle Monitoring Station to address critical uncertainties regarding the life history of *O. mykiss* in Topanga Creek, as well as needs of the CMP and NMFS Recovery Plan. Lifecycle monitoring includes a program to capture, tag, and monitor *O. mykiss*, conduct redd surveys, deploy an instream antenna system capable of detecting half-duplex tags, DIDSON camera station and storm event weir trapping in lower Topanga Creek to monitor outmigration and return of tagged anadromous adults. Since 2019 to present, CDFW has continued to conduct pit tagging, manage the instream antenna and deploy the DIDSON camera as conditions allow. Details on the specific methods used are found in Dagit *et al*. (2018).

Beginning in 2010, redds surveys were added to monthly snorkel surveys between December and May. When young of the year were observed, additional redd surveys were also conducted during focused spawner surveys. Data on location, length, width, depth, substrate size, presence of adult fish or young of the year, and approximate age of the redd was recorded using the survey protocol developed by NMFS (2012) and updated by McLaughlin and Christianson (NMFS 2017).

Fish Passage Assessment. For smolts to migrate out of Topanga Creek or for adult anadromous *O. mykiss* to migrate into and upstream in Topanga Creek, two key variables must be aligned. First, the lagoon entrance needs to be open and passable to the ocean. Second, the base stream flow level needs to be high enough to ensure surface flow connectivity in areas with minimal depth and to provide sufficient depth for fish to pass natural low flow barriers and impediments.

Fish migration conditions have been monitored in Topanga Creek since 2001 by the RCDSMM through monitoring storm event connectivity at the lagoon-ocean interface and monitoring base flow connectivity throughout the lower reaches of the creek subject to sub-surface flow conditions.
These data records were used to both validate and calibrate hydrologic and fish passage models.

Details on that are found in in the *Topanga Lagoon Restoration Technical Report for Hydraulics, Sediment Transport and Sea Level Rise Analysis* (Moffatt & Nichol 2022) and the *Topanga Lagoon Restoration Ecohydrology Report: Fish Passage, Fish Habitat Suitability and Habitat Zone Elevations* (ESA 2022).

The entire lagoon was occasionally seined to check for presence of smolts using two teams with 3-meter x 1-meter seines pulling the nets for 10-20 meters at various spots within the lagoon up as far as the PCH bridge. All fish captured were moved into buckets of clean, chilly water standing by each net. Types of algae were noted. Fish were identified, fork length (FL) measured, then released. No *O. mykiss* was captured.

Genetics Analysis. To identify relatedness within the Topanga population as well as examine relatedness to other anadromous populations regionally, material was collected both opportunistically from carcasses and systematically via electrofishing and weir trapping from all captured *O. mykiss* in Topanga as part of the Lifecycle Monitoring project from 2008-2019. Samples therefore include representatives from various age and size classes. All fin clips were dried in Rite in the Rain paper, placed in envelopes with associated data (fork length, condition, direction of travel, time and date), and sent to the NMFS Genetic Tissue Laboratory, in Santa Cruz, CA. Tissue samples were digested in Proteinase K lysis buffer and extracted on a QIAGEN BioRobot 3000, following the DNeasy 96 Tissue Kit protocol (QIAGEN Inc., Hilden, Germany). Additional details on specific methods used are found in Dagit et al. (2018).

4.3.7 Reptiles and Amphibians. Two separate herpetofauna survey efforts were conducted in 2021 by National Park Service (NPS) SMMNRA staff with the support of RCDSMM. Aquatic herpetofauna were the focus of the *Stream Survey for the Topanga Lagoon Restoration Project* (Delaney 2021) while more upland species were the focus of the *Terrestrial Reptile and Amphibian Surveys* (Delaney 2021b). Both reports are attached in Appendix I and J, respectively. Herpetofauna species and general age class (adults, metamorphs, tadpoles, egg masses) were also identified as present when encountered during steelhead snorkel surveys (Section 4.3.6.3) or during other general wildlife surveys (Section 4.3.1).

4.3.7.1 Aquatic Survey. A survey focused on detection of aquatic herpetofauna was conducted by Dr. Katy Delaney, NPS Wildlife Ecologist, and Sarah Wenner, NPS Biological Technician, on June 10, 2021, from 12:25 – 2:15 pm following the "intensive" protocol of the National Park Service Mediterranean Coast Network's Inventory and Monitoring Program (Delaney et al. 2011).

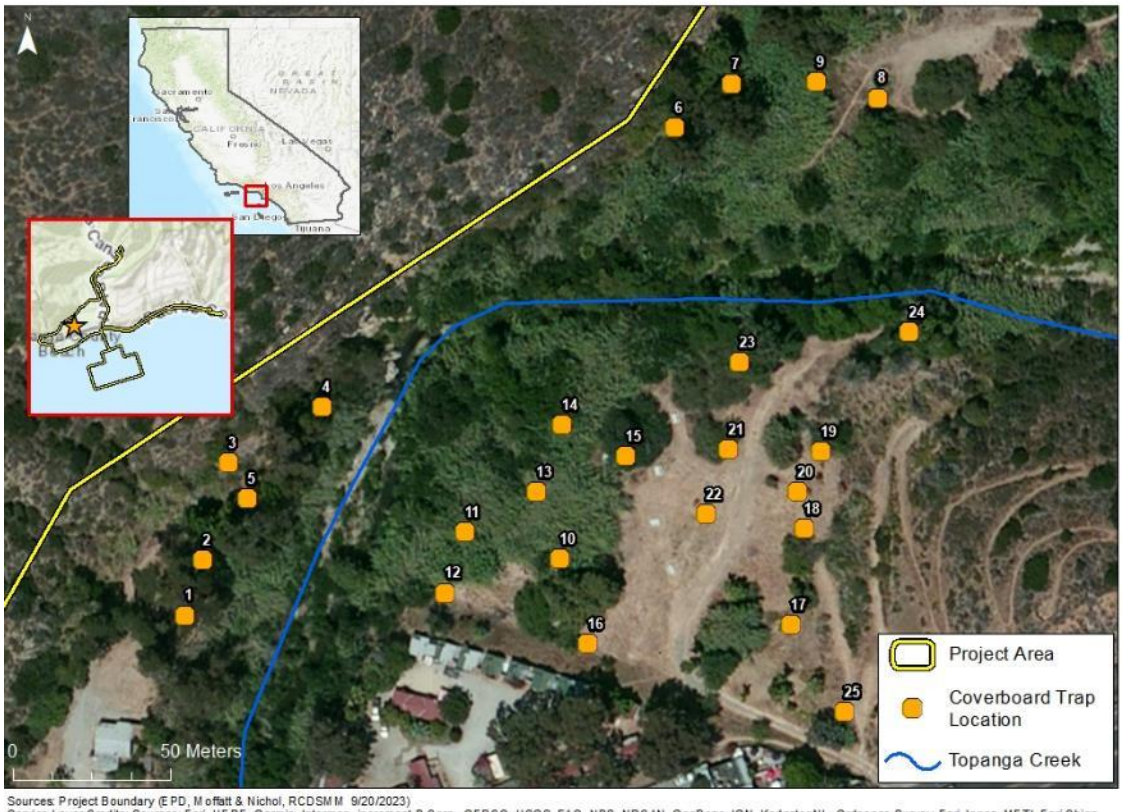
A 250-meter section of Topanga Creek was surveyed to collect physical and biological stream data and to verify species identification. NPS surveys were limited to this area as it was where water was present within the project boundary and along areas to be disturbed (Figure 18). Undersides of rocks, submerged logs and floating vegetation were searched for amphibian egg masses. Banks, exposed rocks, and floating vegetation were also scanned for juvenile and adult amphibians. Abundance estimates and age class counts were collected. The presence/absence and abundance of fish and crayfish were also documented.

4.3.7.2 Terrestrial Surveys. Terrestrial herpetofauna surveys were conducted by Dr. Katy Delaney, NPS SMMNRA Wildlife Ecologist, and NPS and RCDSMM support staff. Between June 24 to August 16, 2021, NPS deployed 25 coverboards (Grant *et al*. 1992) over the study area in various habitat types to facilitate surveying of terrestrial herpetofauna (Figure 19). The coverboards were approximately 0.6 m x 0.8 min size and made from 6.4 mm plywood. They were not checked or moved for a 26-day "curing" period.

Each coverboard and the surrounding area was checked five times over a 5-week period (July 20, 22, August 3, 5, and 16, 2021) by NPS herpetofauna interns, Randy Viola and Lindsay Nason, and Claire Sanders, RCDSMM Watershed Steward. Checks were performed mid-morning and lasted 1-2 hours. Other herpetofauna encountered onsite were noted.

Sources: Project Boundary (EPD, Moffatt & Nichol, RCDSMM 9/20/2023)
Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Figure 18. Stream Survey for Herpetofauna. Note additional RCDSMM surveys occurred ~monthly as part of greater steelhead snorkel surveys for the project area.



Sources: Project Boundary (EPD, Moffatt & Nichol, RCDSMM 9/20/2023)
Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Figure 19. Terrestrial Herpetofauna Survey Areas and Coverboard Locations.

4.3.8 Birds. Bird surveys utilized included historic surveys in 2004 by USGS, review of verified eBird observations for the Topanga Beach and Lagoon areas for 2000-2023. Project specific surveys included general bird surveys completed by CDPR and RCDSMM in 2021-2022 and protocol surveys for the federally and state endangered least Bell's vireo (*Vireo bellii pusillus*) completed in 2021-22. See Figure 20 for survey locations.

Figure 20. Bird Survey Locations.

4.3.8.1 Historic USGS Surveys. Four bird surveys were completed by USGS within lower Topanga State Park on May 22 - 23, and June 26 - 27, 2004. These included 24 sites, of which one (R1) was located onsite along the riparian corridor near the Snake Pit. Trained observers Josephine Falcone and Heather Howitt censused birds an hour after sunrise to ~11 am using both unlimited distance counts (Blondel *et al.* 1981) and fixed-radius counts (Ralph *et al.* 1993). Each count began immediately upon the arrival of the observer at the plot and lasted ten minutes. Observers counted all birds detected and recorded for each whether it occurred inside or outside of a 50-m-radius count circle centered on the observer. Birds flying overhead ("flyovers") were recorded separately. Data were recorded separately for the first three minutes, the following two minutes, and the remaining five minutes of the count, to allow for potential comparisons with data from investigators using count durations of less than ten minutes. When possible, the age and sex of birds detected were recorded. Observers did not move about the plot during the count, and no attracting devices or sounds (e.g., "pishing") were used.

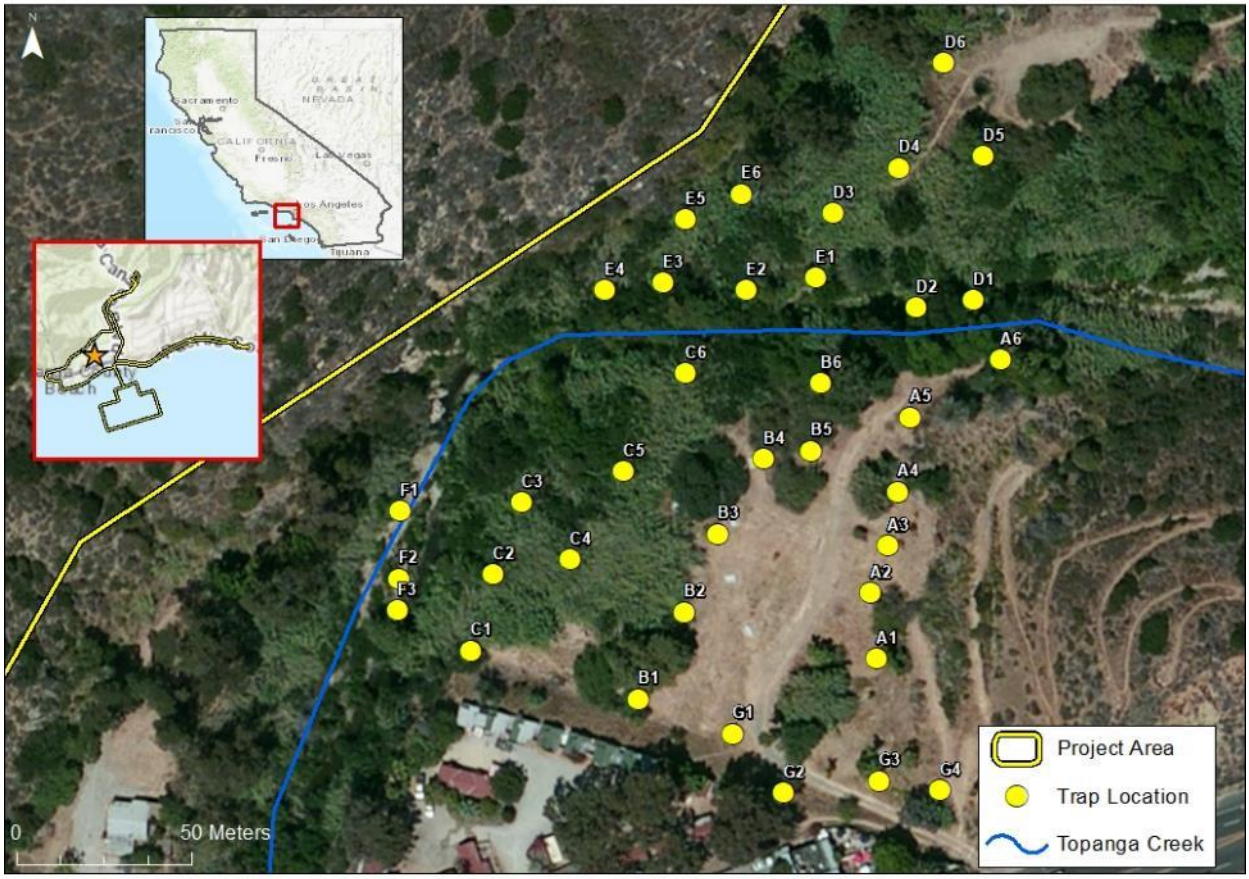
4.3.8.2 CDPR and RCDSMM General Surveys. Project specific surveys were conducted by CDPR and RCDSMM in 2021-23 concurrently with other general wildlife and vegetation surveys as summarized above in the *Vegetation, Rare Plants and General Wildlife* section above. The intent was not to document active nesting, which is typically done just prior to construction, but to identify species utilizing

the site. An additional focused avian survey was conducted by Dr. Daniel Cooper, RCDSMM Sr. Conservation Biologist in advance of onsite percolation testing on April 14, 20222.

4.3.8.3 Protocol Least Bell's Vireo Surveys. Nesting least Bell's vireo (LBV) is listed as both state and federally endangered. Surveys for the presence of LBV were conducted in June-July 2021 by Courtney McCammon of CJ Biomonitoring following the 2001 USFWS Survey Guidelines. Figure 20 identifies the area surveyed. Five surveys at least ten days apart between June 21 through July 31 were conducted. All were within the protocol survey period. Surveys were conducted between dawn and 11:00 am, avoided periods of extreme or unusual weather, and were via foot within suitable habitat. Avian species observed during protocol Least Bell's vireo surveys were also documented. A copy of the full report, *Least Bell's Vireo Report* (McCammon 2021), is found in Appendix K.

4.3.9 Mammals. Recent mammal surveys within the project area included terrestrial mammal surveys by NPS SMMNRA staff in 2021 and a bat survey by Central Coast Bat Survey in June 2021. The associated reports are attached in Appendix L, Terrestrial Mammal Surveys for the Topanga Lagoon Restoration Project (Riley 2021) and Appendix M, Topanga Lagoon Bat Surveys, Topanga Canyon, Los Angeles County, CA (Haas 2021).

4.3.9.1 Terrestrial Mammals. Trapping efforts for small terrestrial mammals were led by NPS SMMNRA wildlife ecologists Dr. Seth Riley and Joanne Moriarty, MS RVT. A total of 40 Sherman small mammal traps were deployed June 14-18, 2021, along seven transects, with traps approximately 10 m apart (Figure 21). Traps were checked at first light each morning from June 15-18, 2021, with all captures identified and processed. Trapping support staff included Tori Locke, Claire Sanders (Watershed Steward, RCDSMM), Thea Wang (PhD, post-doc in Mammalogy), Rosi Dagit (Sr. Conservation Biologist RCDSMM), and volunteers Adrien Thein-Sandler, Ella Taghibagi, and Margot Barrett.



Sources: Project Boundary (EPD, Moffatt & Nichol, RCDSMM 9/20/2023), Trapping Locations: SMMNRA NPS: 2021
Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China

Figure 21. Small Mammal Trapping Sites.

Remote cameras were set at four sites in the project area to detect the presence of medium to large mammals (Figure 22) and were active from June 29 -August 4, 2021. Dr. Riley and Tori Locke selected camera sites in late June 2021, Tori Locke set the cameras, and collected and processed the photos from them.

4.3.9.2 Bats. A visual and audio bat survey was conducted by William E. Haas, Director of Central Coast Bat Survey in June 2021 with the support of RCDSMM staff and volunteers.

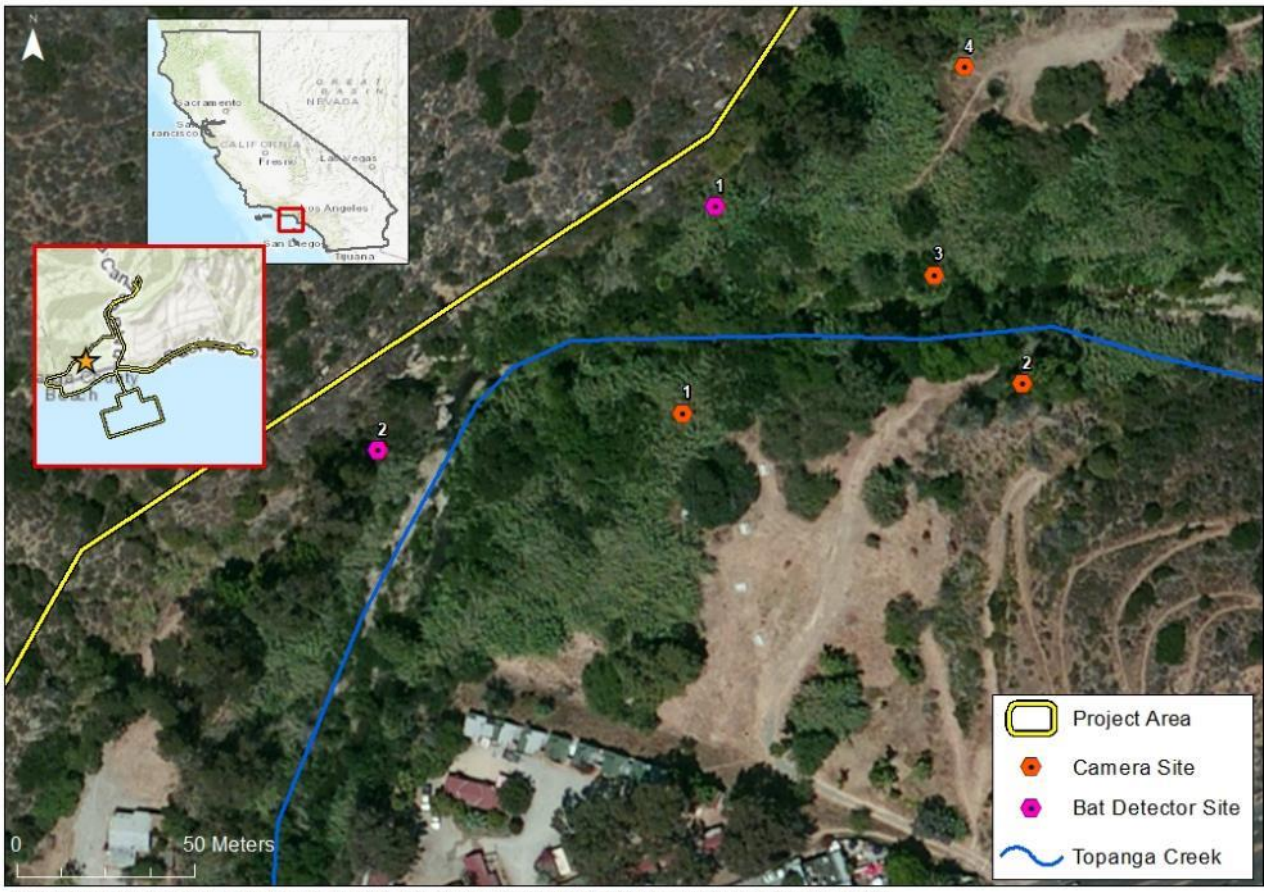


Figure 22. Mammal Camera and Bat Detector Sites. Remote camera sites for surveys of medium-sized to large mammals (July 2021) and bat detection sites (June 2021).

On June 1, 2021, a visual assessment of the project area was conducted for potential roost sites and bat foraging habitats. Two Titley Scientific AnaBat Swift full-spectrum passive bat detectors/recorders, fitted with Titley's US-O V3 omni-direction microphones were deployed to passively sample two areas with greatest probability to support bat activity in the project area. Detector #1 was located at 34.041255° N, 118.581980° W (WGS 84) at the edge of Topanga Creek to sample the open airspace of the western portion of the project area. #2 was located at 34.040751° N, 118.582821° W (WGS 84) in a small forest glade away from the creek and chosen to sample the eastern portion of the study area within a corridor that included willows *(Salix* sp.*)* and mulefat (*Baccharis salicifolia)* dominated riparian scrub edge and a tall, riparian, western sycamore (*Platanus racemosa*) dominated woodland. See Figure 22 for the location of the bat detectors.

On June 1-4, 2021, the detectors were set to automatically initiate and record bat call files in wav format from one half-hour prior to sunset until one half-hour following sunrise (approx. 19:30 PM until 06:15 AM).

On June 5, 2021, both detectors were retrieved, and the data files subsequently analyzed to determine the bat species cohort within the study area.

4.3.10 Marine Resources. Beneficial nearshore nourishment is a key goal and benefit of the Topanga Lagoon Restoration Project. Up to 260,000 cubic yards (CY) of native fill material is proposed for placement between -15 ft and -35 ft depth in the nearshore just south of the intersection of Topanga Canyon Boulevard and PCH. Surveys were conducted in 2022 to identify the marine resources present and potential project impacts to them. After review and receipt of feedback by CCC staff on the 2022 surveys and nourishment proposal, additional surveys were conducted in 2023 (Figure 23). The intent of the surveys was to fill in gaps in information along Topanga Beach, and to extend surveys east to include Mastro's Point and Ratner Beach, which could be potentially affected by sediments moving downcoast after nearshore placement.

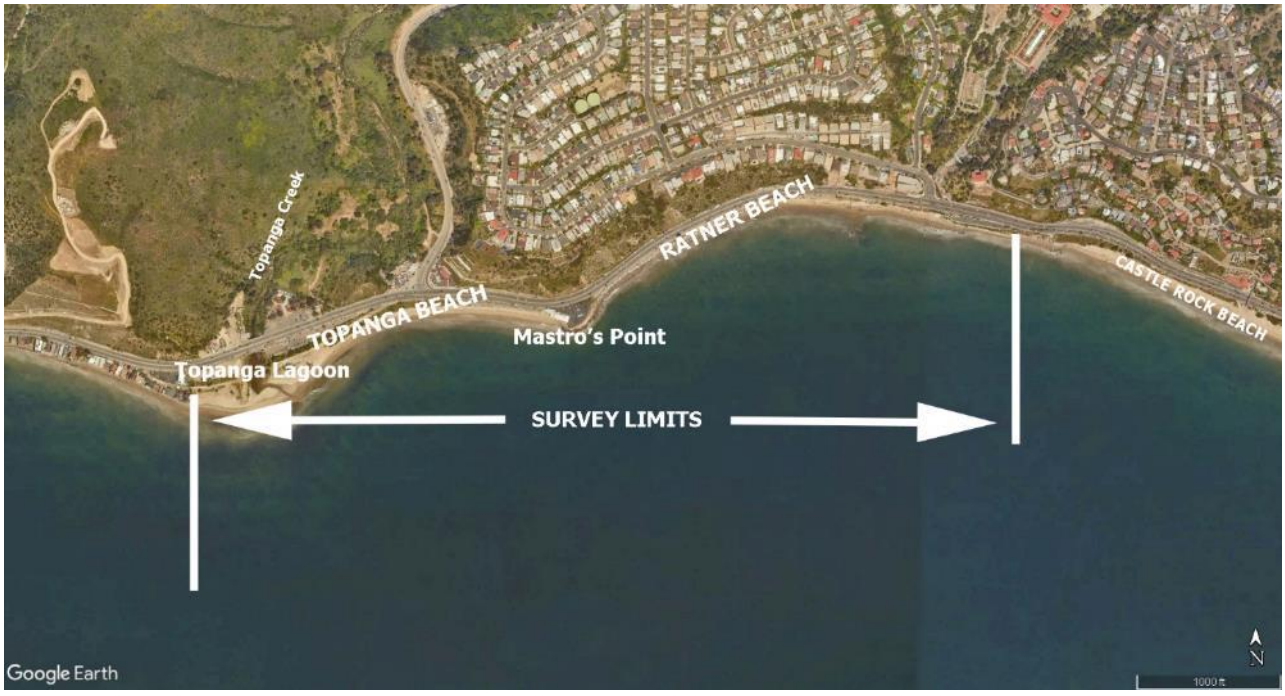


Figure 23. Marine Survey Area 2022-23, Topanga and Ratner Beaches.

Surveys were conducted in August-September 2022 and June-July 2023 by Coastal Resources Management Inc. (CRM) and Nearshore and Wetlands Surveys (N&WS) to assess ~ 245 acres that included intertidal and subtidal areas along Topanga and Ratner Beaches, the nearshore beneficial nourishment area, the pipeline connecting the beach to the nourishment area, and a buffer. The marine survey area extended from approximately -6 to -30.6 feet Mean Lower Low Water (MLLW) over a mile of coastline between the mouth of Topanga Creek on the west, to the eastern side of Ratner Beach on the east (Figure 23). Historical photographs, past biological surveys of the area, current drone and video photography, and the CDFW marine database (kelp (*Macrocystis pyrifera)*, surf grass (*Phyllospadix torreyi)* and artificial reef locations) were reviewed to provide additional information about the project area (Thom and Widdowson 1978, Engstrom 1974, Montgomery Engineers 1985, CRM 1994, CDFW 2022).

4.3.10.1 Intertidal Surveys. On September 27, 2022, a rocky intertidal reconnaissance survey (qualitative only) was conducted during a receding tide between the mouth of Topanga Lagoon and just east of the lifeguard and public restroom building at elevations between +0.8 and +4.0 ft MLLW. More extensive surveys were conducted June 8-9, 2023, from the western extent of Topanga Beach to the eastern extent of Ratner Beach, located east of Mastro's Point (Figure 24).

The goal was to identify any sensitive habitats (i.e., surfgrass), habitat types, and biological communities along the shoreline at low tide. Biologists walked the shoreline during low tide recording all organisms

observed to the lowest taxonomic level possible and photographing representative habitats and taxa. Surveys were completed by the following CRM staff: Mr. Rick Ware, Dr. Stephen Whitaker (Marine Biologist, University of California at Santa Barbara), and Ms. Elaine Valentine Ware (Field Assistant). Mr. Bernard Yin provided aerial drone video and still photography.

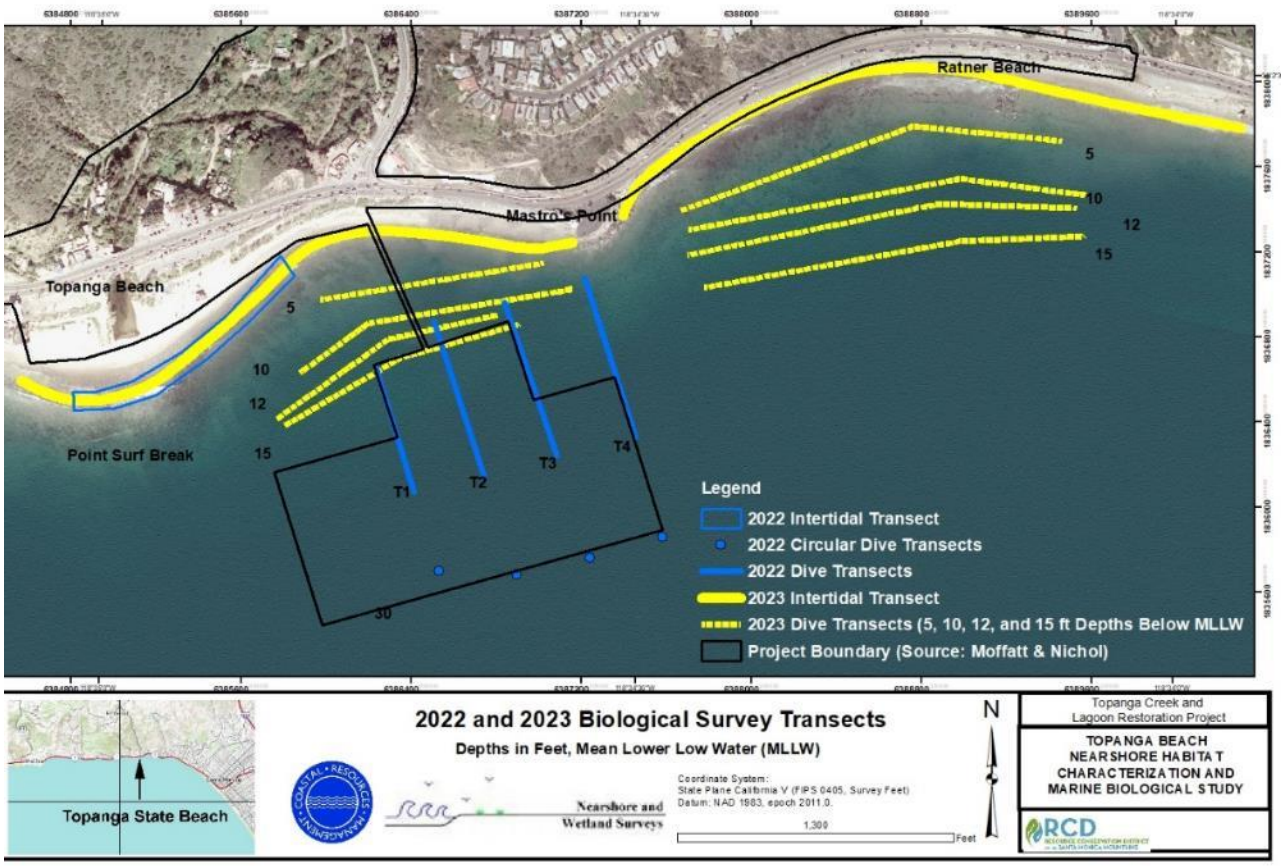


Figure 24. Transect Locations Intertidal and Subtidal Dive Surveys, 2022-23, Topanga and Ratner Beaches.

4.3.10.2 Sidescan Sonar Surveys. On August 17, 2022, a one-day sidescan/downscan sonar survey was completed for a 67-acre area that include both the beneficial nearshore nourishment receiver site, but also surrounding area. The area was surveyed using 26 transects spaced 50 feet apart. On August 18, 2022, 22 remote videos were taken of the substrate/seafloor type to verify physical habitat types, and where possible, biological attributes. Additional surveys were completed June 28-29, 2023, from Topanga Lagoon to the east end of Ratner Beach to more fully cover areas potentially affected by nearshore nourishment activities. See Figure 25.

Bottom and habitat types followed the classification of Cowardin *et al* 1979. Bathymetry contours were also determined. Surveys were completed by Mr. Rick Ware (Principal Investigator/Senior Marine Biologist, CRM), Mr. Rick Hollar (Senior Coastal Engineer, N&WS), Mr. Steve Graham (N&WS, Skipper); and Ms. Courtney Graham (N&WS, Skipper).

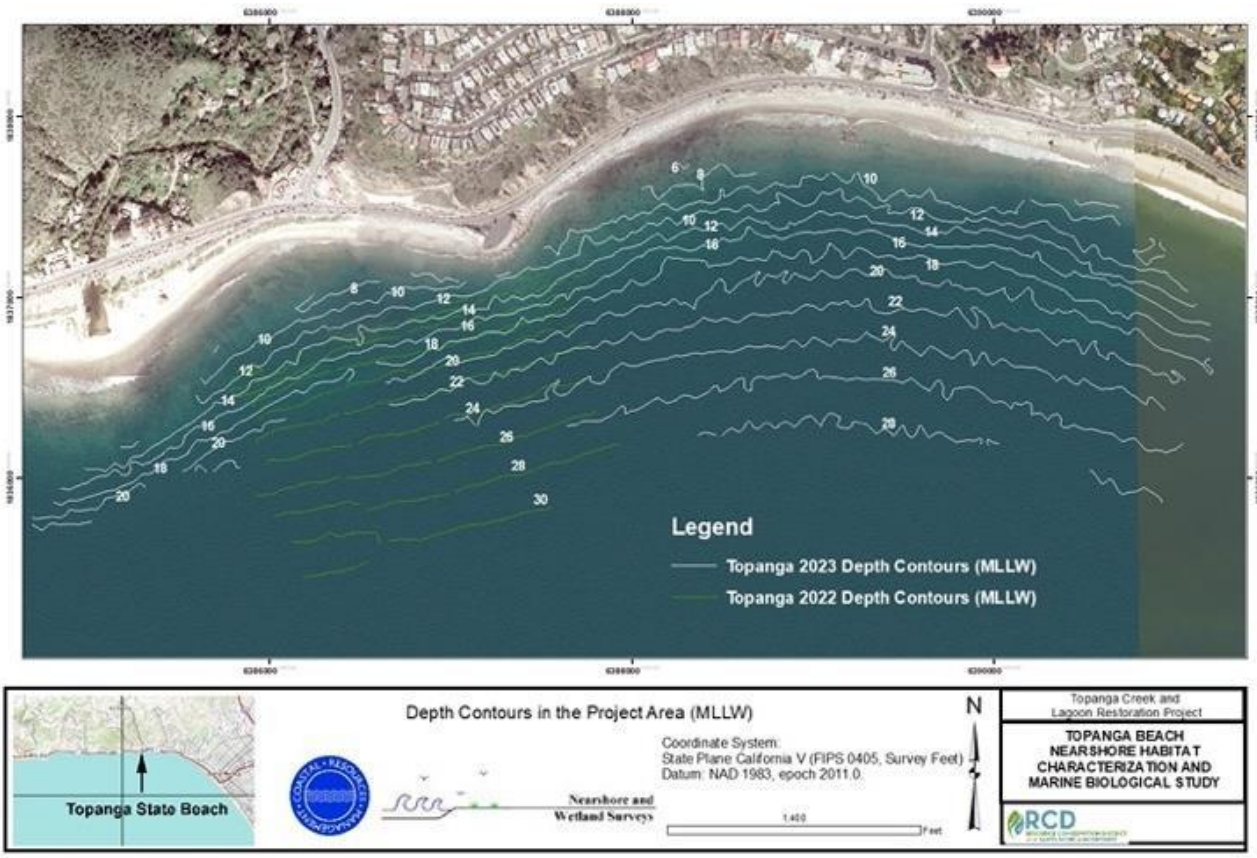


Figure 25. Depth Contours in the Project Area.

4.3.10.3 Subtidal Surveys. On August 30-31, 2022 and July 11-13, 2023 dive surveys were conducted based upon the results of the sidescan/downscan surveys, and agency feedback, to ground truth results, and more completely document invertebrate and fish community composition and relative abundance. Sediment samples were also collected in 2022 to assess material size and chemistry. CRM staff conducted the surveys and included: Mr. Rick Ware, Mr. Mike Anghera (Marine Biologist), Dr. Stephen Whitaker, (Marine Biologist, University of California, Santa Barbara, Mr. Kenny McCune (Marine Biologist), and Mr. Tom Gerlinger (Vessel Skipper).

In 2022, diver surveys were focused on the initial nearshore nourishment receiver site. Four underwater transects 200-230 m long perpendicular to the shore were swam at depths between -9 and -25 ft. MLLW. Transects did not extend deeper as 100% sand areas were encountered. Transects were divided into 10-meter segments, each 2 meters wide. A 10-meter radius circular swim was conducted at a bottom anchor at -30 ft deep at the terminus of each transect. Divers assessed the presence and abundance of plants and animals (rare, present, common, and abundant), bottom habitat type (sand, rock/cobble/shell hash), depth, water temperature, and underwater visibility during surveys.

Two transects were surveyed from the beach to -30 ft depth to allow collection of grab samples of sediments (10 cm PVC cores approximately 5-inch depth), which will be further analyzed by Moffatt & Nichol Engineers for grains size and chemistry to provide data required by the Dredge Material Management Team (DMMT) to evaluate compatibility of substrate to receive disposal of project fill materials. Figure 26.

In 2023, dive surveys were significantly extended to fully cover the shallow subtidal habitat at Topanga Beach and Ratner Beach (Figure 24). Longshore transects were conducted at the -5, -10, -12, and -15 ft (MLLW) isobaths, were 1-6 meters wide, and ranged from 320 to 402 meters long (1,056-1,320 ft) offshore of Topanga Beach and 547 to 563 m long (1,795-1,848 ft) off Ratner Beach. 2023 dive surveys focused on: confirming habitat types and dominant species; identifying areas of EFH such as surfgrass (*Phyllospadix* spp.) beds, kelp, and rocky reef; documenting the presence of unique, sensitive or commercially important

species such as sand dollars, (*Dendraster excentricus*), the sea pansy (*Renilla kollekerii*), spiny lobsters (*Panulirus interruptus*), and gorgonians (*Muricea* spp.); and documenting rare species when encountered.

See Appendix N, Marine Surveys for more detailed information.

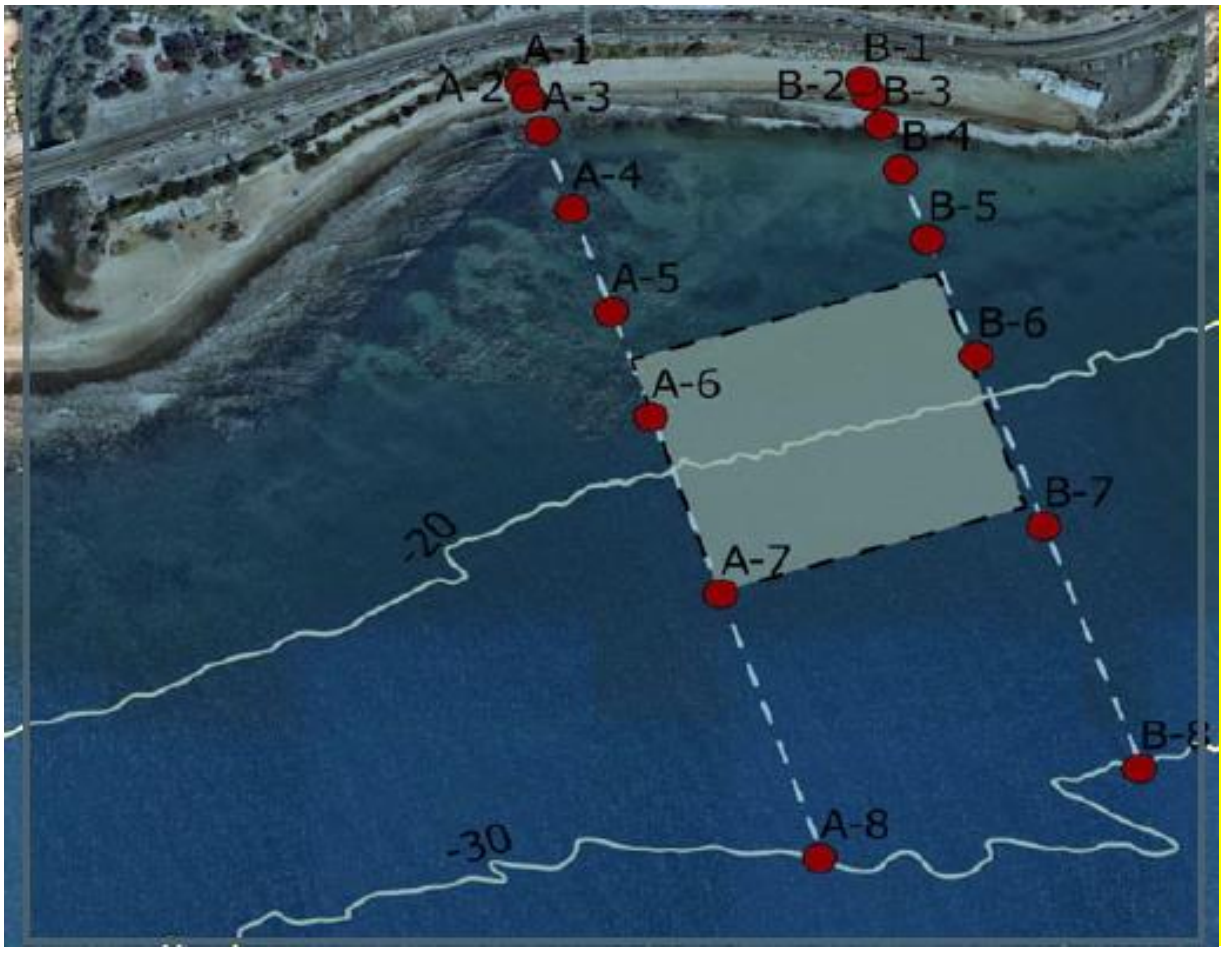


Figure 26. Sediment Sampling Dive Survey, 2022.

5 RESULTS

The sections below describe the physical and biological resources observed and anticipated to be present within the project area. This includes species, habitats, and regulated areas. It also provides an analysis of the potential impacts on these resources based upon the current 30% project designs, both at the time of construction and under the 1.8’ and 6.8’ sea level rise scenarios. Marine resources are discussed in a separate section.

5.1 Physical Characteristics

5.1.1 Climate. The climate in the region is characterized by dry summers with frequent coastal fog and wet, cooler winters. Seasonal precipitation in the Santa Monica Mountains averages between 15 and 24 inches, with most falling between November and April and the greatest amounts on the upper ridges. Along the coast, particularly in the spring and early summer, the cooler ocean water, and onshore breezes buffer temperatures, preventing the extreme temperatures found inland. The cooler ocean water often condenses atmospheric water vapor producing cloud cover those drifts inland overnight.

During the summer precipitation is rare, so the climate is quite dry, except for coastal fog, which makes the area prone to wildfires. Fire hazard is especially severe during the fall "Santa Ana" wind events when the air flow reverses due to interior high-pressure systems. During these wind events, compression heated air with very low humidity flows from the inland toward the coast, sometimes with strong winds, creating extreme fire conditions that periodically result in wildfires.

Rainfall during the 2020 to 2022 water year was 5.66 inches, which is well below the watershed average of 24 inches (Los Angeles Department of Public Works 2022).

Within open space areas of the BSA, significant tree cover (e.g., shade) and presence of water contribute to cooler temperatures when compared to surrounding open areas with more sun exposure.

5.1.2 Landforms and Geomorphology. The project area is located at the southern terminus of Topanga Creek on the southern coastal slope of the Santa Monica Mountains. Elevations through the project area range from sea level on Topanga Beach to approximately 200 feet (61 meters) above sea level on the steep slopes in the western portion of the project area. Steep fill slopes separate the floodplain and Topanga Canyon Boulevard to the east.

The proposed restoration area is characterized by the stream course and floodplain of Topanga Creek, which flows through its course within the floodplain until reaching the culvert that conveys it under PCH and onto the beach. Historically, development in the form of numerous residences abutted the creek.

5.1.3 Soils. Four native soil types occur within the project area. In general, the floodplain of Topanga Creek is comprised of Elder fine sandy loam, coastal, having 0 to 2 percent slopes. The steep hillsides to the northwest of the floodplain are comprised of Chumash-Boades-Malibu association, with 30 to 75 percent slopes, and the remainder of the project area to the south of the floodplain, including the developed areas and beach, is primarily comprised of Abaft-Beaches complex with 0 to 5 percent slopes. A small area of Mipolomol-Topanga association, 30 to 75 percent slopes, is located along Topanga Canyon Boulevard.

See Figure 27 for a map of these soil types (Web Soil Survey, https://websoilsurvey.sc.egov.usda.gov/). A detailed description of each soil type can be found at the weblink above or within the project's *Jurisdictional Delineation Report for the Topanga Lagoon Restoration Project* (WRA 2020) found in Appendix A.

There are also areas of imported fill that are associated with previous development at the site. These are primarily along the western edge of Topanga Canyon Boulevard, along PCH, and on either side of lower Topanga Creek.

5.1.4 Wildfire History. The Santa Monica Mountains in general are subject to recurring wildfires due to the naturally dry climate, adapted plant communities, and high levels of human disturbance. The project area is located within a "Very High" Fire Hazard Severity Zone as defined by Cal Fire's Fire Hazard Severity Zone Web Map Application (https://hub.arcgis.com/datasets/d2ea45d15c784adfa601e84b38060c4e). According to historical data available from Cal Fire, four fires have burned within the project area since 1939, with the most recent fire (The Old Topanga Fire) occurring in 1993. Notably, the well-known Woolsey Fire of 2018 did not burn in this part of the Santa Monica Mountains.

Figure 27. Soils Map.

5.2 Jurisdictional Wetlands and Waters

This section summarizes the results of the delineation of regulated waters and wetlands onsite as summarized by ESA 2023a delineation. The complete document is found in Appendix A, Jurisdictional Delineation Reports.

The project area is located within the 12,800 acres Topanga Creek watershed (Garapito Creek watershed, USGS Hydrologic Unit Code 12-180701040401), which terminates at the Pacific Ocean within Santa Monica Bay. Within the BSA, Topanga Creek runs to the south and parallel to Topanga Canyon Boulevard before arcing west, and finally curving sharply to the south to terminate in Topanga Lagoon, a natural bar-built estuary closed much of the year. The creek is fed by freshwater ground seeps and precipitation, with more limited input from upstream urban runoff. Although considered perennial overall, Topanga Creek typically lacks surface flows during summer months and drought conditions for sections of the creek upstream between 300 and 1700 meters from the lagoon.

The creek's path is constrained by several factors. Near the PCH current development, artificial fill, armored banks, and a narrow Caltrans bridge opening constrain the footprint of the creek. In the E-W section of Topanga Creek (the Rodeo Grounds/Snake Pit areas) historic residential development and associated fill are factors. The most upstream N-S leg of the creek is constrained by steep canyon walls and the presence of Topanga Canyon Boulevard. Dense vegetation along the majority of the creek corridor onsite is dominated by willows and arundo (*Arundo donax*).

Topanga Lagoon is perennially ponded with water levels varying depending on precipitation and the status of the lagoon as open or closed to the ocean. Winter storm flows from Topanga Creek are the main driver for breaching the sand bar, allowing greater direct tidal influence during the rainy season, and tidal muting and eventual closing during the summer and fall months.

5.2.1 Waters of the U.S.: Non-Wetland Waters, Wetlands, and Tidal Waters. ESA identified eight drainages in the project area (Figure 28). Two of the drainages, Topanga Creek (D1) and a tributary drainage (D2), are potential Waters of the U.S. as they have a hydrological connection to the Pacific Ocean through Topanga Lagoon, support riparian vegetation, and meet current USACE relatively permanent waters (RPW) and continuous surface connection (CSC) standards and thus are within the Corps' jurisdiction. Topanga Lagoon is also considered a water of the U.S. and is not identified as tidal as it functions primarily as a freshwater system. A total of 2.28 acres (2,907 linear feet) of potential non-wetland Waters of the U.S. were identified. See Figure 29 and Table 2.

Two wetlands were identified onsite: one within Topanga Lagoon (W1) and one upstream of drainage 2 (W2). Both wetlands met the USACE three wetland parameters of hydrology, hydric soils, and a preponderance of hydrophytic vegetation. A total of 0.029 acre of potential Waters of the U.S. wetlands were identified.

Potential tidal waters were identified in the project area under both the Clean Water Act (CWA) and River and Harbors Act (RHA, Figure 30). Under the CWA, the extent of the high tide line was delineated by observed debris deposits and slope break and totaled 5.84 acres (2,585 linear feet). Under the RHA, the mean high water (MHW) was identified as 4.5 feet NAVD88 as reported at the NOAA Santa Monica Tidal Station for a total of 38.11 acres. In addition, the Pacific Ocean is considered a traditional navigable water (TNW).

Figure 28. Onsite Drainages. ESA 2023a. Note: Although the delineation did not include recently added areas included in the project boundary for seepage pit or sewer wastewater development, no wetland or water features were observed in these areas during biological surveys as the wastewater areas involve the PCH pavement, TCB road shoulder, or disturbed upland areas at the seepage pit location. Once a final wastewater alternative is selected, that area will be formally reviewed to confirm these findings.

Figure 29. Potential Waters of the U.S. ESA 2023a.

Figure 30. Potential Tidal Waters of the U.S. and State. ESA 2023a.

Table 2. Potential Waters of the U.S. Acreages.

Aquatic Feature	Linear Feet	Acres
Non-wetland Waters		
Topanga Creek (Drainage 1)	2,352	1.52
Topanga Lagoon	449	0.75
Drainage 2	106	0.002
Non-wetland Waters Total:	**2,907**	**2.28**
Wetland Waters		
Wetland 1	--	0.014
Wetland 2	--	0.014
Wetland Total:		**0.029**
Tidal Waters – CWA		
Tidal Waters Total:	**2,585**	**5.84**
Tidal Waters – Rivers and Harbors Act*		
Tidal Waters Total:	**--**	**38.11**
TOTAL Potential WOTUS	**5,492**	**46.26**

**Acreages of tidal waters regulated under Rivers and Harbors Act are included in the acreage of tidal waters regulated under the CWA. Source: ESA 2023a.*

5.2.2 Waters of the State. All eight drainages (D1-8) and Topanga Lagoon are considered potential waters of the State based on OHWM indicators and total 2.44 acres (4,148 linear feet). Both wetlands (W1-2) are considered potential wetland waters of the State (Figure 31) and total 0.029 acre. A total of 5.84 acres of potential tidal waters of the State subject to the Clean Water Act were identified with a subset of 3.29 acres of potential tidal waters of the State subject to the Rivers and Harbors Act. See Figure 31 and Table 3 below.

Figure 31. Potential Waters of the State. ESA 2023a.

Table 3. Potential Waters of the State Acreages.

Aquatic Feature	OHWM (range in feet)	Linear Feet	Acres
Non-wetland Waters			
Topanga Creek (Drainage1)	13–40	2,352	1.52
Topanga Lagoon	40-100	449	0.75
Drainage 2	0.5–1	106	0.002
Drainage 3	3–6	363	0.07
Drainage 4	3–6	202	0.03
Drainage 5	3–6	76	0.01
Drainage 6	2–4	169	0.02
Drainage 7	2–4	130	0.01
Drainage 8	2–4	302	0.03
Other Waters Total:	**--**	**4,148**	**2.44**
Wetland Waters			
Wetland 1	--	--	0.014
Wetland 2	--	--	0.014
Wetland Total:	**--**	**--**	**0.029**
Tidal Waters			
Tidal Waters Total:	--	**2,585**	**5.84**
Total Potential Waters of the State		**6,733**	**8.309**

Source: ESA 2023a.

5.2.3 CDFW and CCC Jurisdictions. 18.51 acres of CDFW Section 1600 areas were delineated based on the lateral extent of the creek bed and bank and associated riparian cover. Areas subject to the California Coastal Act mirrored CDFW jurisdiction, but also included portions of Topanga Beach below MHW for a total of 21.79 acres. See Table 4 and Figures 32 and 33 below.

Table 4. Potential CDFW and California Coastal Act Acreages.

.

Aquatic Feature	CDFW Section 1600	Coastal Wetland & Waters
Drainages 1–5, Topanga Lagoon and Wetland 1 and 2	18.45	18.45
Drainage 6	0.02	0.02
Drainage 7	0.01	0.01
Drainage 8	0.03	0.03
Topanga Beach	**--**	3.29
Total:	**18.51**	**21.79**

Source: ESA 2023a.

Figure 32. Potential CDFW Section 1600 Jurisdiction. ESA 2023a.

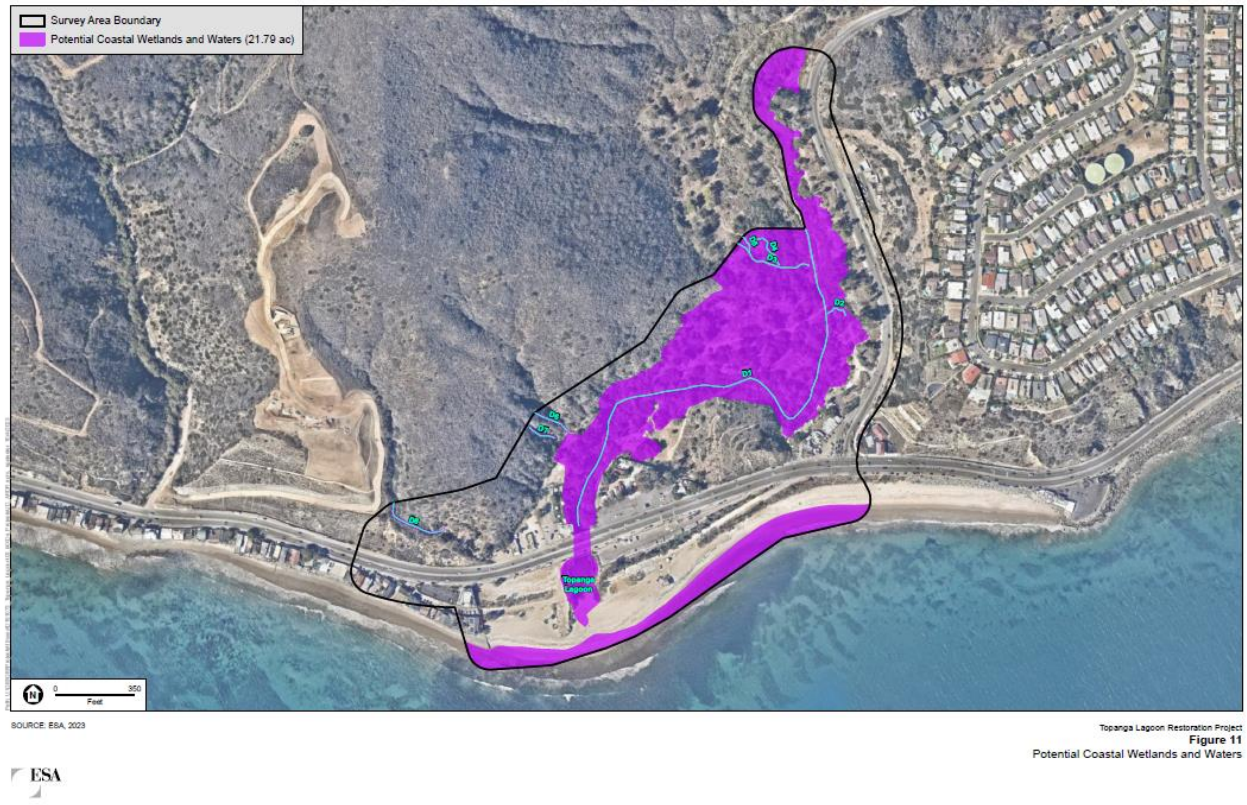


Figure 33. Potential Coastal Wetlands and Waters.

5.2.4 Impact Analysis- Jurisdictional Wetlands and Waters. As summarized in Tables 5-7, temporary impacts to jurisdictional waters and wetlands would occur during bridge removal and construction activities, dewatering, grading outside of wetted channels, and installation of infrastructure associated with nearshore nourishment.

Table 5. Impacts to Jurisdictional Waters of the US and Wetlands Per Alternative.

Aquatic Feature	Wetland Impacts (acres)	Other Non-Wetland Impacts (acres)	
	Alternatives 2-4	Alternatives 2-3	Alternative 4
Non-Wetland Waters			
Topanga Creek (Drainage 1)	--	0.021	0.021
Topanga Lagoon	--	0.142	0.142
Drainage 2	--	--	--
Non-Wetland Waters Total:	**--**	**0.163**	**0.163**
Wetland Waters			
Wetland 1	--	--	--
Wetland 2	--	--	--
Wetland Waters Total:	**--**	**--**	**--**
Tidal Waters – CWA			
Tidal Waters – CWA Total:	**--**	**0.004**	**--**
Tidal Waters – RHA			
Tidal Waters – RHA Total:	**--**	**34.83**	**34.83**
TOTAL WOTUS Impacts	**--**	**35.00**	**34.99**

Source: ESA 2023a.

Table 6. Impacts to Jurisdictional Waters of the State Per Alternative. Source ESA 2023a.

Aquatic Feature	Wetland Impacts (acres)	Other Non-Wetland Impacts (acres)
Non-Wetland Waters		
Topanga Creek (Drainage 1)	--	0.021
Topanga Lagoon	--	0.142
Drainage 2	--	--
Drainage 3	--	--
Drainage 4	--	--
Drainage 5	--	--
Drainage 6	--	--
Drainage 7	--	--
Drainage 8	--	--
Other Waters Total:	**--**	**0.164**
Wetland Waters	--	--
Wetland 1		--
Wetland 2	--	--
Wetland Waters Total:	**--**	**--**
Tidal Waters		**--**
Tidal Waters Total:		**0.164**

Table 7. Impacts to Potential CDFW and California Coastal Act Acreages Per Alternative.

Aquatic Feature	Alternative 2	Alternative 3	Alternative 4
Drainages 1–5, Topanga Lagoon and Wetland 1 and 2	2.130	1.986	1.904
Drainage 6	--	0.021	
Drainage 7	--	0.142	
Drainage 8	--	--	
Tidal Waters – CWA	--	--	
Tidal Waters – RHA	--	--	
Total Impacts	--	--	

Source: ESA 2023a.

All alternatives would experience limited impacts to non-tidal waters and wetlands during construction as summarized in Tables 4-6. This is because a key project requirement is to conduct all grading outside of the wetted areas, outside of the dripline of the vast majority of riparian tree canopy that defines the outer edge of CDFW Section 1600 regulated areas and above the tide line. Impacts to tidal waters are associated with placement of native soil in the nearshore for beneficial reuse.

Jurisdictional waters and wetlands could be potentially affected only during the following activities: removal of the footings and pier walls associated with the existing bridge, construction of the temporary and final bridges, grading activities directly adjacent to wetted and riparian cover areas, installation of the trail system that crosses through these areas, and installation of the nearshore nourishment pipeline. For work within or near Topanga Creek, work would only be permitted to occur in the dry after special-status species had been excluded at a safe distance from the work area. Impacts could occur due to inadvertent movement of soil and materials into jurisdictional areas by way of water, wind, or gradient. Best Management Practices such as outlined in Mitigation Measure 1 below, such as stockpile management, dust and tracking control measures, soil stabilization during rain events and periods of inactivity, and avoidance of maintenance activities near the creek would be incorporated into the required Storm Water Pollution Prevention Plan (SWPPP), regulatory permits (404, 401, 1600) and construction design to avoid and minimize impacts to a less than significant level.

Alternative 2 would result in greater impacts to jurisdictional areas (ranging from 0.164 acre to 2.130 acres depending on the regulatory agency) compared to other build alternatives. All project alternatives would remove over 166,000 CY of fill surrounding the lagoon in order to re-contour the newly restored lagoon. All or a substantial part of the excavated soil is proposed for beneficial reuse by deposition in nearshore areas once confirmed that the soil is clean and not contaminated.
Short term construction impacts are required to create long term benefits to jurisdictional waters and wetlands. All Project Build Options will expand jurisdictional wetlands creating a more natural topography that can accommodate Sea Level Rise, and by expanding and enhancing the wetland/riparian vegetation along Topanga Lagoon and Creek as part of project restoration efforts. Alternative 2 would maximize wetted areas by creating an additional channel to the west of the lagoon that would become inundated during higher water levels. Over the long-term, all project alternatives would result in a net increase and benefit jurisdictional waters and wetlands by increasing the acreage and quality of these areas onsite. Alternative 2 would have the greatest net benefit as it maximizes restoration of these areas, followed by Alternatives 4 and then 3.

Impacts to wetlands and other aquatic resources from all Build Alternatives and wastewater management options would be significant at least temporarily, but impacts would be reduced to less than significant with the following measure.

Mitigation Measure 1: Jurisdictional Waters/Wetlands Habitat Restoration and Adaptive Management Plan: Prior to any permanent or temporary impacts to wetlands or waters, State Parks shall obtain a CWA Section 404 permit from the USACE, a CWA Section 401 permit from the RWQCB, Streambed Alteration Agreement pursuant to under Section 1602 of the CFGC from CDFW, and a CDP from the CCC. Wetland and waters restoration requirements will be included in the Habitat Restoration and Adaptive Management Plan (HRAMP), discussed below in Section 5.4, Vegetation Communities and Land Cover Types and Mitigation Measure 3, below.

5.3 Wetland Conditions-California Rapid Assessment Method (CRAM).

CRAM condition scores ranged 41-87 for the five Assessment Areas (AA) onsite with overall scores generally increasing with distance from the bridge (AA1 → AA4, Figures 34-36, Table 8) as the level of past and ongoing human impact decreases. The Bar-Built AA score was "poor," while the four Riverine AAs scored in the "fair" to "good" range. The low scores of the Bar-Built AA were largely due to the limited topographic complexity, structural patch richness, and poor vegetation composition, horizontal structure, and lateral dispersion.

Riverine hydrology scores were consistently high across all four Riverine AAs and ranged between 83-92. Biotic structure scores across all AAs varied from 28 to 78; similarly, physical structure scores varied from 25 to 88. Scoring suggests that the most degraded areas (AA1 >AA 2>AA3>AA45>AA4) will likely benefit the most from restoration.

Review of the online CRAM database identified two CRAM surveys that had been previously completed within the BSA (Table 8). A 2012 Bar-Built estuarine CRAM (overall score: 47) yielded comparable results to the Bar Built AA1 completed in 2020 by The Bay Foundation. A 2011 Riverine CRAM (overall score: 69) that was most closely located to AA3 also showed similar results.

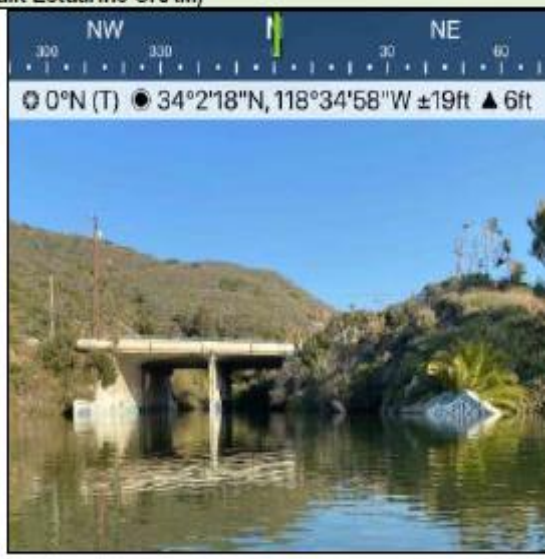
Additional past CRAM assessments were identified upstream but outside of the BSA along Topanga Creek. The assessments showed higher value scores consistent with improved wetland conditions with distance from the ocean: 84 (2013), 84 (2010), 83 (2013), 72 (2009), and 77 (2013).

No reference sites for Bar-Built estuarine AA with the same wetland type and same ecoregion were found within the CRAM database. Three Riverine AAs were identified in upper San Mateo Creek in the Santa Ana Mountains as the nearest similar reference sites. These sites were assessed in 2010-11, and scored higher (93, 93, and 95) than those assessed in the BSA.

Topanga Lagoon Restoration Project
CRAM Survey - AA1

Topanga Lagoon Restoration Project
CRAM Survey - AA2

Topanga Assessment Area 1 (Bar-Built Estuarine CRAM)



Topanga Assessment Area 2 (Riverine CRAM)

Figure 34. Site AA1, Bar Built and AA2, Riverine Location and Site Photos.

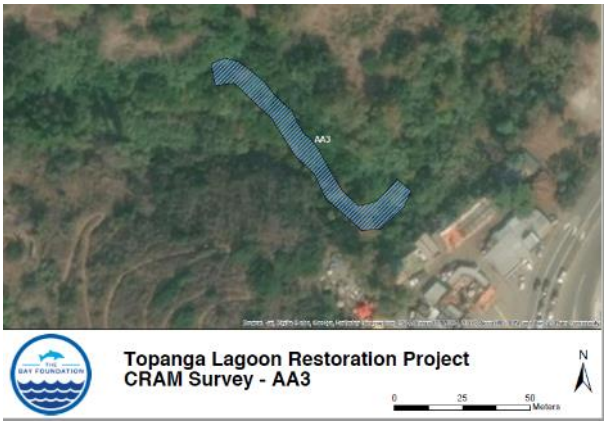


Figure 35. Site AA3 and AA4, Riverine Location and Site Photos.

Figure 36. Site AA5, Riverine Location and Site Photos. Site photo taken on August 24, 2023, at AA5 downstream boundary looking upstream, strong storms between the date of CRAM survey and photo date significantly changed site characteristics.

Table 8. CRAM Results Per Assessment Area.

Assessment Area	Module	Attribute 1: Buffer and Landscape Context	Attribute 2: Hydrology	Attribute 3: Physical Structure	Attribute 4: Biotic Structure	OVERALL SCORE
Topanga AA1	Bar-Built	**43**	**67**	**25**	**28**	**41**
Topanga AA2	Riverine	**70**	**92**	**25**	**28**	**54**
Topanga AA3	Riverine	**78**	**83**	**63**	**61**	**71**
Topanga AA4	Riverine	**90**	**92**	**88**	**78**	**87**
Topanga AA5	Riverine	**83**	**92**	**63**	**66**	**76**

Source: The Bay Foundation 2020 and CDPR 2022. Colors correspond to the quality of overall CRAM score. Red=poor, yellow=fair, green=good,

Table 9. Results for Previous CRAM Assessments Onsite.

Module	Year	Attribute 1: Buffer and Landscape Context	Attribute 2: Hydrology	Attribute 3: Physical Structure	Attribute 4: Biotic Structure	OVERALL SCORE
Bar-Built	2012	**52**	**67**	**25**	**44**	**47**
Riverine	2011	**92**	**67**	**63**	**53**	**69**

Source: The Bay Foundation 2020.

5.4 Vegetation Communities and Land Cover Types

Twenty-five plant communities and land cover types exhibiting varying degrees of disturbance were identified within the project area. These include multiple non-native plant communities and disturbed and developed areas. Plant communities were correlated with the CDFW Natural Communities List (CDFW, September 2020), where applicable, and are labeled as "non-ranked" where they do not conform to any of the communities on the list. Plant community alliances with global or state conservation status ranks of G1 through G3, or S1 through S3, respectively, are CDFW "natural communities of special concern".

The Project area shows a high level of disturbance due to historic onsite development, existing surrounding development, invasive species, and ongoing human impacts (trash, illegal camping, etc.). Six CDFW special-status communities were identified to a limited extent onsite, and consistent with the site as a whole, show a history of disturbance. Important native tree and shrub components persist onsite, but usually with a highly disturbed understory dominated by nonnative vegetation. As a result, special status plant species are not frequently encountered in the Project area. Figures 37-38 show an overview of the communities and landcover types onsite.

These landcover types, their CDFW Natural Community identification codes, conservation status ranks and acreages within the project area are mapped in Figure 39. Table 10 summarizes these communities and highlights those considered sensitive by CDFW. A summary of the composition and characteristics of all landcover types follows.

Information on the Santa Monica Mountains LCP Habitat Category for each landcover type is also provided for reference in Table 10. More detailed information about the Santa Monica Mountains LCP Habitat Categories is in Section 5.5 below.

5.4.1 Woodland Communities. Several woodland communities were identified within the floodplain of Topanga Creek north of PCH. The dominant association is a mix of native sycamore (*Platanus racemosa*), willow (*Salix laevigata*, *S. lasiolepis*), and mulefat (*Baccharis salicifolia*). Openings created in the woodland canopy and the introduction of ornamental non-native trees has created breaks in the continuity of the original riparian woodland community. This has resulted in the presence of both non-native tree stands and isolated native trees that were fragmented from the contiguous native tree canopy. Several of these habitats are considered sensitive by CDFW and the LCP.

Sources: Project Boundary (EPD, Moffatt & Nichol, RCDSMM 9/20/2023), Service Layer Credits: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Figure 37. Site Key of Landcover Photographs. CDPR 2023.

1A – View from the knoll looking west / southwest, Pacific Coast Highway (PCH) and Pacific Ocean shown in upper left. The Topanga Ranch Motel is visible in the center left but is largely obscured by eucalyptus trees. The riparian corridor of Topanga Creek is visible, marked by willow growth from center right to the motel on the left. Steep lemonade berry dominated slopes are shown in the background behind more eucalyptus and other ornamental trees.

1B – View from the knoll looking northwest. View shows remnant ornamental trees amongst Sycamore woodland. Hillsides in background are relatively undisturbed slopes dominated by lemonade berry and California (CA) sagebrush – ashyleaf buckwheat scrub. Note that plastic sheeting shown in photo center was placed purposely to solarize arundo rhizomes and discourage regrowth as part of ongoing restoration efforts.

1C – View from the knoll looking north/northwest. Similar view to that of 1B, meant to show more of the Project area. Most of what is seen below is more of the Sycamore woodland with pockets of disturbed herbaceous areas (mapped as nonnative grasses and forbs, or "NNG"), and some relict ornamental tree

1D – View from the knoll looking northeast. Topanga Canyon Boulevard is briefly visible center right, which is lined with non-native trees, predominantly eucalyptus. Most of what is seen below is more of the Sycamore woodland with pockets of disturbed herbaceous areas (NNG), while the hillsides visible are outside of the Project area.

Figure 38, Site Photographs

2A – View from Topanga Beach lifeguard tower looking northeast up the coast. This photo shows the general conditions of Topanga Beach, the lifeguard tower and access, and the predominantly landscaped areas adjacent to the beach and access. Just right of center, the vegetation strip between PCH and the beach is visible, which is dominated by native CA brittlebush and CA sagebrush

2C – View from the western edge of the mouth of Topanga Lagoon, looking northeast. The PCH bridge over Topanga Lagoon is visible on the left, while the slopes above the beach dominated by

2B – View from the eastern edge of the mouth of Topanga Lagoon, looking northwest. The patch of saltgrass is visible in the foreground just below center. Beyond that is the water of the lagoon and then the opposite bank, dominated (left to right) by arundo, eucalyptus, and disturbed coastal sage scrub species, predominantly ashyleaf buckwheat and CA brittlebush.

Figure 2D – A view looking west/northwest overlooking the westernmost segment of Topanga Beach. This view shows the terminus of Topanga Beach where it borders the adjacent private commercial building and residence. Vegetated areas upslope from the beach are dominated by

Figure 38, Site Photographs

ornamental vegetation are visible to the left of the bridge. Many ornamental trees surround the primary Topanga beach parking lot, including fan palms, tamarisk, and eucalyptus.

3A – View looking west/northwest from the northwestern edge of the Topanga Beach Property, the vacant lot between Topanga Beach and PCH. PCH is shown in the foreground, with the eroded hillside shown across the road. This hillside is dominated by ashyleaf buckwheat (where not vertical /eroded), which gives way to dominant lemonade berry once the slope becomes more gentle. The palm tree shown top right is an ornamental tree from adjacent landscaping.

ornamental vegetation and landscaping plants. The hillsides visible in the background right are dominated by ashyleaf buckwheat and lemonade berry.

3B – View from same point as 3A looking north/northeast. PCH is again shown in the foreground, and the slope seen across the road is where the native plant community gives way to more landscaping plants from the adjacent commercial property, which is shown center right. Here, there is a cleared area. The slopes shown top center and top left behind the landscaping vegetation are again dominated by native lemonade berry scrub.

3C – View from the same point as 3A and 3B, looking west/southwest and showing the disturbed area between Topanga Beach and PCH. PCH is shown center left. This lot is closed to public parking and is used as a staging area for utility equipment, though usually empty. Frequent public pedestrian access occurs through this area .While primarily barren and classified as barren / sparsely vegetated on the landcover map, ornamental species such as the eucalyptus shown center right occur around the lot. The main parking lot and its abundant ornamental vegetation is shown just left of center. The hillsides shown center left are outside of the Project Area.

Figure 38, Site Photographs

4A – View to the north/northwest from northeastern edge of the vacant lot shown in 3C. PCH is shown in the foreground, while two of the commercial properties (Cholada, Wylie's Bait and Tackle) adjacent to Topanga Lagoon are shown, surrounded by their barren parking areas and ornamental trees. The hillsides shown in the background are dominated by lemonade berry scrub upslope from the various ornamental plants.

4B – View from same point as 4A, looking north/northeast and showing another of the adjacent commercial properties (Wylie's, Rosenthal's), this one immediately abuts Topanga Creek where it flows under PCH, shown in foreground. The large barren parking areas and surrounding ornamental vegetation are shown low center and left. The hills shown center and to the left are within the Project area and are predominantly lemonade berry scrub. The hills shown right of center are outside of the Project area.

4C – View from the western edge of the Topanga Ranch Motel parking lot looking west/northwest, showing the current conditions of the closed Motel. The shuttered rooms are shown along the left, and large ornamental eucalyptus trees line the property. Just right of center, an adjacent commercial business (Reel Inn) is shown. PCH is shown far right center. Just right of center, above the adjacent commercial property, the knoll (a rise within the project area) is shown.

4D – View from PCH adjacent to the knoll looking north/northeast. PCH is shown in the foreground, with the south-facing slope of the knoll shown center. While heavily eroded and invaded by invasive grasses, the slope is categorized as purple sage and ashyleaf buckwheat scrub. To the left, the beginning of a large area overrun with ornamental plants begins.

Figure 38, Site Photographs

5A – View from the knoll looking west/southwest and overlooking the "snake pit". Lower left, some ornamental non-native prickly pear is shown, representative of the large number of ornamentals that still grow on this part of the knoll (see 5C). The backside of the Topanga Ranch Motel is shown in the upper left, and many ornamental trees, predominantly eucalyptus, are shown just above and far left of center. Native sycamore trees and willow woodland are shown from center left to right.

5B – View from the dirt path leading into the snake pit from PCH looking north/northwest. Concrete picnic tables are visible right of center, overgrown with invasive herbaceous species. This area is typically overgrown by invasive plants, primarily wild radish, cheeseweed, and thistles, among other grasses and forbs, and is classified as "NNG" on the landcover map. To the left, a large Sycamore is shown, and in the background, native willows invaded by arundo are shown from center left to right, along with a single coast live oak center right.

5C – View of the western edge of the knoll, which is predominantly covered with ornamental plants. Green herbaceous material on the ground is predominantly comprised of invasive grasses and forbs, and a concrete table is visible left of center. The back of the Reel Inn is visible background right.

5D – Photo taken from same point as 5C looking east/northeast. This shows the remainder of the portion of the knoll that is dominated by ornamental and invasive species, along with some relict walls and structures. Upslope, the dominant native lemonade berry scrub of the knoll is visible (top center).

Figure 38, Site Photographs

6A – View of a creek access path north of the Topanga Ranch Motel and west of Topanga Creek, looking northeast. This area used to be the location of homes, and relict pavement and pipes are visible throughout (pavement shown bottom right of center). Arundo begins to grow thickly here, shown center left. A small segment of hillside dominated by native lemonade berry scrub is visible far left above center.

6B – View from area immediately adjacent to photo point for 6A looking north, showing the frequently used pathway down to Topanga Creek. This area is thickly overgrown with arundo, shown throughout this photo.

6C – View from the edge of Topanga Creek looking downstream south/southwest showing the conditions of Topanga Creek in this reach as it flows towards the lagoon. Both banks have abundant growth of arundo, with native willows and mulefat vying for dominance.

6D – View from the same point as 6C looking upstream north/northeast. Conditions here are similar, with arundo dominating the banks and vying for dominance with native willow and mulefat. Some alder trees are visible photo center / above center.

Figure 38, Site Photographs

7A – View from along Topanga Canyon Boulevard (Blvd) looking southeast in the northeastern terminus of the Project area. Topanga Canyon Blvd is shown running left to right through the photo. In the foreground, conditions typical of the roadside exist, with invasive grasses and forbs dominating the herbaceous layer. The hillside shown across the road is predominantly covered with native lemonade berry scrub, typical of slopes too steep for grazing or development in this area.

7B – Photo taken from same point as 7A looking south along Topanga Canyon Boulevard, which is shown center left. This shows typical roadside conditions along Topanga Canyon Blvd, which is typically dominated by either invasive annual grasses or non-native trees, such as the stand of eucalyptus shown center to left. Other ornamental trees are shown right of center entering the floodplain, and the edge of a large arundo infestation in this area is shown in the lower right hand corner.

7C – View from same point as 7A/B looking to the west/northwest overlooking the floodplain. Here you can see the extensive arundo infestation that is dominant in this portion of the Project area. Native sycamores are seen to the right in the foreground and in the background left center, as well as scattered throughout the background. The hillsides in the background are mostly out of the Project area, except the far left area, which is dominated by native lemonade berry scrub.

7D – View from approximately one hundred yards south of photos 7A-7C, looking west/southwest overlooking the floodplain. This photo further demonstrates the infestation of arundo in this part of the floodplain, shown low center. A native sycamore tree is shown on the left, while ornamental and non-native trees are shown right and in the background center. Hillsides in the background are dominated by native lemonade berry scrub.

Figure 38, Site Photographs

8A –View from Topanga Creek at its eastern extreme approximately 250’ west of Topanga Canyon Blvd. looking north / northwest in alignment with the stream course. A sycamore is visible in the upper right foreground, and an invasive eucalyptus in the upper left, while mostly native mulefat and willows are visible throughout the rest of the photo on either side of the creek.

8B – View from the same point as 8A looking west/southwest showing conditions around the stream in this area. Native willow and sycamore are visible in the upper left and right respectively, while native willows are visible in the background left beside large relict ornamental trees shown center right. Invasive annual grasses are shown between the creek and willows.

8C – View from within the “Rodeo Grounds” clear area west of Topanga Creek looking north/northwest, approximately 400’ west of the photo point for 8A and 8B. The general conditions of the “NNG” areas in the floodplain is shown here, with abundant cover of invasive grasses and forbs (primarily Geraldton carnation spurge). Remnant ornamental palm trees are shown left of center, which are flanked by a sycamore. The hills in the background transition from ornamentals and invasive plants to native scrub dominated by CA sagebrush and ashyleaf buckwheat.

8D – View from the same point as 8C looking west/southwest. This photo shows more disturbed “NNG” areas and many ornamental plants, including mission prickly pear (center right) flanked by eucalyptus with the edge of a palm tree far center right. Sycamores are visible upper right and center left, with a native willow thicket visible center left.

Figure 38, Site Photographs

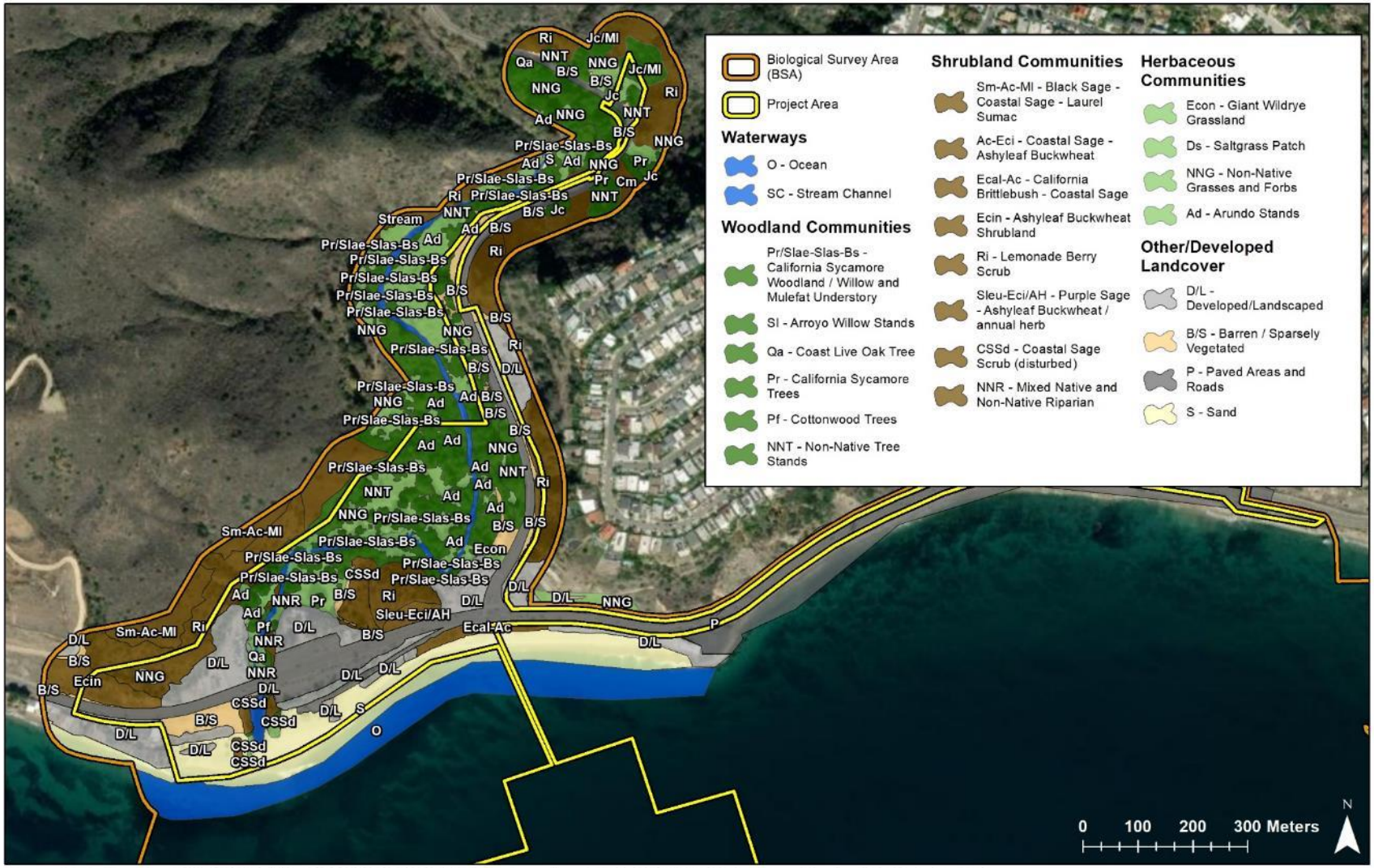
5.4.1.1 California Sycamore (*Platanus racemosa*) Woodland / Red & Arroyo Willow (*Salix laevigata*, *S. lasiolepis*) and Mulefat (*Baccharis salicifolia*) Understory [61.312.05]. This community comprises the largest native community delineated within the BSA and encompasses the portions of the floodplain where there is no development, high degree of disturbance, or cleared areas filled with non-native herbaceous plant communities. The arborescent vegetation layer is dominated by western sycamore (*Platanus racemosa*) trees, which vary in density and size. Beneath the sycamores, and particularly near the regular watercourse of Topanga Creek, primarily arroyo (*Salix lasiolepis*) and some red willow (*Salix laevigata*) trees, as well as mulefat (*Baccharis salicifolia),* grow densely. California black walnut and white alder (*Alnus rhombifolia*) are also occasionally present. As recently as 2002, over 20 single-family residences existed within this area prior to their removal by DPR. Some relict ornamental trees and shrubs still grow within this community, such as cape honeysuckle (*Tecoma capensis)*, English ivy (*Hedera helix)* and iris *(Iris pseudacorus*). It is also noteworthy that, in some areas within this community, replanting efforts of native trees have been made by the RCDSMM, CDPR, and Mountains Restoration Trust (MRT). This community designation is considered sensitive by the CDFW (G3S3) and is considered H1 habitat by the LCP.

.**5.4.1.2 Arroyo Willow Thickets Association [61.201.01].** This natural community occurs in multiple locations along the stream channel in the southern half of the BSA, in riparian areas without larger trees that are not overrun with invasive arundo (*Arundo donax*). One of these areas is adjacent to the parking area at the Topanga Ranch Motel upslope of the stream course, while the other locations occur further to the northeast in between the stream channel and disturbed grassland. These areas are dominated by arroyo willow with an understory typically composed of mixed native and non-native grasses (*Avena* and *Bromus* spp.) and some native herbaceous plant species such as ragweed (*Ambrosia psilostachya)* and invasive terracina spurge (*Euphorbia terracina)*. This natural community is not considered sensitive by the CDFW as an alliance (G3S4) but is considered H1 habitat by the LCP. Trees within areas that could be disturbed have been individually tagged and considered in the Native Tree and Oak Tree Report (2022) attached in Appendix C.

5.4.1.3 Individual Native Trees (Sycamore, Cottonwood (*Populus fremontii*), Coast Live Oak (*Quercus agrifolia*)). This map unit is used to show the locations of individual native trees that do not meet the dominance criteria to reclassify the vegetation communities in which they are found. Most of these trees are western sycamores, with some coast live oak (*Quercus agrifolia*) and cottonwood (*Populus fremontii*) trees also identified within the project area. While these trees are not communities, and therefore are not considered a sensitive community by the CDFW, they are all considered H1 habitat within their riparian context by the LCP. They are also individually tagged and considered in the Native Tree and Oak Tree Report (2022) in Appendix C

5.4.1.4 *Eucalyptus* Woodland Alliance/Non-Native Tree Stands [79.100.02]. This community is common along TCB, as well as in areas of the floodplain that were previously occupied by residences. This community is dominated by non-native eucalyptus (*Eucalyptus* spp.) trees and other horticultural varieties with an understory of mixed native and non-native shrubs, grasses, and forbs, such as garden nasturtium (*Tropaeolum majus*), wild radish (*Raphanus* sp.), English ivy (*Hedera helix*), and various common weedy annual grasses common to the region, such as bromes (*Bromus* spp.) and Bermuda grass (*Cynodon dactylon*). This community is not native and not considered sensitive by the CDFW and is considered H3 habitat by the LCP. All trees within this area that could be disturbed by project activities are individually tagged and considered in the Native Tree and Oak Tree Report (2022) in Appendix C.

5.4.1.5 California Black Walnut (*Juglans californica*) Woodland/ Annual Herbaceous understory [72.100.03] This community occurs in two locations, both in the northern extent of the BSA, on the east side of TCB within the greater area that may be utilized for wastewater seepage pits, if that wastewater option is pursued. Both locations are adjacent to TCB and located at the bottom of draws, which channel runoff from the hillside above. In both instances the understory is comprised almost entirely of non-native understory, the first consisting of non-native annual grasses such as bromes, and herbaceous forbs such as terracina spurge. This natural community is considered sensitive by CDFW (G3S3) and is considered H1 by the LCP.



Sources: Project Boundary (EPD, Moffatt & Nichol, RCDSMM 9/20/2023), Biological Survey Area (CDPR, CRM 9/21/2023), Landcover Mapping: DPR September 2023
Service Layer Credits: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Figure 39. Vegetation Communities and Land Cover Map. CDPR 2022.

Table 10. Summary of Vegetation/Land Cover Acreages Per Alternative, Existing and Anticipated Disturbance. Sensitive habitat categories are shaded gray.

Vegetation Community or Land Cover Type	CDFW Conservation Status Rank[1]	LCP Designation[2]	Project Area (acres)	BSA (acres)	Alt. 2 Impact Acreage[5]	Alt. 3 Impact Acreage	Alt 4 Impact Acreage	Wastewater Option 2- Seepage Pits	Wastewater Option 3- Sewer
Woodland									
California Sycamore (*Platanus racemosa*) Woodland / Red & Arroyo Willow (*Salix laevigata*, *S. lasiolepis*) and Mulefat (*Baccharis salicifolia*) Understory [61.312.05]	G3S3	H1	8.98	15.54	1.04	0.82	0.82	0.10	-
Arroyo Willow Thickets Association [61.201.01]	G4S4	H1	0.23	0.38	0.08	0.08	0.07	-	-
Individual Native Trees (Sycamore, Cottonwood (*Populus fremontii*), Coast Live Oak (*Quercus agrifolia*)	NR	H1	0.16	0.23	-	-	-	-	-
Eucalyptus Woodland Alliance/Non-Native Tree Stands [79.100.02]	NR	H3	2.48	6.93	1.26	0.77	0.72	0.32	-
California Black Walnut (*Juglans californica*) Woodland/ Annual Herbaceous understory [72.100.03]	G3S3	H1	0.03	0.37	-	-	-	0.03	-
California Black Walnut (*Juglans californica*)/ Laurel Sumac (*Malosma laurina*) Woodland [72.100.07]	GNRS3	H1	0.15	1.48	-	-	-	0.14	-
Scrub/Shrublands									
Black Sage (*Salvia mellifera*) - Coastal Sage (*Artemisia California*) – Laurel Sumac (*Malosma laurina*) Association [32.020.15]	G4S4	H2	-	2.49	-	-	-	-	-
California Sagebrush (*Artemisia californica*) - Ashyleaf Buckwheat (*Eriogonum cinereum*) Association [32.010.07]	G4S4	H2	-	1.76	-	-	-	-	-
California Brittlebush (*Encelia californica)* - California Sagebrush (*Artemisia californica)* Shrubland Association [32.050.01]	G3S3	H2HS	0.51	0.74	0.41	0.41	0.34	-	-
Ashyleaf Buckwheat (*Eriogonum cinereum)* Association – [32.035.01]	G2S2	H2HS	0.96	1.76	-	-	-	-	-
Lemonade Berry (*Rhus integrifolia)* Shrubland Association - [37.803.01]	G3S3	H2HS	3.96	16.29	-	-	-	0.01	-
Purple Sage (*Salvia leucophylla*) - Ashyleaf Buckwheat (*Eriogonum cinereum*) / Annual Herb Association - [32.090.05]	G3S3	H3	0.53	0.53	0.04	0.04	0.06	-	-
Coastal Sage Scrub (Disturbed)	NR	H3	1.52	1.73	0.81	0.57	0.79	0.05	-
Mixed Native and Non-native Riparian	NR	H1	0.48	0.48	0.19	0.20	0.04	-	-
Bigpod Ceanothus (*Ceanothus megacarpus*) Chaparral [37.201.01]	G4S4	H2	-	0.98	-	-	-	-	-
Herbaceous									

Vegetation Community or Land Cover Type	CDFW Conservation Status Rank[1]	LCP Designation[2]	Project Area (acres)	BSA (acres)	Alt. 2 Impact Acreage[5]	Alt. 3 Impact Acreage	Alt 4 Impact Acreage	Wastewater Option 2- Seepage Pits	Wastewater Option 3- Sewer
Giant Wildrye (*Elymus condensatus*) Grassland [41.265.01]	G3S3	H3	0.18	0.18	0.16	0.16	0.16	-	-
Salt Grass (*Distichlis spicata*) Flats [41.200.09]	G5S4	H2	0.07	0.07	-	-	-	-	-
Arundo Stands (*Arundo donax*) Association [42.080.01]	NR	H3	1.88	6.16	0.46	0.44	0.43	-	-
Ruderal Areas and Non-native Annual Grassland	NR	H3	3.41	6.03	0.89	0.66	0.67	0.21	-
Waterways									
Stream Channel (Topanga Creek)	NR	H1	1.50	2.52	0.10	0.10	0.10	-	-
Ocean	NR	N/A	34.80	53.10	-	-	-	-	-
Other/Developed Areas									
Developed / Landscaped Areas	NR	H3	7.63	12.78	5.14	4.98	4.74	-	-
Paved Areas	NR	H3	14.10	16.70	3.90	3.87	3.73	0.03	2.39
Sand	NR	H3	4.64	11.44	1.03	0.87	0.72	-	-
Barren / Sparsely Vegetated Areas	NR	H3	2.73	3.31	1.72	1.28	1.32	0.43	-
Subtotal Sensitive Community Acreage					**1.65**	**1.43**	**1.38**	**0.11**	**-**
Total Acreage[3]			**90.94**	**164.00**	**17.23**	**15.24**	**14.71**	**1.32[4]**	**2.39[4]**

[1] A conservation status rank (also known as "rarity rank" or "high inventory priority" designation) is used to determine the significance of Project impacts to plant communities. The conservation status ranking system consists of a geographic scale (G=Global; S=State) and a degree of threat (1=critically imperiled; 2=imperiled; 3=vulnerable to extirpation or extinction;4=apparently secure; and 5=demonstrably widespread, abundant, or secure). Plant community alliances with conservation status ranks of G1 through G3, or S1 through S3, are considered "sensitive natural communities".

[2] LCP Habitat Categories: H1, H2, and H2HS are considered Sensitive Environmental Resource Area (SERA).

[3] Acreages may not sum due to rounding.

[4] Impact acreages may be duplicative based on Alternative chosen.

[5] Wastewater Management Option 1 is included in Alternative 2.

5.4.1.6 California Black Walnut (*Juglans californica*)/ Laurel Sumac (*Malosma laurina*) Woodland [72.100.07] This community occurs in the northern extent of the BSA, adjacent to TCB and the potential site for wastewater seepage pits. The community is found in close proximity to the California black walnut woodland alliance noted below, but is more upland in character. There is a distinct difference in slope aspect and steepness which leads to more arid conditions. The understory, where present, consisted of non-native annual grasses and terracina spurge. This community is considered sensitive by CDFW (GNRS3) and is considered H1 by the LCP.

5.4.2 Scrub / Shrublands Communities. Several coastal sage scrub natural communities were identified on the steep slopes along the northern and eastern edges of the BSA and to the northeast of the Topanga Ranch Motel. This series of communities is separated topographically by several ridgelines and steep-walled draws on the hillside. These changes in terrain, aspect, and previous development have created breaks in the continuity of these various communities. In general, these communities were dominated by dense growth of native shrubs and a disturbed understory of primarily non-native grasses and forbs, such as crimson fountain grass (*Pennisetum setaceum*), wild oats (*Avena* spp.), and bromes. Several of these habitats are considered sensitive by CDFW.

5.4.2.1 Black Sage (*Salvia mellifera*) - Coastal Sage (*Artemisia California*) - Laurel Sumac (*Malosma laurina*) Association [32.020.15]. This natural community was found along the northern boundary on the slopes above the building lease development along PCH, west of Topanga Creek. This community is bounded cross slope by two draws which change the slope aspect. Black sage, California sagebrush and laurel sumac were the dominant shrubs onsite. The understory is lightly disturbed by common invasive grasses, such as bromes and rattail fescue (*Festuca myuros*). This community is not considered sensitive by CDFW (G4S4) but is considered H2 habitat by the LCP.

5.4.2.2 California Sagebrush (*Artemisia californica)* - Ashyleaf Buckwheat (*Eriogonum cinereum*) Association [32.010.07]. This natural community was found along the northern boundary of the BSA on the slopes above the vegetated Topanga Creek floodplain. This community is bounded a draw on one side, a change in slope face on the other, and by non-native tree stands that remain from the past residential development to the southeast. California sagebrush, and ashyleaf buckwheat dominated the shrub layer. The herbaceous layer, as is common within the region, is invaded by common invasive grasses including bromes, rattail fescue, and wild oats. This community is not considered sensitive by CDFW (G4S4) but is considered H2 habitat by the LCP.

5.4.2.3 California Brittlebush *Encelia californica)* - California Sagebrush (*Artemisia californica)* Shrubland Association [32.050.01]. This community was located within a strip of disturbed but largely native vegetation located between Topanga Beach and Pacific Coast Highway in the southeast corner of the project area. California brittlebush and California sagebrush were predominant, but sugar bush (*Rhus ovata*) was also present. Nonnative invasive and horticultural species were frequent and included palm trees, arundo, fountain grass, horseweed (*Erigeron* sp.), terracina spurge and English ivy, among others. While this community designation is considered sensitive by the CDFW (G3S3), this habitat type when found along the PCH is subject to recurring disturbance and will presumably remain highly disturbed indefinitely. The LCP would classify this community as H2 habitat or H3 habitat where disturbance frequently recurs due to the PCH.

5.4.2.4 Ashyleaf Buckwheat (*Eriogonum cinereum)* Association [32.035.01]. This community was mapped at the extreme western edge of the BSA along the PCH. Ashyleaf buckwheat is the dominant native in the shrub layer, with rarely occurring lemonade berry. This community is highly disturbed by crimson fountain grass and iceplant (*Carpobrotus edulis*), which is commonly seen along PCH and other roads along the south coast, as well as other invasive annuals such as bromes and wild oats. Areas near the road are also subjected regular disturbance by humans, vehicles, and their associated refuse. This community is considered sensitive by the CDFW (G2S2) and would be considered H2 habitat, or perhaps H3 in this highly disturbed state, by the LCP.

5.4.2.5 Lemonade Berry (*Rhus integrifolia)* Shrubland Association [37.803.01]. This community was mapped in several locations along the northern edge of the BSA and on a small hill landform rising from the floodplain of Topanga Creek, located immediately west of the businesses on the northwest corner of the intersection of PCH and TCB. This hill is crossed by a switchback trail that leads to the top and is subject to heavy visitor traffic. Despite this high degree of disturbance, plant life on the hill is predominantly native shrubs. Aside from dominant species lemonade berry (*Rhus integrifolia*), other prevalent native shrubs include laurel sumac (*Malosma laurina*), ashyleaf buckwheat, California sagebrush, clustered tarweed (*Deinandra fasciculata*), native needlegrass (*Stipa* sp.) and deerweed (*Acmispon glaber*) among other native species. Non-native plants within this community include an abundance of century plants (*Agave americana*), various landscape plants that are remnant from past development onsite, and invasive annuals such as bromes, wild oats, and onionweed (*Asphodelus fistulosus*). This community is considered sensitive by the CDFW and is classified as H2HS habitat by the LCP.

5.4.2.6 Purple Sage (*Salvia leucophylla)* - Ashyleaf Buckwheat (*Eriogonum cinereum)* / Annual Herb Association [32.090.05]. This community is in a small area between steep slopes on the southern side of the hill near the PCH. This community is heavily disturbed, likely due to its steep and eroded slope, constant exposure to winds, and proximity to PCH. In addition to the dominant purple sage and ashyleaf buckwheat shrubs, coast prickly pear (*Opuntia littoralis*) and lemonade berry are also present. Ther area is heavily colonized by crimson fountain grass, Russian thistle, and wild oats along with other non-native grasses and forbs. While this community designation is considered sensitive by the CDFW (G3S3), this area will likely remain highly disturbed indefinitely regardless of any potential project activities due to its exposure, slope, and proximity to the PCH. The LCP would classify this habitat as H3 habitat due to its high level of disturbance.

5.4.2.7 Coastal Sage Scrub (Disturbed). This community designation was used to classify areas where a component of coastal sage scrub species (i.e., lemonade berry, coast goldenbush [*Isocoma menziesii*], or California sagebrush) exists but are dominated by non-native plants or is otherwise highly disturbed. This includes areas west of the small hill on the north side of PCH, and a highly disturbed patch of coast goldenbush found on the beach in the southwestern portion of the BSA. These areas are dominated by ornamental plants and non-native grass species, including bromes, wild oats, crimson fountain grass, and other invasive annuals. This community is not designated in the CDFW Natural Communities List and is therefore not considered sensitive. The LCP designation would classify such disturbed habitats as H3 habitat.

5.4.2.8 Mixed Native and Non-Native Riparian. This community is used for convenience to refer to areas adjacent to the Topanga Creek stream channel that are dominated by non-native vegetation. These areas are often dominated umbrella sedge (*Cyperus involucratus*), mint species (*Mentha* sp.), and various predominantly non-native grasses and herbaceous species. Natives of note in this area include one small (~40 square foot) patch of native California bulrush (*Schoenoplectus californicus*) south of the PCH bridge on the eastern bank of the creek, as well as occasional occurrences of native narrowleaf cattail (*Typha latifolia*) and giant horsetail (*Equisetum telmateia)*. The small size of these stands makes mapping impractical, however. This community is not designation in the CDFW Natural Communities List and is therefore not considered sensitive. The LCP classifies all riparian habitat as H1 habitat, even if it is disturbed habitat.

5.4.2.9 Bigpod Ceanothus (*Ceanothus megacarpus*) chaparral [37.201.01] This community is present on portions of the eastern slopes above TCB and consisted of bigpod ceanothus and a limited understory on rocky substrate. This community was limited in extent and associated with a flat aspect dividing draws along the slope with riparian communities. This community is not considered sensitive by CDFW (G4S4), and is classified as H2 habitat by the LCP.

5.4.3 Herbaceous Communities. Several herbaceous communities were identified within the BSA. Non-native plant communities represent most of these communities by area. These non-native

herbaceous communities are frequently present in areas disturbed by previous development within the Topanga Creek floodplain north of PCH.

5.4.3.1 Giant Wildrye (*Elymus condensatus*) Grassland - [41.265.01]. This community was identified in between the hill north of PCH and west of TCB, where it is differentiated from its barren or developed surroundings by a dominance of giant wildrye (*Elymus condensatus*). The community's proximity to TCB as well as cleared and developed areas has resulted in a high degree of disturbance. Smaller plants in the herbaceous layer are overwhelmingly non-native grasses and forbs typical of disturbed areas, such as rattail fescue (*Festuca myuros*) and bromes, as well as some terracina spurge. It is worth note that north from this area along the western edge of TCB, there is abundant giant wildrye that occurs underneath the canopy of non-native trees, though the area is highly disturbed due to its proximity to the road and sidewalk. While this community designation is considered sensitive by the CDFW (G3S3), this area is highly disturbed and modified from its natural state. The LCP would classify his habitat as H3 habitat due to the high level of disturbance.

5.4.3.2 Salt grass Flats (*Distichlis spicata*) - [41.200.09]. This habitat exists in one small patch on the east bank of Topanga Creek at the beach. This is a relatively homogenous patch of salt grass (*Distichlis spicata*) with some scattered silver beach bur (*Ambrosia chamissonis)* and ruderal species nearby. It exists in a mat adjacent to the creek outlet, beach sand, and a patch of disturbed coastal sage scrub vegetation. This community is not considered sensitive by the CDFW (G5S4). The LCP would classify this habitat as H2 habitat.

5.4.3.3 Arundo Stands (*Arundo donax*) Association [42.080.01]. This community designation refers to those areas that are overgrown and dominated by arundo. Arundo is ubiquitous in nearly every watershed in California, forming dense stands with deep rhizomes that make it resilient in the face of attempted control. Arundo occurs throughout the BSA within the riparian area adjacent to the stream channel and comprises the second most common community mapped therein. This community is invasive and has no CDFW ranking. The LCP would classify this habitat as H3 because it is dominated by invasive plants.

5.4.3.4 Ruderal, Barren, and Predominantly Non-Native Annual Grasslands. This mapping unit is used for convenience and encompasses multiple areas within the BSA that are typified by low-lying primarily non-native herbaceous vegetation typical of disturbed areas. These areas are typically overrun with non-native grasses and forbs and other annuals, predominantly bromes, wild oats, wild radish (*Raphanus* sp.), and nasturtium.

Areas assigned to this category were located on the hillside in the southwestern corner of the BSA, throughout substantial portions of the riparian area, and along the north side of PCH east of TCB. Some native annuals may live in these areas but do not approach dominance. This community is not designated by the CDFW and is therefore not considered sensitive. The LCP would classify this habitat as H3.

5.4.4 Waterways. This category represents unvegetated areas consisting of open water and seasonally wetted. Within the Topanga Creek floodplain, open water and seasonally wetted unvegetated areas are frequently associated with riparian plant communities considered sensitive by CDFW and considered H1 habitat by the LCP, and as such is mapped separately from other barren and sparsely vegetated areas.

5.4.4.1 Stream Channel (Topanga Creek). This mapping unit represents the bank full stage of Topanga Creek. Southern portions of the stream channel, and the entirety of the lagoon, are open water, while northern portions of the stream channel are a mixture of open water and unvegetated seasonally wetted areas. The stream channel is closely associated with the California Sycamore Woodland - Red & Arroyo Willow and Mulefat, the Arundo Stands, and the Mixed Native and Non-Native Riparian communities. This landcover type is not a CDFW designated community and therefore cannot be considered sensitive. The LCP would likely categorize the creek as H1 habitat.

5.4.4.2 Ocean. The extended BSA includes a portion of the Pacific Ocean. This area was not surveyed during these surveys and is only included in the southernmost portion of the buffer. This landcover type is not a CDFW designated community and therefore cannot be considered sensitive.

5.4.5 Other/ Developed Areas. Due to their developed and disturbed nature, all these land cover types are not designated by the CDFW and are therefore not considered sensitive. These land cover types are considered H3 per the LCP.

5.4.5.1 Developed and Landscaped Areas. This land cover type includes all developed areas associated with the Topanga Ranch Motel and onsite business leases, including associated landscaping and ancillary structures. It also applies to the roads including TCB, PCH (inclusive of Topanga Creek bridge) and large parking lots associated with the Topanga Ranch Motel and Topanga Beach. This landcover type is one of the most prevalent mapped.

5.4.5.2 Paved Areas. This mapping unit is used for convenience, applies to all roads, and parking lots identified within the project area, including Topanga Canyon Boulevard, Pacific Coast Highway, and large parking lots associated with the Topanga Ranch Motel and Topanga Beach.

5.4.5.3 Sand. This mapping unit encompasses all areas covered by bare sand, specifically the majority of Topanga Beach. Additionally, one area of Topanga Creek had a large unvegetated deposition of sand, which was also mapped under this unit.

5.4.5.4 Barren / Sparsely Vegetated. This mapping unit is used for convenience and applies to all undeveloped and unpaved areas with no significant native or non-native vegetation present. These areas were mostly associated with roadside turnouts and the vacant footprints of previously developed areas.

5.4.6 Impact Analysis-Vegetation Communities. Table 10 above summarizes the anticipated impacts per vegetation community per alternative.

Alternative 1, No Project/Managed Decline would keep in place the existing configuration and degraded habitat onsite. Although no temporary disturbance of vegetation would occur beyond the ongoing but limited management of invasive weeds, fuel clearance zones, and hazardous trees by CDPR and partners, the habitat integrity and ecosystem health are anticipated to continue to decline as the impacts of disturbance associated with habitat degradation, unmanaged human activity, and invasive species presence increases.

Under all build alternatives, Alternatives 2-4, significant vegetation removal would occur outside of existing wetted areas onsite. Although protected native trees lining the wetted banks of the creek would be preserved and protected during grading to the maximum extent feasible. most other vegetation outside of the wetted areas and within the grading footprint would be removed. This includes 1-2 acres of sensitive communities. This is most extensive for Alternative 2, with lesser vegetation removal projected for Alternatives 3 and 4. This short-term disturbance must be viewed in the context of the substantial net benefit to the quality and quality of native habitats that would replace them and expand over the long-term as vegetative cover increases. These temporary impacts to “common” native vegetation are not considered significant.

There could be adverse effects associated with the spread of invasive propagules during construction, however. Although a significant reduction in invasive plant species onsite is expected from the project, care must be taken during construction to minimize their spread offsite or into newly planted areas. The Habitat Restoration Plan being prepared for the project will address methods to do so. Mitigation Measure 2 ensures incorporation of measures in the plan to minimize invasive species spread to the maximum extent feasible.

Mitigation Measure 2: Invasive Species Management. At a minimum, the Habitat Restoration Plan and Project Plans and Specifications will include the following measures to minimize the spread of invasive species. Additional measures required by CCC and CDFW will also be incorporated. When a conflict arises between specific measures, the most protective will apply.

1. Stockpiled soil, and grubbed vegetation when blooms or seeds are present, shall be covered to avoid spread of weed seed.
2. If any soil is slated to be used offsite outside of disposal in a landfill, it will be subject to review and approval by a qualified biologist to ensure the soil is free of invasive propagules (e.g., pieces of arundo, ivy) that reproduce vegetatively and could spread to receiver sites.
3. Haul trucks shall be covered to avoid seed dissemination during soil and vegetation disposal.
4. Areas slated for planting shall be pretreated for emergent weeds prior to planting. Typical measures include irrigating and then spot treating germinating weeds three times prior to planting to reduce the invasive seed base. This is usually initiated 3-4 months prior to planting. Any herbicide use will be approved by the CDPR and will be conducted by trained staff overseen by a supervisor with a Qualified Applicator License or Certification from the Department of Pesticide Regulation. All herbicide applications will be according to State and Federal requirements.
5. Any weed removal work shall take an Integrated Pest Management approach where manual, mechanized, cultural and chemical methods are all considered to determine the most environmentally friendly and functional methods. Landowner policies and Department of Pesticide Regulation guidelines must be followed when limited pesticide use is determined to be needed.
6. Use of jute netting, landscape cloth, or mulch, as appropriate, shall be used to cover bare soil and reduce the area available for weed intrusion.
7. Irrigation design shall consider weed control. Drip systems are preferred if feasible, as water is directed solely at the target plant species.
8. Biodegradable materials shall be used when available for erosion control and soil management. All plant derived materials (mulch, straw) shall be certified weed free.
9. Monthly weeding will be required for the first-year post planting, Quarterly weeding will be required thereafter for the 5-year mitigation and monitoring period.
10. Success criteria shall include the following for five years post restoration:
    - Native vegetative shall reach 85% cover except for areas such as mudflats, rocky slopes, beach areas and other habitats that are not naturally highly vegetated.
    - No highly invasive plants shall be present onsite.
    - Other nonnative weedy species shall not exceed 5% cover.

Terrestrial areas not associated with potential wastewater development total 45.92 acres within the project area. A total of 39.24 acres of this are anticipated to be restored/enhanced under Alternative 2, while Alternative 3 and 4 would restore/enhance a total of 38.54 and 38.71 acres, respectively (Table 11). Restoration efforts will be focused on areas graded to restore more natural topography and hydrological processes and will require extensive restoration plantings (see Figures 6-12). Additional habitat enhancement will occur as funding permits within terrestrial open space areas not proposed for grading. These areas would be enhanced via weed management and focused plantings. Restoration and enhancement efforts will result in a significant net benefit to sensitive natural communities through their improved quantity and quality for Alternatives 2–4, which will be most evident upon completion of the construction/restoration phase. Alternative 2 provides the greatest benefit to sensitive native communities as it maximizes restoration acres, especially for aquatic and riparian habitats, while Alternative 4 provides the greatest opportunity for creating sensitive dune habitat types.

Table 11. Restoration and Enhancement Acreages.

Area	Alternative 2 Restored Acreage	Alternative 3 Restored Acreage	Alternative 4 Restored Acreage
Terrestrial Area, excluding wastewater option areas	45.92	45.92	45.92
Total Graded/Disturbed Areas	15.89	15.25	14.71
Proposed Development	6.68	7.38	7.21
Proposed for Restoration	9.21	7.87	7.50
No Grading/Ground Disturbance (Enhancement Area)	30.03	30.67	31.21
Total Area Proposed for Restoration/Enhancement	39.24	38.54	38.71

A Conceptual Habitat Restoration and Adaptive Management Plan (CHRAMP, ESA 2023b) has been prepared to outline the general approach to restoration planting, maintenance, monitoring, and adaptive management at this conceptual 30% level of design. The CHRAMP incorporates the findings of the Topanga Lagoon Restoration Alternatives Analysis Report (Moffatt and Nichol 2022), which includes a summary of potential habitat types that are anticipated to occur in a 42-acre subarea associated with the lagoon and creek and project how those habitats shift over time under the 1.6-foot and 6.9-foot SLR scenarios (Table 12). Alternative 2 tends to increase the extent of seasonal shallow open water, seasonal unvegetated flat, emergent marsh and decreased developed areas. Alternatives 3 and 4 are anticipated to result in somewhat more uplands habitats and Alternative 4 maximizes beach habitat gains. Alternatives 2–4 are projected under SLR to shift toward more open water and seasonally unvegetated flat habitats at the expense of decreased riparian presence.

Table 12. SLR Impacts on Habitat Acreages, Topanga Lagoon Restoration Project Area.

Habitat Type	NO SLR Condition				1.6 ft SLR Condition				6.8 ft SLR Condition			
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 1	Alt 2	Alt 3	Alt 4	Alt 1	Alt 2	Alt 3	Alt 4
Open Water	0.06	0.04	0.08	0.07	1.21	1.19	1.23	1.22	5.07	5.78	5.22	5.14
Seasonal Shallow Open Water	0.42	0.69	0.44	0.38	0.42	0.69	0.44	0.38	0.08	0.32	0.12	0.08
Seasonally Unvegetated Flat	0.16	1.51	0.28	0.27	0.38	1.69	0.28	0.51	0.99	3.87	2.77	2.53
Emergent Marsh	0.47	1.12	0.5	0.5	0.39	1.87	0.5	0.82	0.24	0.94	0.59	0.8
Saltgrass	0.07	N/A	N/A	N/A	0.07	N/A	N/A	N/A	0.01	N/A	N/A	N/A
Riparian	2.46	6.09	6.42	6.36	2.32	5.16	6.42	5.79	1.62	2.59	3.11	3.13
Wetted Area Below Riparian/Upland Transition	**3.6**	**9.5**	**7.7**	**7.6**	**4.8**	**10.6**	**8.9**	**8.7**	**8.0**	**13.5**	**11.8**	**11.7**
Riparian/Upland Transition	6.06	6.14	6.34	6.23	6.06	6.14	6.34	6.23	6.06	6.14	6.34	6.22
Coastal Sage Scrub	3.66	2.98	2.98	2.98	3.66	2.98	2.98	2.98	3.65	2.98	2.98	2.98
Upland	11.16	13.84	14.37	14.49	11.15	13.84	14.37	14.49	11.16	13.84	14.35	14.49
Disturbed Upland/Trails	0.49	N/A	N/A	N/A	0.49	N/A	N/A	N/A	0.49	N/A	N/A	N/A
Riparian/Upland Transition Habitats	**21.4**	**23.0**	**23.7**	**23.7**	**21.4**	**23.0**	**23.7**	**23.7**	**21.4**	**23.0**	**23.7**	**23.7**
Sand (Beach)	4.18	4.39	4.42	4.56	3.05	3.24	3.28	3.41	0.27	0.34	0.35	0.48
TOTAL ALL HABITAT	**29.2**	**36.8**	**35.8**	**35.8**	**29.2**	**36.8**	**35.8**	**35.8**	**29.6**	**36.8**	**35.8**	**35.9**
Roadways/Developed/Landscaped	12.43	4.84	5.78	5.78	12.43	4.84	5.78	5.78	11.99	4.84	5.78	5.78
TOTAL PROJECT AREA	**41.6**	**41.6**	**41.6**	**41.6**	**41.6**	**41.6**	**41.6**	**41.6**	**41.6**	**41.6**	**41.6**	**41.6**

Source: Moffatt and Nichol 2022.

In all cases, the quality and quantity of onsite natural communities will increase for all project build alternatives and result in a net long-term benefit. These will be outlined in the Habitat Restoration and Adaptive Management Plan (HRAMP). As outlined in Mitigation Measure 3, the HRAMP will be prepared for agency approval at the 60-90% design phase and provides detailed planting plans with plant palettes and

layout information, in addition to a refined installation, maintenance, monitoring and adaptative management approach.

Mitigation Measure 3: Habitat Restoration and Adaptive Management Plan (HRAMP): The HRAMP shall include at a minimum the following measures. Additional measures are required by CDFW and CCC will also be incorporated. When a conflict exists between specific measures, the most protective will be implemented.

1. The project will complete on-site restoration and enhancement of sensitive plant communities (e.g., removal of invasive species; transplantation, seeding, or planting of representative plant community species; salvage/dispersal of duff and seed bank) at a ratio of no less than 1:1 for temporary impacts and not less than 2:1 for permanent impacts.

2. A HRAMP shall be prepared and reviewed by the CCC and CDFW for compliance prior to ground disturbance. The plan shall focus on the creation of equivalent sensitive plant habitats within disturbed habitat areas within the Project area or directly offsite within Topanga State Park and Topanga Beach. In addition, the plan shall provide details as to the implementation of the plan, maintenance, and future monitoring including the following components:

    - Description of existing sensitive habitats in the Project area.

    - Summary of permanent impacts to sensitive communities based on approved project design.

    - Proposed location for mitigation areas, either on-site or off site, with description of existing conditions prior to mitigation implementation.

    - Detailed description of restoration or enhancement goals.

    - Inclusion of sensitive communities and plant species with the goal of providing a net increase in the quantity and quality of them onsite.

    - Description of implementation schedule, site preparation, erosion control measures, planting plans, and seed collection or plant propagation of genetically appropriate plant materials.

    - Provisions for mitigation site maintenance and control on non-native invasive plants; and

    - Monitoring plan, including performance standards, adaptive management measures, and monitoring reporting to the CCC and CDFW.

5.5 LCP Habitats and SERA

The Coastal Act defines Environmentally Sensitive [Habitat] Area (ESHA) as any area in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem, and which could be easily disturbed or degraded by human activities and developments (California Coastal Act Section 30107.5). Section 30240 of the Coastal Act states that ESHAs "shall be protected against any significant disruption of habitat values, and only uses dependent on those resources shall be allowed within those areas." Also, development in areas adjacent to environmentally sensitive habitat areas and parks and recreation areas shall be sited and designed to prevent impacts which would significantly degrade those areas and shall be compatible with the continuance of those habitat and recreation areas.

SERAs are the equivalent of ESHA in the County LCP, and areas of relatively undisturbed habitat with high biological significance, typically with rare or special-status species present. The Santa Monica Mountains

Local Coastal Plan developed a system of habitat categories based on biological resources that designates development standards for each category within the LCP boundaries. Habitat categories are defined as the following (Section 22.44.1810 and .1900 of the SMM Local Implementation Plan (LIP)). Categories H1 and H2 are considered Sensitive Ecological Resource Areas (SERA).

- H1 Habitat – This category consists of habitats of highest biological significance, rarity, and sensitivity.
  - H1 Habitat Buffer – All lands within 100 feet of H1 Habitat.
- H2 Habitat – This category consists of habitats of high biological significance, rarity, and sensitivity.
  - H2 "High Scrutiny" Habitat (H2HS) – A subcategory of H2 Habitat, H2 "High Scrutiny" Habitat, which comprises extra sensitive H2 Habitat species/habitats that should be given avoidance priority over other H2 habitat.
- H3 Habitat – primarily disturbed, fragmented or non-native habitats, fewer restrictions on development.

As defined in Section 22.44.1800 *et seq.* of the LIP, H1, H2 and H2 "High Scrutiny" habitat types are designated as SERA under the County LCP and take priority during the project design process.

5.5.1 County Mapped. The County LCP habitat map is shown below in Figure 40.

Figure 40. County Mapped LCP Habitats/SERA.

5.5.2 CDPR Ground-truthed and Mapped. The ground-truthed Habitat/SERA map is shown in Figure 41 and Table 13. About a third of the landcover acreage onsite is considered SERA; this includes most of the woodland, scrub/shrubland, and waterway communities, and a limited herbaceous area (Table 10). Because the landcover acreage totals for the H2HS, H2, and H3 habitat areas within the BSA were not within 5 percent of the LCP mapped acreages, it is recommended that the County's database be updated to reflect the ground-truthed mapping.

Figure 41. CDPR Mapped LCP Habitats/SERA.

5.5.3 Impact Analysis-LCP Habitats and SERA. Project impacts to LCP Habitats/SERA are summarized in Table 13. The type and level of impacts and the general differences between alternatives mirrors that discussed for vegetation communities in Section 5.4.6.

Alternative 1, No Project/Managed Decline would keep in place the existing configuration and degraded habitat onsite. Although no temporary disturbance of vegetation would occur beyond the ongoing but limited management of invasive weeds and hazardous trees by CDPR and partners, the habitat integrity and ecosystem health are anticipated to continue to decline as the impacts of disturbance associated with habitat degradation, unmanaged human activity, and invasive species presence increases. This would be exacerbated by habitat compression due to SLR.

Short-term impacts to SERA habitat include vegetation removal during construction activities and the potential for the spread of invasive weed species. Alternative 2 results in the most temporary disturbance of the build alternatives, but also provides the most long-term benefit to SERA. This short-term disturbance must be viewed in the context of the substantial net benefit to the quality and quality of SERA that would replace them and expand over the long-term as vegetative cover increases. Development and implementation of the HRMP (Mitigation Measure 3) for the project will reduce potential impacts by facilitating effective and timely restoration, as will implementation of Mitigation Measure 2, invasive species management measures. With the above actions, temporary impacts to SERA are not considered significant.

Table 13. Santa Monica Mountains LCP SERA Impacts Per Alternative.

Habitat Categories	Project Area (acres)	BSA (acres)	Alternative 2[3] Impacts (acres)	Alternative 3 Impacts (acres)	Alternative 4 Impacts (acres)	Wastewater Option 2- Seepage Pits (acres)	Wastewater Option 3- Sewer (acres)
SERAs							
H1 Habitat	11.53	23.01	1.63	1.41	1.33	0.37	-
H2 Habitat	0.27	5.51	0.16	0.16	0.16	0.05	-
H2 HS Habitat	3.96	16.29	-	-	-	0.01	-
Other Areas							
H1 Habitat 100-Foot Buffer	N/A	N/A	6.30	5.42	4.84	1.46	0.39
H3 Habitat	39.40	66.09	15.45	13.67	13.22	1.19	-
Uncategorized	34.80	53.10	-	-	-	-	-
Total Impacts[1]	**90.94**	**164.00**	**17.23**	**15.25**	**14.71**	**1.62**	**-**

1 The Total Impacts is the sum of H1, H2, H2 HS, H3 Habitat, and uncategorized acres. H1 Habitat 100-Foot Buffer overlaps with areas mapped as either H2 or H3 Habitat.

2 Impact acreages may be duplicative based on Alternative chosen.

3 Wastewater Option 1-SDI is included in Alternative 2.

The long-term goal of the project is to provide a net increase in the quality and quantity of native vegetation communities, which includes SERA habitats. The project is therefore expected to be self-mitigating for temporary impacts to SERA. Alternative 2 would provide the greatest increase in SERA, followed by Alternatives 4, then 3.

To ensure that the project meets its goal in terms of long-term habitat gains for both common and SERA/special-status vegetation communities, and to reduce construction impacts, Mitigation Measures 4 and 3 will be implemented.

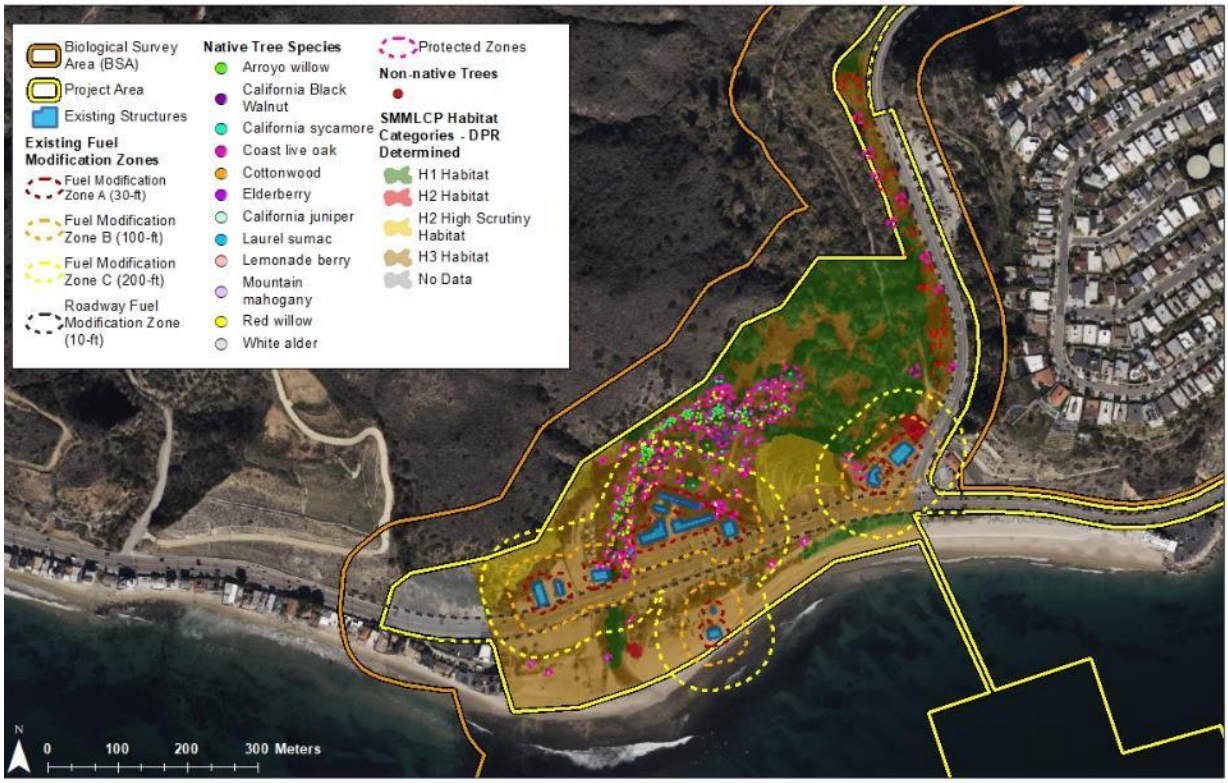
> **Mitigation Measure 4: Ensure Replacement Goals Met.** The County LCP Resource Conservation Program was developed to address and compensate for unavoidable impacts to H1 and H2 habitats. Pursuant to Section 22.44.1950 *et seq* of the LIP, the project proponent will consult with CCC/Los Angeles County to confirm that the project provides adequate onsite mitigation via natural habitat creation and enhancement. In the event, additional mitigation actions or acreage are required, CDPR will coordinate with CCC/Los Angeles County to identify needed mitigation, which could include payment into the LCP or other CCC approved in-lieu fee program.

With implementation of the HRAMP, and Mitigation Measures 1 - 4, impacts to LCP Habitats/SERA would be less than significant.

5.6 Protected Trees

5.6.1 Existing Conditions. A total of 292 native trees were tagged in the project area in 2021 during surveys of the subset of the project area that were anticipated to be disturbed during construction. 277 were of protected size, and 15 were undersized natives that could grow to protected size during project development, none of these trees are considered Heritage (native with a single trunk > 36 inches) or Historic. Eleven trees are “biologically significant clusters” due to their colocation and size (arroyo willow: #358, 383; California sycamore: #359, 384, 386; and elderberry (#360, 388, 389, 390, 391, 392) and grading around these trees was avoided.

Additionally, 343 non-native trees representing 36 species were documented within the project area. Of these eight eucalyptus, one Canary Island palm and a mature euphorbia tree located within the Topanga Ranch Motel are considered potentially Historic. Four of these (#418, 421, 422, and 425) also meet the criteria as Heritage trees due to having a single trunk exceeding 36 inches DSH. The locations of all trees were overlaid upon LCP ground-truthed Habitat Categories and fuel modification zones (Figure 42). Affected trees per category are summarized in Table 14.



Sources: Project Boundary (EPD, Moffatt & Nichol, RCDSMM 9/20/2023), Biological Survey Area (CDPR, CRM 9/21/2023)
Service Layer Credits: © 2023 Microsoft Corporation © 2023 Maxar ©CNES (2023) Distribution Airbus DS

Figure 42. Trees within LCP Habitat Designations, Fuel Modification and Protected Zones-Existing Conditions. *Note: Some of the protected trees onsite were originally planted by previous landowners. All California junipers were planted. Two additional black walnuts were identified during 2023 in the seepage pits area that was part of the 2023 project boundary expansion. but are not mapped here.*

Twelve species of native trees were identified in potentially disturbed areas within the project footprint. At least one species, California juniper, was planted in the area. The size class per species of protected native trees are shown in Table 15. Thirty-six species of nonnative trees were identified and are summarized per size class in Table 16.

A complete inventory of trees and details on tree identification, scientific and common name, location (latitude and longitude in decimal degrees), recommended action (retain, remove), % encroachment into the protected zone, DBH, condition comments and photos are found in the appendices of the Native Tree and Oak Tree Report (RCDSMM 2022) found in Appendix C.

Five additional sensitive black walnuts were also identified in some of the wastewater areas. Three sensitive California black walnuts were observed during general vegetation surveys in 2022 within the expanded project area that included a potential OWTS SDI area. These trees were outside of the areas proposed for disturbance and are shown in Figure 42. Two additional black walnuts were documented in the seepage pit wastewater area that was added to the expanded project area in 2023. In the event this OWTS is selected, the black walnut trees could be indirectly affected by seepage pit development.

Table 14. Trees Documented within Project Area

Category	Totals
Native Trees (292 Total)	
Protected	277
Heritage (subset of protected)	0
Historic (subset of protected)	0
Not Protected	15
Nonnative Trees (343 Total)	
Potentially Historic	8
Heritage and Potentially Historic (subset of total and same trees)	4
TOTAL ALL TREES	**635**

Five additional protected black walnuts were identified in the SDI (N=3) and seepage pit (N=2) OWTS treatment areas. Which specific OWTS will be selected is unknown at this time.

Table 15. Species and Size Classes of Protected Native Trees.

Common Name	Scientific Name	Total Number <5" DSH	Total Number 5-20" DSH	Total Number 20.1-36" DSH	Total Number >36" DSH	Total Number
White Alder	*Alnus rhombifolia*	0	2	0	2	**4**
Mountain mahogany	*Cercocarpus sp.*	0	1	0	0	**1**
Toyon	*Heteromeles arbutifolia*	0	1	1	0	**2**
Juniper*	*Juniperus californica*	0	2	2	0	**4**
Laurel Sumac	*Malosma laurina*	0	8	5	0	**13**
California Sycamore	*Platanus racemosa*	6	31	4	5	**46**
Cottonwood	*Populus fremontii*	0	2	0	0	**2**
Coast Live Oak	*Quercus agrifolia*	1	2	0	0	**3**
Lemonade Berry	*Rhus integrifolia*	0	3	0	0	**3**
Arroyo Willow	*Salix lasiolepsis*	8	90	28	16	**142**
Red Willow	*Salix laevigata*	0	22	14	14	**50**
Elderberry	*Sambucus nigra*	0	7	7	8	**22**
	TOTAL	**15**	**171**	**61**	**45**	**292**

**Known to be planted onsite.*
Five additional protected black walnuts were identified in the SDI (N=3) and seepage pit (N=2) OWTS treatment areas. Which specific OWTS will be selected is unknown at this time. DBH were not identified during surveys.

Table 16. Species and Size Classes of Non-Native Tree

Common Name	Scientific Name	Total Number <5" DSH	Total Number 5-20" DSH	Total Number 21-36" DSH	Total Number >36" DSH	Total Number
Acacia	*Acacia sp.*	0	1	1	0	2
Aleppo Pine	*Pinus halipensis*	0	2	1	1	4
Banana	*Musa sp.*	0	1	0	0	1
Bird of Paradise	*Strelitzia reginae*	0	1	0	2	3
Black Acacia	*Acacia melanoxylon*	0	0	1	0	1
Blue Gum	*Eucalyptus globulus*	2	31	31	21	85
Brazilian Pepper	*Schinus terebinthifolia*	0	7	6	0	13
California Pepper	*Schinus mole*	0	2	1	1	4
Canary Island Palm	*Phoenix canariensis*	0	0	2	2	4
Canary Island Pine	*Pinus canariensis*	0	4	0	0	4
Cherry	*Prunus sp.*	2	14	4	0	20
Chinese Elm	*Ulmus parvifolia*	0	2	1	0	3
Cypress	*Cupressus semperivirens*	0	3	1	0	4
Date Palm	*Phoenix dactylifera*	0	0	1	1	2
Dracaena	*Dracaena draco*	1	2	2	2	7
Dracaena	*Dracaena sp.*	0	13	11	6	30
Elm	*Ulmus sp.*	0	3	0	0	3
Eucalyptus	*Eucalyptus sp.*	0	4	2	0	6
Euphorbia	*Euphorbia sp.*	0	0	1	0	1
Fan Palm	*Washingtonia sp.*	0	51	10	0	61
Ficus	*Ficus benjamina*	0	11	3	1	15
Ficus	*Ficus sp.*	1	8	7	0	16
Fire Thorn	*Pyracantha sp.*	0	1	0	0	1
Hibiscus	*Hibiscus sp.*	0	1	0	0	1
Jacaranda	*Jacaranda mimosifolia*	0	2	0	0	2
Lemon	*Citrus aurantiifolia*	0	1	0	0	1
Mexican Fan Palm	*Washingtonia robusta*	0	2	1	1	4
Monetery Pine	*Pinus radiata*	0	3	0	0	3
Monkey Puzzle	*Auaracaura spp.*	0	2	0	0	2
Myoporum	*Myoporum* sp.	0	7	1	0	8
Olive	*Olea Europeans*	0	0	0	1	1
Pine	*Pinus sp.*	0	5	3	0	8
Pittosporum	*Pittosporum sp.*	0	4	0	0	4
Pomegranate	*Pomegranate granatum*	0	1	0	0	1
Podocarpus	*Podocarpus sp.*	0	1	0	0	1

Common Name	Scientific Name	Total Number <5" DSH	Total Number 5-20" DSH	Total Number 21-36" DSH	Total Number >36" DSH	Total Number
Red Box	*Eucalyptus polyanthemos*	0	0	1	0	1
Red River Gum	*Eucalyptus camaldulensis*	0	0	1	0	1
Rubber Fig	*Ficus elastica*	0	0	2	1	3
Spineless Yucca	*Yucca gigantea*	0	1	1	0	2
Tamarisk	*Tamarix ramosissima*	0	1	3	3	7
Tree Tobacco	*Nicotiana glauca*	0	2	0	0	2
Velvet Ash	*Fraxinus velutina*	0	1	0	0	1
	TOTAL	**6**	**195**	**99**	**43**	**343**

5.6.2 Impact Analysis-Protected Trees. Table 16 summarizes the impacts to protected native trees based upon the 30% design.

Table 17. Summary of Proposed Native Tree Removal & Encroachment Mitigation.

Scientific Name	Common Name	Alternative 1 # of Trees			Alternative 2 # of Trees			Alternative 3 & 4 # of Trees		
		Removed	Encroached	Remain	Removed	Encroached	Remain	Removed	Encroached	Remain
Alnus rhombifolia	White Alder	-	-	4	-	-	4	-	-	4
Cercocarpus sp.	Mountain Mahogany	-	-	1	1	-	0	-	-	1
Heteromeles arbutifolia	Toyon	-	-	2	-	-	2	-	-	2
Juniperus californicus	Juniper[1]	-	-	4	2	-	2	2	-	2
Malosma laurina	Laurel Sumac	-	-	13	6	1	6	6	1	6
Platanus racemosa	California Sycamore	-	-	46	1	-	45	1	-	45
Populus fremontii	Cottonwood	-	-	2	-	-	2	-	-	2
Quercus agrifolia	Coast Live Oak	-	-	3	-	1	2	-	1	2
Rhus integrifolia	Lemonade Berry	-	-	3	3	-	0	3	-	0
Salix lasiolepsis	Arroyo Willow	-	-	142	12	6	124	9	7	126
Salix laevigata	Red Willow	-	-	50	6	5	39	4	5	41
Sambucus nigra	Elderberry	-	-	22	1	1	20	1	1	20
Totals		**0**	**0**	**292**	**32**	**14**	**246**	**26**	**15**	**251**

[1] *Cultivated landscaping*

Five additional protected black walnuts were identified in the SDI (N=3) and seepage pit (N=2) OWTS treatment areas in 2023. No impacts would occur to walnuts under development of the SDI option, but two walnuts could be indirectly affected during seepage pit development. Which specific OWTS will be selected is unknown at this time.

Alternative 1, No Project/Managed Decline would keep in place the existing configuration and degraded nature of onsite habitats. Although no temporary disturbance of vegetation would occur beyond the ongoing but limited management of invasive weeds and hazardous trees by CDPR and partners, the habitat integrity and ecosystem health are anticipated to continue to decline as the impacts of disturbance associated with habitat degradation, unmanaged human activity, and invasive species presence increases. This would be

exacerbated by climate change stressors such as increasing high temperature events and period of drought that would likely increase the impacts of invasive invertebrates such as shot hole borers and tree diseases.

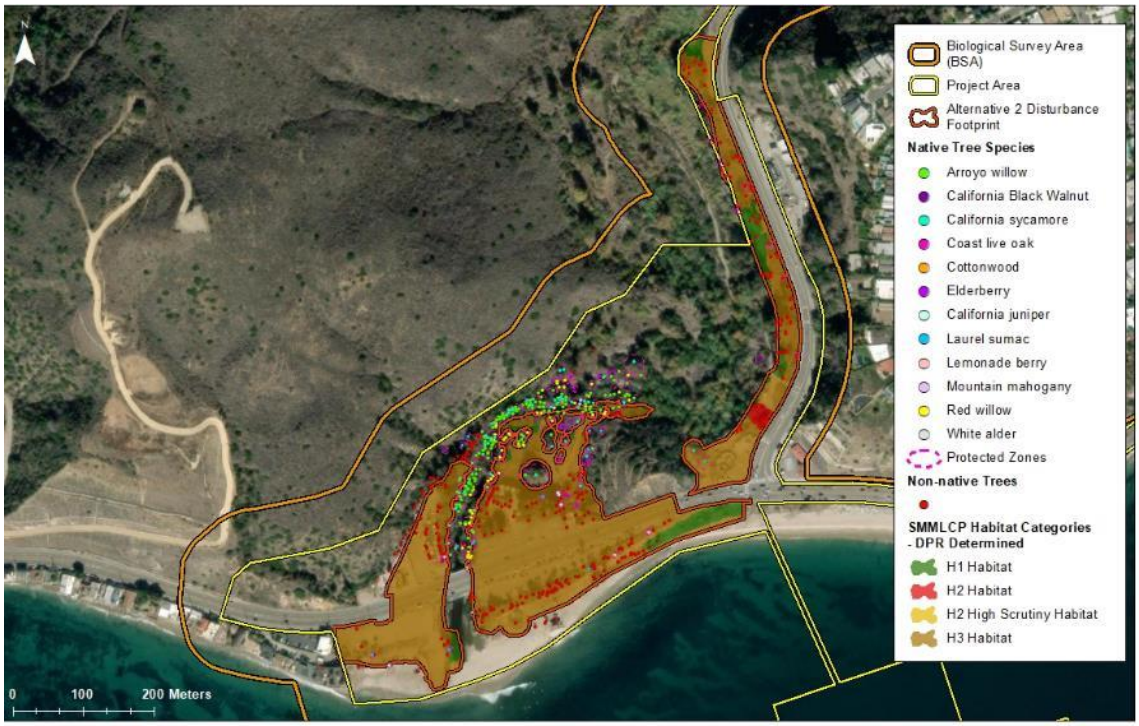
The goal of the Topanga Lagoon Restoration Project is habitat restoration. For that reason, for all build alternatives (2-4), the vast majority of the trees lining the creek banks will be avoided. Additionally, trees #358-360, 383 and 388-392 will also be retained in all alternatives because of their size and biological significance. All affected trees will be replaced onsite as part of onsite restoration activities.

Construction impacts to protected trees include direct mortality through tree removal or indirect harm or mortality by large machinery or equipment driving over tree roots, damage to overhanging branches by equipment, or compaction within the trees protected zone. Alternative 2 results in impacts to 46 protected trees, a slightly greater impact than the 41 trees affected in Alternatives 3 and 4. Alternative 2 has the greatest construction impacts as it restores the greatest number of habitat acres onsite.

For Alternative 2, 246 native trees would be avoided within disturbance areas, while 32 protected native trees would be removed and 14 native trees would be encroached upon. All non-native trees within the graded areas of the project will be removed or as required per permit requirements. Potential impacts from fuel modification will be associated with understory vegetation removal and minimal pruning to retain required clearance from the ground. Please see Figures 43-44.

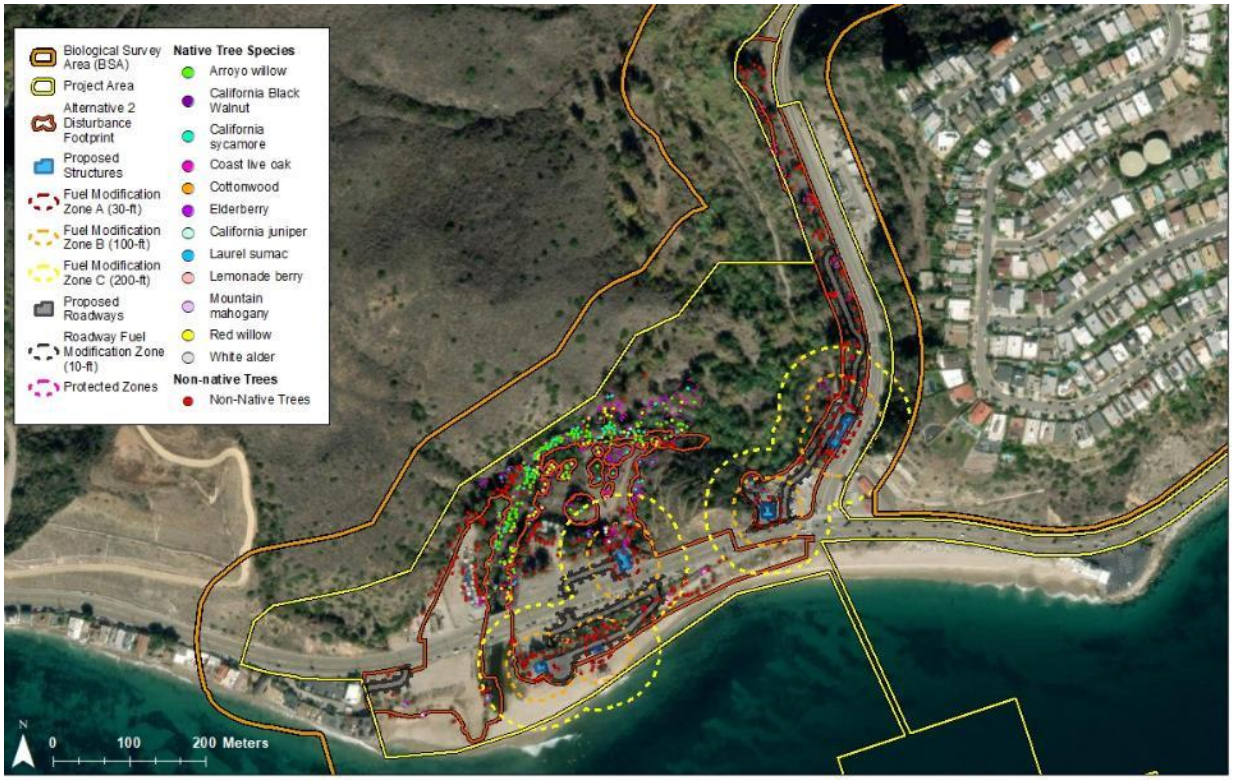
For Alternative 3 and 4, 251 native trees would be avoided, while 26 protected native trees would be removed, and 15 native trees would be encroached upon. Alternatives 3 and 4 would also remove 10 fewer nonnative trees within graded areas that are associated with the Topanga Ranch Motel compared to Alternative 2. These include eucalyptus trees #393, 394, 395, 419, 420, 421, 422, 424, a Canary Island palm #423, and mature euphorbia #425. Please see Figures 45-48. Vegetation removal and pruning will be required to retain required fire clearance from both the buildings and roadways.

In the event seepage pits are selected as the preferred wastewater treatment option, two black walnuts could be indirectly affected by construction activities. Measures to avoid and minimize impacts to black walnuts or other protected trees in the seepage pit area would be implemented.



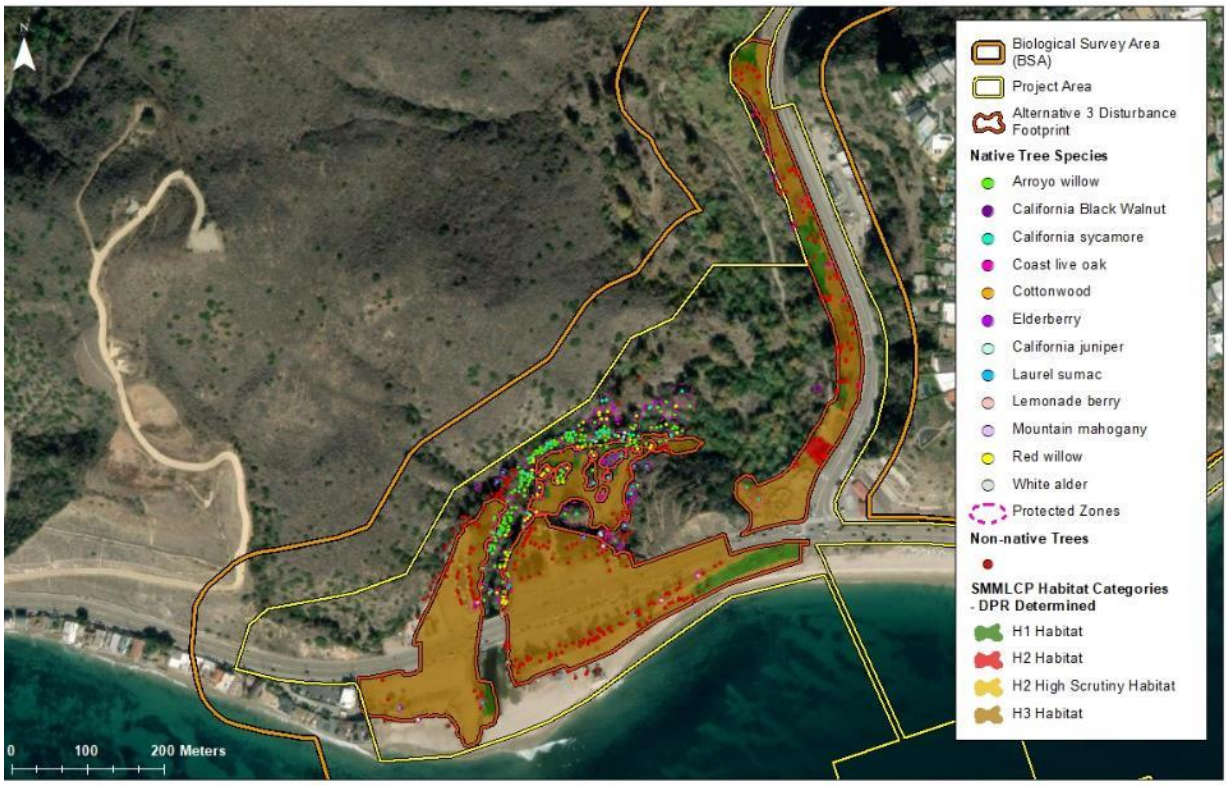
Sources: Project Boundary (EPD, Moffatt & Nichol, RCDSMM 9/20/2023), Biological Survey Area (CDPR, CRM 9/21/2023)
Service Layer Credits: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Figure 43. Onsite Trees within LCP Habitat Designations-Alternative 2.



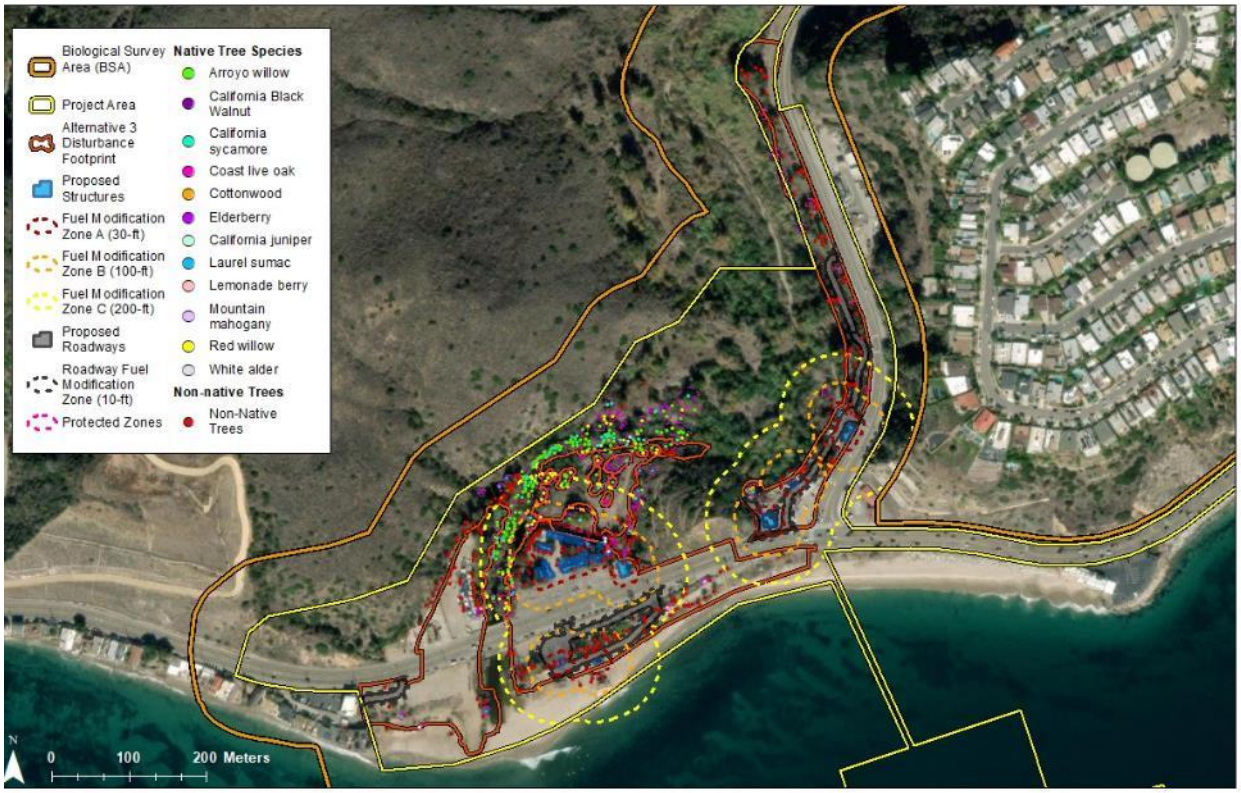
Sources: Project Boundary (EPD, Moffatt & Nichol, RCDSMM 9/20/2023), Biological Survey Area (CDPR, CRM 9/21/2023), Development Layer: Chris Nelson & Associates June 2023
Service Layer Credits: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Figure 44. Tree Fuel Modification and Protected Zones-Alternative 2.



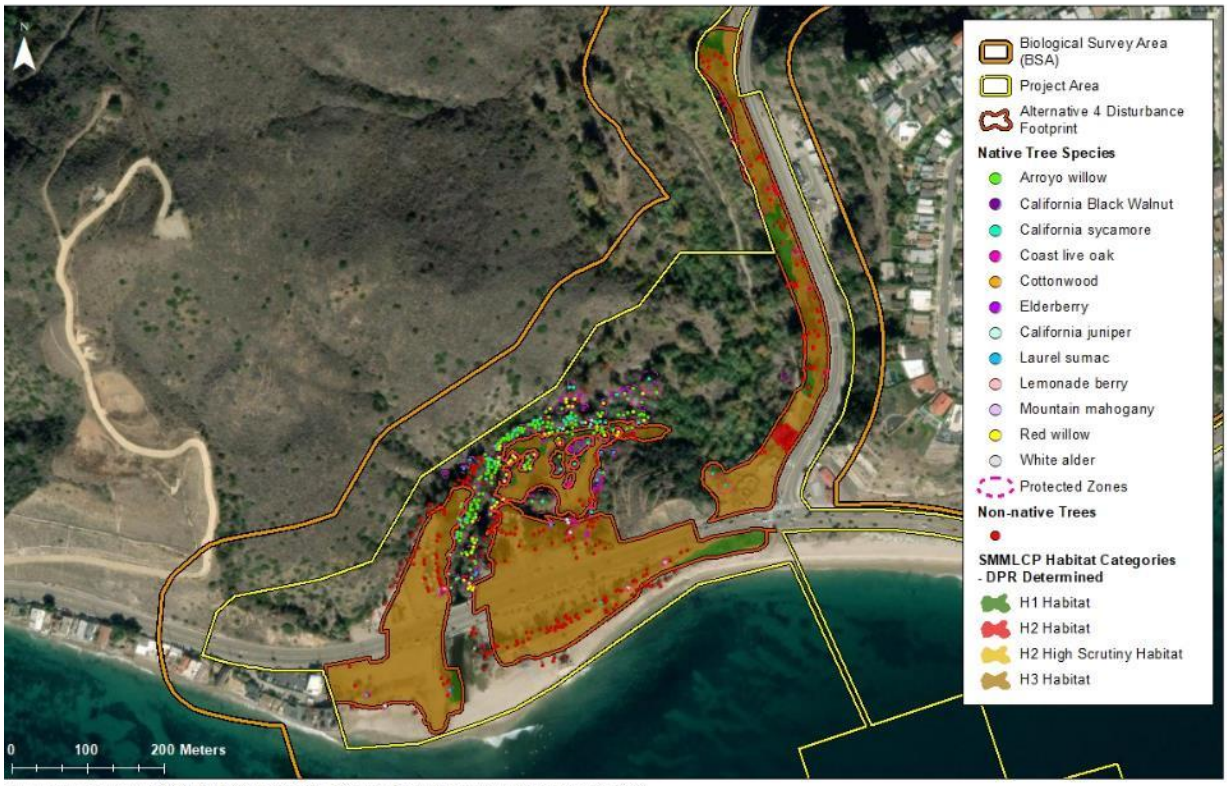
Sources: Project Boundary (EPD, Moffatt & Nichol, RCDSMM 9/20/2023), Biological Survey Area (CDPR, CRM 9/21/2023)
Service Layer Credits: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Figure 45. Onsite Trees within LCP Habitat Designations-Alternative 3.



ources: Project Boundary (EPD, Moffatt & Nichol, RCDSMM 9/20/2023), Biological Survey Area (CDPR, CRM 9/21/2023), Development Layer: Chris Nelson & Associates June 2023
ervice Layer Credits: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Figure 46. Tree Fuel Modification and Protected Zones-Alternative 3.



Sources: Project Boundary (EPD, Moffatt & Nichol, RCDSMM 9/20/2023), Biological Survey Area (CDPR, CRM 9/21/2023)
Service Layer Credits: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Figure 47. Onsite Trees within LCP Habitat Designations-Alternative 4.

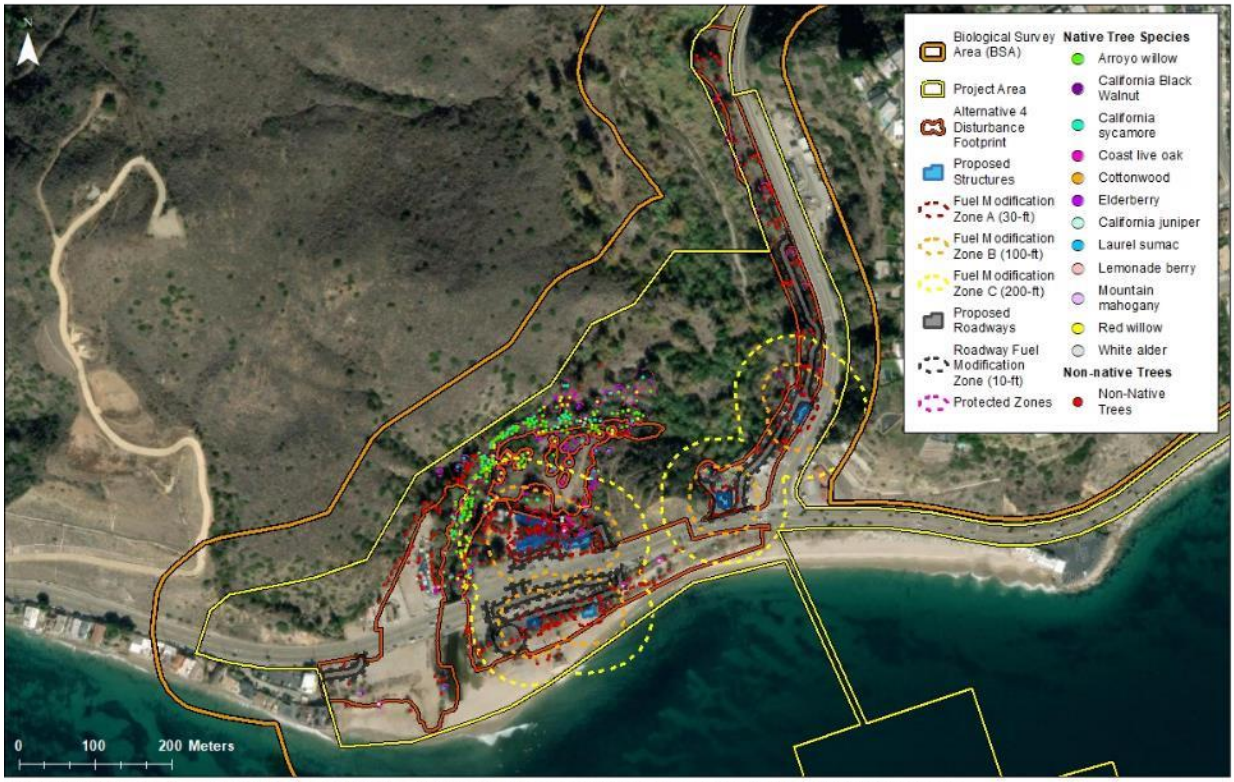


Figure 48. Tree Fuel Modification and Protected Zones-Alternative 4.

Potential impacts from fuel modification for both Alternative 3 and 4 would be greater than Alternative 2 as the Topanga Ranch Motel remains, with Alternative 3 being greater than Alternative 4.

To avoid potential significant impacts during construction activities to protected trees as outlined in Table 15, implementation of Mitigation Measure 5, would be required. This measure includes mitigation for protected native tree removal and encroachment from construction activities, protective fence to protect tree roots, detection of invasive beetles within woodlands, and annual monitoring for up to ten years to ensure mitigation occurs if native tree death occurs after construction activities are completed.

> **Mitigation Measure 5**: **Protected Tree Replacement and Management.** A preconstruction survey of protected native trees will be conducted once an Alternative and wastewater treatment option has been selected and prior to construction. The project is an extensive restoration project that not only restores natural topography and hydrology followed by extensive planting in a 7.50-9.21-acre area, but it also provides additional enhancements via weed management and focused planting in a 30.03 to 31.21-acre enhancement area (Table 11). Due to the significant net benefits of the project to native trees and habitats, and State Parks/RCDSMM record of ~ 75% survivorship of native tree plantings, protected native trees being removed or impacted during construction shall be planted at 5:1 ratio. Protected trees that are encroached upon within 3 feet of the trunk or more than 30% of the tree protected zone (TPZ) shall be replaced at a 3:1 ratio. Protected trees that are encroached into 10-30% of the TPZ shall be replaced at a 1:1 ratio. Volunteer native seedlings within the BSA can be mapped and used as mitigation trees. No mitigation shall be required for protected native trees if they are encroached by less than 10% of the TPZ, but these trees shall be monitored. Annual monitoring of all encroached protected trees shall occur for 5 years post impact and shall require annual reporting to document any tree death. If any replacement trees die during the annual monitoring period, the tree shall be mitigated at a 2:1 ratio. The watering of replacement trees shall be scheduled to have fully removed additional watering by year 4-5 to promote natural survival.

Trees will be preferentially be incorporated into appropriate open space habitat areas, but will also be incorporated into the plant palettes of the developed and transitional areas.

Mitigation Measure 6 will require the preparation of a tree management and preservation program, consistent with CCC guidelines and the County's LCP. With implementation of these mitigation measures, project construction impacts to protected native trees would be less than significant.

> **Mitigation Measure 6: Prepare Tree Management and Protection Program.** Prior to the removal of any protected tree, a tree management and preservation program will be prepared by a certified arborist or qualified biologist for review by CDFW, CCC and County. The plan shall include details for protective fencing to be placed at the limits of the Tree Protected Zone (TPZ) of all oak and native trees within or extending into the project area that may be impacted by or are in close proximity (50 feet) with construction activities. In addition, the plan will describe the protection and maintenance provisions for all native trees and the replacement trees for those native trees removed and annual reporting requirements.

All three build alternatives would significantly benefit protected trees in the long term by providing both increased quantity and quality of native habitats (see Table 10) where they could be incorporated as part of the plant palette. The Habitat Management Plan will identify which tree species will be incorporated into specific vegetation communities and at what abundance and distribution. Alternative 2 provides the greatest benefit for expanding the presence of protected trees onsite, followed by Alternative 4, then 3.

5.7 Plant and Animal Observations.

This section identifies the plant and animal species observed during field surveys in the lagoon, creek, and terrestrial areas, other "common" (not sensitive) species that are expected onsite, and a preliminary analysis of project impacts to them. Special-status biological resources are discussed in more detail in Section 5.8, Special-status Biological Resources. Marine resources are discussed in Section 5.9, Marine Resources.

5.7.1 Plants. Due to the high levels of onsite and historic disturbance, nonnative and invasive species are very abundant, and the diversity of native species and special-status species is low, most prominently in the herbaceous understory and emergent vegetation. The site is also at the terminus of a watershed and surrounded by development on three sides, which also adversely affects native plant diversity and abundance onsite. The topography associated with the lagoon and portions of the creek have been artificially constrained by adjacent development, resulting in artificially steep grade changes which significantly reduce the size of habitats that transition laterally from aquatic areas to uplands zones. Consequently, the available habitats for plants in these transition zones are especially limited and nonnative weeds and invasive species are prevalent. Conversely, special-status plants are rarely encountered.

All plant species observed during field surveys were documented and categorized as "common" (not special-status) native, special-status native, nonnative, or nonnative invasive. A list of the plant species observed is provided in Appendix O, Plant Species Observed. A discussion of special-status plant species and their presence and potential for occurrence is discussed in Section 5.8.3 Special-Status Plant Species below.

A total of 253 species of plants were recorded during field surveys, including 99 native and 154 non-native species. The non-native plant species listed with a Cal-IPC Rating are considered invasive. Invasive plant species can spread and disperse further throughout the Project area during construction related activities and are likely to outcompete or take over native vegetation. Table 18 lists invasive plant species documented in the BSA and their level of invasiveness.

Table 18. Invasive Plant Species Observed within the BSA.

Scientific Name	Common Name	Cal-IPC Rating[1]
Acacia baileyana	Cootamundra Wattle	Watch
Acacia dealbata	Silver Wattle	Moderate
Acacia melanoxylon	Blackwood Acacia	Limited
Ailanthus altissima	Tree-Of-Heaven	Moderate
Arundo donax	Giant Reed	High
Asparagus aethiopicus	Asparagus Fern	Watch
Asphodelus fistulosus	Onion Weed	Moderate
Atriplex semibaccata	Australian Saltbush	Moderate
Avena barbata	Slender Wild Oat	Moderate
Brassica nigra	Black Mustard	Moderate
Bromus diandrus	Ripgut Grass	Moderate
Bromus hordaceus	Soft Chess	Limited
Cakile maritima	European Sea Rocket	Limited
Carduus pycnocephalus	Italian Thistle	Moderate
Carpobrotus edulis	Iceplant	High
Centaurea melitensis	Tocalote	Moderate
Cirsium vulgare	Bull Thistle	Moderate
Conium maculatum	Poison-Hemlock	Moderate
Cortaderia jubata	Jubata Grass	High
Cortaderia selloana	Pampas Grass	High
Cotoneaster pannosus	Silverleaf Cotoneaster	Moderate
Cynodon dactylon	Bermuda Grass	Moderate
Delairea odorata	Cape Ivy	High
Dipogon lignosus	Okie bean	Watch
Echium candicans	Pride of Madeira	Limited
Erodium cicutarium	Redstem Filaree	Limited
Eucalyptus camaldulensis	Red Gum	Limited
Eucalyptus globulus	Blue Gum	Limited
Euphorbia terracina	Carnation Spurge	Limited
Festuca perennis	Italian Ryegrass	Moderate
Foeniculum vulgare	Sweet Fennel	High
Hedera helix	English Ivy	High
Hirschfeldia incana	Short Pod Mustard	Moderate
Hypochaeris glabra	Smooth Cat's Ears	Limited
Ipomea indica or I. pupurea	Morning Glory	Watch
Iris pseudacorus	Yellow Flag Iris	Limited
Lantana camara	Lantana	Watch
Ligustrum lucidum	Glossy Privet	Limited

Scientific Name	Common Name	Cal-IPC Rating[1]
Malephora crocea	Coppery Mesembryanthemum	Watch
Marrubium vulgare	Horehound	Limited
Myoporum laetum	Ngaio Tree	Moderate
Nicotiana glauca	Tree Tobacco	Moderate
Olea europea	Olive	Limited
Oxlis pes-caprae	Bermuda Buttercup	Moderate
Pennisetum setaceum	Crimson Fountain Grass	Moderate
Phoenix canariensis	Canary Island Date Palm	Limited
Pittosporum sp.	Pittosporum	Watch
Plantago lanceolata	English Plantain	Limited
Polypogon monspeliensis	Rabbitsfoot Grass	Limited
Raphanus sativus	Wild Radish	Limited
Ricinus communis	Castor Bean	Limited
Rumex crispus	Curly Dock	Limited
Salsola tragus	Russian Thistle	Limited
Schinus molle	Peruvian Pepper Tree	Limited
Schinus terebinthifolius	Brazilian Pepper Tree	Moderate
Silybum marianum	Milk Thistle	Limited
Sisymbrium irio	London Rocket	Limited
Spartium junceum	Spanish Broom	High
Stipa miliacea var. *miliacea*	Smilo Grass	Limited
Tamarisk ramosissima	Saltcedar	High
Tetragonia tetragonioides	New Zealand Spinach	Limited
Vinca major	Periwinkle	Moderate
Washingtonia robusta	Mexican Fan Palm	Moderate

[1] ***Source**: Cal-IPC Invasive Plant Inventory Database, 2022. Overall rating listed for southwest region, factoring impact, invasiveness, distribution, and documentation level.*

Cal-IPC Inventory Categories:

***High**: Species have severe ecological impacts, are conducive to moderate to high rates of dispersal/establishment, and most are widely spread.*

***Moderate**: Species have substantial and apparent, but not severe, ecological impacts; are conducive to moderate to high rates of dispersal, though establishment is generally dependent on ecological disturbance; and distribution may range from limited to widespread.*

***Limited**: Species are invasive, but their ecological impacts are minor on a statewide level, or there was not enough information to justify a higher score; have low to moderate rates of invasiveness; and are generally limited but may be locally persistent and problematic.*

***Watch:** Species have been assessed as posing a high risk of becoming invasive in the future in California*

5.7.2 Impact Analysis-Common Plants. The impacts to individual plant species are like that of vegetation communities. A primary goal of the project is to restore a substantial portion of the historic lagoon and associated seasonally wetted areas. This will result in both an increase in the acreage and diversity of native habitats and associated plants, The project also intends to plan for projected climate change by providing areas where vegetation can retreat during rising sea levels, thereby maximizing the potential for the survival of onsite habitats and associated plants. A Habitat Restoration Plan will be completed for the project, which will identify the location, number, and diversity of native species to plant

to not only improve the current condition of the project area but to proactively address future SLR and climate change concerns.

Under Alternative 1, No Project/Managed Decline would keep in place the existing configuration and degraded nature of habitats onsite. Although no temporary disturbance of vegetation would occur beyond the ongoing fuel clearance zones, and limited management of invasive weeds and hazardous trees, the habitat integrity and ecosystem health is anticipated to continue to decline as the impacts of disturbance, presence of invasive species, and unmanaged human activity increases. The relative presence of native plant species is expected to decrease as invasive species continue to increase.

Under all build project scenarios, Alternatives 2-4, significant vegetation removal would occur outside of existing wetted areas onsite. Although the vast majority of protected native trees lining the wetted banks of the creek would be preserved and protected during grading, most other vegetation outside of the wetted areas would be removed. This is most extensive for Alternative 2, with lesser vegetation removal projected for Alternatives 3 and 4. This short-term disturbance associated with the removal of common native species is not considered significant. It must be put into the context of the substantial net benefit to native habitats that would occur over the long-term, resulting in an increase in diversity and abundance of native plant species.

There could be significant effects associated with the spread of invasive propagules during construction, however. Although a significant reduction in invasive plant species onsite is expected from the project, care must be taken during construction to minimize their spread offsite or into newly planted areas. The HRAMP being prepared for the project will address methods to do so. Mitigation Measure 2, above, ensures incorporation of measures in the plan to minimize invasive species spread to the maximum extent feasible.

Section 5.4.6 also discusses the location and quantity of anticipated habitat zones under current and future SLR scenarios. Depending on the alternative chosen, different suites of habitats would become more prevalent, and with them their associated plants (Table 10). We see that Alternative 2, tends to increase the extent of seasonal shallow open water, seasonal unvegetated flat, emergent marsh and decrease developed areas. Open water is anticipated to increase, but just under the 6.8’ SLR scenario. Alternative 3 tends to see an increase in open water, riparian, and riparian/upland transition for all SLR scenarios, while Alternative 4 tends to see an increase in upland and sand habitats. The extent of coastal sage scrub/upland habitat is unchanged for all SLR scenarios.

Plants at Topanga lagoon would be enriched by both the expansion of existing habitats onsite, but just as importantly, by the removal of onsite nonnative/invasive species and their replacement with a more diverse native plant palette that should occur in the area. For example, emergent marsh habitat is very limited onsite. It would not only be expanded during restoration but would be planted with species such as tule, jaumea, cattail, alkali heath, and others that are generally lacking onsite. Limited resources like the small patch of saltgrass would be significantly expanded. This would occur for project Alternatives 2-4 where fill is removed to recreate a more natural topography. Alternative 2 would have the additional benefit of increasing these rare habitat types within the western secondary channel.

Implementation of Mitigation Measures 1-6 will additionally benefit native plants by providing directed planning and protection guidance for habitat improvements and maintenance of the plants within them.

5.7.3 Animals. The project area is dominated by the highly disturbed Topanga Creek riparian corridor located at the downstream terminus of a watershed that drains via Topanga Lagoon to the Pacific Ocean. This corridor is surrounded by less disturbed scrub/shrublands on steeper slopes to the north, development to the east and west, and an active beach front to the south. Despite this, the area provides an important source of habitat for both resident and migrating species largely due to the rarity and importance of lagoon and riparian habitats as fish and wildlife resources.

Wildlife observations for the project area (excluding marine areas) are summarized in Appendix P, Animal Species Observed. They incorporate the following project studies completed between 2020-23 and as appendices to this document:

- CDPR's 2020-2022 general surveys
- Appendix E BMI Surveys and Assessment
- Appendix F FCalifornia Grunion Technical Report
- Appendix G Tidewater Goby Technical Report
- Appendix H Southern Steelhead Trout (*Oncorhynchus mykiss*) Technical Report
- Appendix I Aquatic Herpetofauna Stream Surveys Technical Report
- Appendix J Terrestrial Herpetofauna Surveys Technical Report
- Appendix K Least Bell's Vireo Surveys Technical Report
- Appendix L Terrestrial Mammal Surveys Technical Report
- Appendix M Bat Surveys Technical Report
- Appendix N Marine Surveys

Over a hundred animal species were observed during project surveys within the non-marine BSA, including 12 nonnative species. Of the native species observed during non-marine surveys, 21 were identified as special-status. A complete list of non-marine animal species observed is attached in Appendix P, Animal Species Observed.

This list provides an outline of the species that are known to use the site but is not assumed to be a complete list of animal species that do or could use the project area in the future.

5.7.3.1 Invertebrates. Site surveys did not focus on invertebrates, beyond collection of benthic macroinvertebrate (BMI) samples in the lagoon and creek as part of assessing water quality and ecosystem health and searching for special-status invertebrates that had the potential to be present based on the range of the species and habitats onsite.

2020 BMI surveys identified 12 taxonomic groups present. Disturbance tolerant ostracods and chironomids dominated. These taxa are preferred food sources for tidewater goby. See Appendix E, BMI Surveys and Assessment for raw data.

Terrestrial and aerial invertebrates incidentally encountered during other surveys were noted and included European honeybee (*Apis* sp.), and individual monarch butterflies (*Danaus plexippus)*, which had one potential overwintering site onsite identified (Figure 49). Marine blue (*Leptotes marina*), gray buckeye *(Junonia grisea*) and anise swallowtail (*Papilio zelicaon)* butterflies were occasionally observed, as were bumble bee (*Bombus* sp.). Red swamp crayfish (*Procambarus clarkia)* was frequently encountered in creek pools.

Although not seen onsite, the following species are anticipated to use the project area as they have been documented upstream: horsehair worm (Nematamorpha, Gordioida), bladder snail (Physidae), spittle bug (Cercopidaea), *Jerusalem* cricket (Stenopelmatidae), blue-fronted dancer damselfly (*Argia apicalis*), white cabbage butterfly (*Pieris* sp.), tussock moth (Lymantriinae), red admiral butterfly (*Vanessa atalanta*), morning cloak butterfly (*Nymphalis antiopa)*, Lorquin's admiral butterfly (*Limenitis lorquini*), orangetip butterfly (*Anthocaris* sp.) and yellow swallowtail butterfly (*Papilio* sp.).

Figure 49. Monarch Butterfly Overwintering Zone.

5.7.3.2 Fishes. Due to the decades of fish work that has been completed along the beach, lagoon, and creek areas by the RCDSMM, CDFW, and others, we have a solid understanding of fish species onsite, and those likely to be found during project construction, and how fish would benefit from the Topanga lagoon restoration. Documented species include the special-status steelhead trout, tidewater goby, California grunion, and arroyo chub. Also infrequently encountered were more "common" native species such as topsmelt (*Atherinops affinis*), mullet *(Mugil cephalus)*, and California killifish (*Fundulus parvipinnis).* Nonnative Mississippi silverside (*Menida audens)* and goldfish *(Carassius auratus)* were also infrequently encountered.

5.7.3.3 Herpetofauna. Site surveys documented a handful of herpetofauna species. A few California and Pacific tree frog (*Pseudacris cadaverina, and P. regilla).* were noted but are not expected to be frequently encountered given the degraded nature of the site and presence of red swamp crayfish.

The two most common lizards were found, western fence lizard (*Sceloporus occidentalis),* and side-blotched lizard (*Uta stansburiana).* Three snakes were also found, the California Species of Special Concern (SSC) two-striped garter snake and San Bernardino ringneck snake (*Diadophis punctatus modestus*), and the locally sensitive coast mountain kingsnake (*Lampropeltis multifasciata*). These are discussed in more detail in Section 5.8, Special Status Biological Resources.

Although not observed, we would expect several additional terrestrial reptiles to occur onsite as either residents or migrants. These include generalists like striped-racer (*Coluber lateralis)*, gopher snake (*Pituophis catenifer*), rattlesnake (*Crotalus oreganus*) and alligator lizard (*Elgaria multicarinata*). Ensatina salamander (*Ensatina eschscholtzii*) would be associated with wetted areas.

5.7.3.4 Birds. Birds were extensively surveyed through nine different visits that focused on presence/ absence rather than specific nesting activity. EBird records and historic USGS surveys for the Topanga Lagoon area were also reviewed. Species utilized a wide range of onsite habitats, with shorebirds

and more aquatic species like gulls, herons, sandpipers, egrets being frequently noted due to their size and visibility along the shoreline. Common scrub and woodland species such as scrub jay (*Aphelocoma californica)*, wrentit (*Chamaea fasciata*), canyon wren (*Catherpes mexicanus*), California towhee (*Melozone crissalis*), and hummingbirds (*Calypte anna, Selasphorus sasin)* were frequently encountered. Species especially suited to the disturbed nature of the site were prevalent such as American crow (*Corvus brachyrhynchos)*, black phoebe (*Sayornis nigricans)*, rock pigeon (*Columbia livia)*, and mourning dove *(Zenaida macroura),* among others.

Two special-status species have been observed onsite, and also have a moderate or high potential to occur in the project area during their protected life stage: Cooper's hawk (*Accipiter cooperi*) and yellow warbler (*Setophaga petechia).* Twelve additional special-status species were observed onsite, but are not expected during their protected life stage (nesting, nesting colony, communal roosts, wintering): great egret *(Ardea alba),* great blue heron (*Ardea herodias*), olive-sided flycatcher (*Contopus cooperi)*, snowy egret (*Egretta thula),* Caspian tern *(Hydroprogne caspia),* California gull (*Larus californicus),* long-billed curlew (*Numenius americanus),* double-crested cormorant *(Nannopterum auritum),* black-crowned night heron (*Nycticorax nycticorax),* osprey (*Pandion haliaetus),* brown pelican (*Pelecanus occidentalis),* and elegant tern (*Thalasseus elegans).* These species are discussed in more detail in *Appendices N, Animals Observed* and *P, Potential for Occurrence-Special Status Animals.*

5.7.3.5 Terrestrial Mammals. The terrestrial mammal sampling captured most species that would be anticipated to currently use the site as either residents (small mammals) or as part of a greater resource area (larger mammals). The species observed included several mouse species (*Peromyscus* spp.); two woodrats (special-status *Neotoma lepida intermedia* and more common N. *macrotisa*); two rabbits-desert cottontail (*Sylvilagus audubonii*) and brush rabbit (*S. bachmani*); two canids-coyote (*Canis latrans*) and gray fox (*Urocyon cinereoargenteus*); two felids-bobcat (*Lynx rufus*) and Proposed State Candidate mountain lion (*Puma concolor*); raccoon (*Procyon lotor*); one marsupial, the nonnative Virginia opossum (*Didelphis virginiana*), and one ungulate, mule deer (*Odocoileus hemionus*).

Other common species that could use the site, but were not observed, include pocket gopher (*Thomomys bottae*), California vole (*Microtus californicus*), broad-footed mole (*Scapanus latimanus*) and ornate shrew (*Sorex ornatus*). Nonnative black rat (*Rattus rattus*), Norway rat (*Rattus norvegicus*), and house mouse (*Mus musculus*) were also expected due to the proximity of adjacent development but were not captured.

5.7.3.6 Bats. Seven species of bats were documented acoustically within the project area. These include the big brown bat (*Eptesicus fuscus),* Mexican free-tailed bat *(Tadarida brasiliensis),* California myotis (*Myotis californicus),* and canyon bat (*Parastrellus hesperus),* as well as the special-status silver-haired bat (*Lasionycteris noctivagans),* western red bat (*Lasiurus frantzii)* and Yuma myotis (*M. yumanensis).* Canyon and Mexican free-tailed bat were the most commonly documented, big brown bat and silver-haired bats were uncommon, and the remainder were rarely documented. All these bat species are expected to forage through the site. Canyon bat and Mexican free-tailed bat most likely day roost in the canyon habitats north of and outside of the project area. The remaining species could roost in larger western sycamore trees and potentially any mature tree onsite. The Topanga Ranch Motel could harbor roosting bats in structures where exclusion features are absent (e.g., wire mesh screens across attic vents).

5.7.3.7 Impact Analysis-Common Animals. The project has the potential to harm common animals temporarily during construction but would result in a long-term net benefit.

Under Alternative 1, No Project/Managed Decline would keep in place the existing configuration and degraded nature of habitats onsite. Although no temporary disturbance to soils or vegetation would occur beyond the ongoing but limited management of invasive weeds and hazardous trees by CDPR and partners, the habitat integrity and ecosystem health is anticipated to continue to decline as the impacts of disturbance, presence of invasive species, and unmanaged human activity increase. Habitat compression due to SLR and increased edge effects due to population growth are also anticipated. All these factors would put more

pressure on local animals and are likely to facilitate the decline of taxa such as amphibians, bats, and other species that are more sensitive to anthropogenic effects.

Under all build project scenarios, Alternatives 2-4, significant vegetation removal and ground disturbance would occur outside of existing wetted areas onsite. Although Alternative 2 would have the most ground disturbance during construction with implementation of standard animal protection practices, there is not expected to be an obvious difference between Alternatives 2-4 for temporary construction impacts.

During construction, burrowing mammals, roosting bats, nesting birds, and aquatic species are the most likely to be affected as larger or more mobile species can typically relocate out of harm's way. As impacts would be at the level of individual, and not at populations of animals, these impacts are considered less than significant for "common" (not special-status) wildlife species. Standard measures to avoid, minimize and mitigate potential impacts have been identified in Mitigation Measures 7 and 8. Additional protective measures for special-status wildlife (Mitigation Measures 10-20) will be implemented during construction to the benefit of all animal species. Together, these measures include preconstruction surveys for flagging and avoiding sensitive sites (nests, burrows, roosts), protecting aquatic areas through sediment management and use of construction Best Management Practices (BMPs), animal trapping for relocation out of harm's way, gently flushing more mobile species out of the project area and installing exclusion fencing once an area is cleared to minimize movement of animals back into active construction zones, and biological monitoring during ground or vegetation disturbing activities or activities near sensitive areas or where animals are likely to be trapped (burrows).

Mitigation Measure 7: General Animal Protection Measures. To minimize impacts to fish and wildlife in general, the following standard measures shall be implemented:

1. Preconstruction environmental education shall be conducted for all construction staff prior to start work to educate onsite crews about potential biological resource concerns. Periodic tail-gate refresher trainings shall occur to update field crews on ongoing concerns and anticipated resource protection activities and constraints.

2. All onsite biologists/monitors shall be qualified and hold the required permits from CDFW/USFWS to handle common wildlife. Handling and species management shall be implemented as outlined in project permits. The biologist shall have the authority to stop work to allow animal retreat or relocation out of harm's way.

3. Exclusion fencing (e.g., 4'-6' high silt fence keyed in) shall be installed around the active work area to limit the potential for re-colonization of the site prior to construction activities. Fence stability shall be surveyed daily and repaired within 24 hours.

4. To avoid avoidable animal mortality, all equipment will be checked for animals underneath before entering and starting. All open trenches, pipes and containers shall be checked daily for entrapped animals, and escape ramps or routes shall be provided to them.

5. A qualified biologist will be present during vegetation removal or initial ground-disturbing activities to facilitate species moving out of harm's way. Special attention shall be given to burrows and allowing animals to escape during these activities. Earthwork and vegetation removal should be sequenced where feasible to facilitate animal movement towards open space areas. When common animals are captured incidentally during special-status animal relocation work, they shall be relocated to a safe location offsite in appropriate habitat.

6. Construction lighting shall be directed away from non-work areas and directed downward to avoid adversely affecting adjacent species and their movement corridors.

Mitigation Measure 8: Standard BMPs to Protect Aquatic Habitats. To minimize impacts to fish and wildlife in general, the following standard measures shall be implemented. Their intent is to

minimize temporary and limited turbidity or water pollution impacts from adjacent ground disturbing activities. If more stringent measures are identified in the project permits and SWPPP, they will also be implemented.

1. Siltation fences, or other suitable material, will be installed at the edge of the work areas to be graded to avoid movement of soil into wetted areas.

2. Vegetation removal will be conducted so that materials are not permitted to fall into wetted areas.

3. Stockpiles will be located away from the lagoon and creek corridor and will be contained by standard BMPs such as wattles, tarps, or burlap to ensure materials are not moved into the creek due to wind, rain, gravity, or flooding.

4. No equipment maintenance will be permitted within 100-feet of waterways to avoid accidental spills from entering the lagoon and/or creek.

5. Soil will be stabilized in bare areas with mulch, straw matting, hydroseeding or other approved methods as described in the Restoration Plan to avoid movement of soils into wetted areas.

6. Ground disturbing activities will not occur during rain events. Within 24-hours of a projected rain event, the site will be "buttoned up" with appropriate BMPs such as covers over stockpiles and wattle installation at graded area boundaries and along slopes so that soil and project materials will not wash into adjacent areas.

7. Access roadways will be periodically swept (paved) or wetted down (unpaved) to minimize soil movement into adjacent areas due to wind.

Over the long term, Alternatives 2-4 would all provide substantial benefits to animals compared to Alternative 1. This occurs because the project would not only increase the quantity and variety of onsite habitats but would also improve their quality through removal of invasive species and increase the number and diversity of native plants. Additional retreat and refuge areas are restored under Alternatives 2-4 which will better buffer animals from the adverse effects of climate change and SLR, compared to Alternative 1.

Resident and migrating fish would benefit from the additional refugia areas and better protected migration corridors that are available under Alternatives 2-4. Alternative 2 provides the most diverse habitats and refugia opportunities for fish within the lagoon as it provides the greatest extent of these habitats.

For aquatic amphibians, Alternatives 2-4 all allow for the reestablishment of aquatic species like California tree frog, and Pacific tree frog with the expansion and improved condition of lagoon, wetland, riparian and transitional habitats. Alternative 2 has the most direct benefits as it includes restoration of side channels of different elevations which would be resilient to sea level changes. Side channels function as refugia for treefrog eggs and tadpoles when non-native predators are present.

Alternative 2 also provides the most access to restored habitat for reptiles, including increased wetted and riparian areas attractive to alligator lizards, and ensatina, among others. The restoration of the flat area associated with the Topanga Motel would attract more coastal sage scrub species onsite. Alternatives 4 and 3 also provide these benefits, but to an increasingly lesser degree.

Terrestrial mammals will benefit most from increasing the size of restored habitat areas as well as creating a wider variety of habitat types along the new dendritic channel patterns, for this reason, all build Alternatives are substantially better for mammals than Alternative 1. Alternative 2 provides the greatest benefit, followed by Alternatives 4 and then 3, to lesser degrees.

All build alternatives would benefit bats by improving water quality which enhances foraging opportunities through promoting more diverse insect fauna. Enhanced roosting opportunities would also occur through restoration, but to a lesser degree.

In summary: Of all the build alternatives, Alternative 2 provides the most benefits for animals over the long term as it maximizes restoration acres and variety, but also reduces adjacent development associated with the Ranch Motel, which could be a source for habitat impacts and edge effects. Alternative 1 does the most harm as onsite habitats and the associated wildlife will continue to degrade. As the project would provide a net benefit, mitigation is not required to protect common animals over the long-term.

5.8 Special-status Biological Resources, Terrestrial/Freshwater Aquatic Areas

This section summarizes the special-status biological resources, per category, which have been observed or are anticipated to be present within the terrestrial and freshwater aquatic zones of project area and the potential impacts of the project upon them. Marine resources are addressed in Section 5.9.

Summary tables of the special-status plants and animals included in this Biological Assessment are found in Appendix Q and R, respectively. The species included in these tables are based on a review of the California Natural Diversity Database, USFWS IPAC, and NOAA Fisheries Species Directory, compilation of current and historical site surveys and the opinion of local CDPR, SMMNRA, RCDSMM experts and other local scientists familiar with the area.

Only species that are known to be present onsite or have a moderate-high probability of being present, are highlighted in the Appendix Q and R summary tables and discussed in detail in the relevant Plant and Animals sections below.

We also provide an impact analysis for each special-status biological resource category. When impacts would be the same for specific species, these are grouped for analysis.

5.8.1 Sensitive Natural Communities. As discussed in Section 5.4 and 5.5, the CDFW, CCC, and Los Angeles County categorize plant communities/habitats by sensitivity. This section focuses on CDFW sensitive natural communities.

CDFW identifies conservation status for plant communities to determine the significance of a project's impacts to them. The conservation status ranking system consists of a geographic scale (G=Global; S=State) and a degree of threat (1=critically imperiled; 2=imperiled; 3=vulnerable to extirpation or extinction; 4=apparently secure; and 5=demonstrably widespread, abundant, or secure). Plant communities with a global or state conservation status ranks of G1 through G3, or S1 through S3 are identified as "natural communities of special concern".

Field surveys in 2020-23 identified the following eight natural communities within the BSA that are considered sensitive by CDFW. Their acreages, specific sensitivity status and distribution are summarized in Table 10 and Figure 39.

- California Sycamore (*Platanus racemosa*) Woodland / Red & Arroyo Willow (*Salix laevigata*, *S. lasiolepis*) and Mulefat (*Baccharis salicifolia*) Understory [61.312.05]
- California Black Walnut (*Juglans californica*) Woodland/ Annual Herbaceous understory [72.100.03]
- California Black Walnut (Juglans californica)/ Laurel Sumac (*Malosma laurina*) Woodland [72.100.07]

- California Brittlebush (*Encelia californica)* - California Sagebrush (*Artemisia californica)* Shrubland Association [32.050.01]
- Ashyleaf Buckwheat (*Eriogonum cinereum)* Association – [32.035.01]
- Purple Sage (*Salvia leucophylla*) - Ashyleaf Buckwheat (*Eriogonum cinereum*) / Annual Herb Association - [32.090.05]
- Lemonade Berry (*Rhus integrifolia)* Shrubland Association - [37.803.01]
- Giant Wildrye (*Elymus condensatus*) Grassland [41.265.01]

The sensitive scrub/shrubland habitats are found on the hillsides along the project perimeter, including the knoll north of PCH, while the woodland is found scattered along the riparian corridor wherever native trees dominate the canopy.

5.8.1.1. Impact Analysis-Sensitive Natural Communities. Alternative 1, No Project/Managed Decline would keep in place the existing configuration and degraded nature of habitats onsite. Although no temporary disturbance of vegetation would occur beyond the ongoing but limited management of invasive weeds and hazardous trees by CDPR and partners, habitat degradation would continue. Invasive plant species, including the highly invasive species *Arundo donax*, would remain present and would likely out-compete many species within the California Sycamore - Red & Arroyo Willow - Mulefat sensitive vegetation community, reducing habitat quality. Eucalyptus dominated areas would continue to spread into sensitive wood and scrublands, and terracina spurge and nonnative thistles and grasses would continue to infill the understory in most habitats, further reducing habitat quality. Habitat integrity and ecosystem health are anticipated to continue to decline as the impacts of disturbance associated with habitat degradation, unmanaged human activity, and invasive species presence increases. This would be exacerbated by habitat compression due to SLR.

Although there would be no direct impacts due to project related activities under this alternative, the consequences of no action would continue to gradually reduce the quantity and quality of sensitive natural communities.

Short-term impacts to sensitive natural communities for Alternatives 2-4 include vegetation removal and ground disturbance during construction activities and the potential for the spread of invasive weed species. Alternative 2 results in the most temporary disturbance of the build alternatives, compared to Alternatives 4 and 3, but also provides the most long-term benefit to sensitive habitats. This short-term disturbance must be viewed in the context of the substantial net benefit to the quality and quality of sensitive natural communities that would replace them and that would expand over the long-term as vegetative cover increases.

Selection of seepage pits as a wastewater treatment option could have temporary indirect effects to walnut woodland habitats (California Black Walnut (*Juglans californica*) Woodland/ Annual Herbaceous understory [72.100.03] and California Black Walnut (Juglans californica)/ Laurel Sumac (*Malosma laurina*) Woodland [72.100.07]). As the understory of these areas have extensive nonnative invasives, and adjacent areas have large numbers of nonnative tree species, restoration of the greater seepage pit areas is anticipated to have a net benefit to sensitive walnut woodland habitats.

Implementation of the Habitat Restoration Plan for the project will reduce temporary construction impacts by facilitating effective and timely restoration (Mitigation Measure 3), as will implementation of invasive species control measures (Mitigation Measure 2). Mitigation Measure 4 ensures restoration goals for sensitive plan communities are met, while Mitigation Measures 5-6, provide protection and planning for individual protected native trees, which are the primary components of the sensitive woodland communities onsite. With the above actions, temporary impacts to sensitive natural communities are not considered significant.

The long-term goal of the project is to provide a net increase in the quality and quantity of native vegetation communities, which includes CDFW natural communities of special concern, as well as CCC ESHA and LCP SERA. The project is thereby expected to be self-mitigating. Alternative 2 would provide the greatest increase in CDFW sensitive communities followed by Alternatives 4, then 3.

To ensure that the project meets its goal in terms of long-term habitat gains for both common and sensitive vegetation communities, and to reduce construction impacts, Mitigation Measures 1-6 will be implemented.

5.8.2 Critical Habitat. Critical habitat is a term defined and used in the Endangered Species Act. It is a specific geographic area(s) that contains features essential for the conservation of a threatened or endangered species and that may require special management and protection. Critical habitat may include an area that is not currently occupied by the species but that will be needed for its recovery. An area is designated as critical habitat after the USFWS or NOAA publishes a proposed federal regulation in the Federal Register and receives and considers public comments on the proposal. The final boundaries of the critical habitat are also published in the Federal Register.

As show in Figure 50, the lagoon and creek within the project area are designated as critical habitat for two species: Federally Endangered tidewater goby, and federally and state candidate endangered steelhead trout-Southern California (Santa Monica Bay Hydrologic Unit 4404, *Topanga Hydrologic Sub-area 440411.* Outlet(s) = Topanga Creek (Lat 34.0397, Long -118.5831) upstream to endpoint(s) in: Topanga Creek (34.0838, -118.5980).

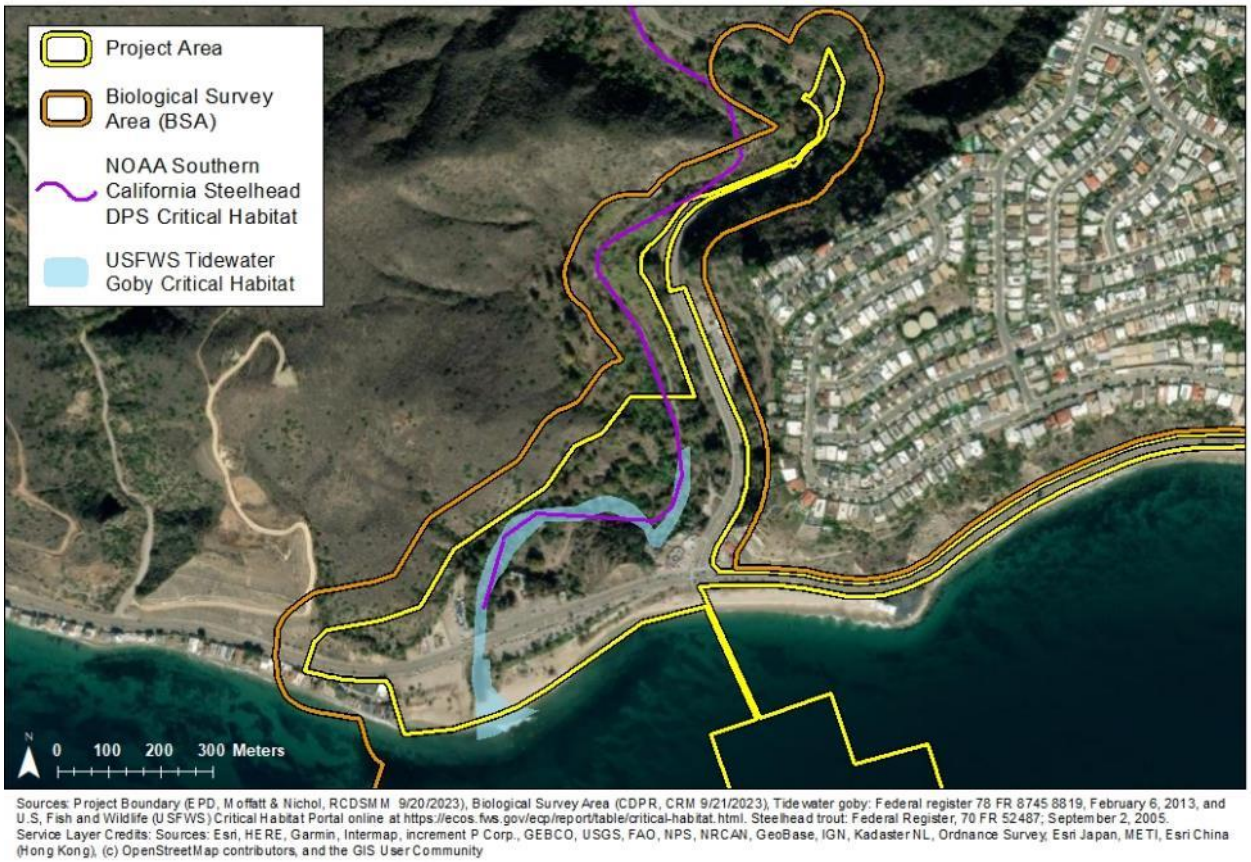


Figure 50. Critical Habitat Within the Project Area. *Source: Tidewater goby: Federal register 78 FR 8745 8819, February 6, 2013, and U.S, Fish and Wildlife (USFWS) Critical Habitat Portal online at https://ecos.fws.gov/ecp/report/table/critical-habitat.html. Steelhead trout: Federal Register, 70 FR 52487; September 2, 2005.*

5.8.2.1. Impact Analysis-Critical Habitat. Alternative 1, No Project/Managed Decline would not directly impact critical habitat but would contribute to its continued deterioration. The Topanga Ranch Motel will continue to deteriorate without restoration and pollutants associated with its structures are likely to wash into critical habitat areas. Several existing business leases directly abut wetted areas (Rosenthal's, Malibu Feed Bin/Oasis) and contribute stormwater runoff and trash into critical habitat. Although CDPR and its partners would continue annual fuel clearance activities, and limited management of invasive weeds and hazardous trees onsite, net habitat degradation is anticipated due to the scale of the current invasive weed infestation. Of greatest concern is the highly invasive species *Arundo donax*, which would remain present and would continue to overgrow and clog the stream corridor.

Steelhead trout would continue to decline without restoring the lagoon as there would be no reduction in high velocity breaches during storm events for migration. In addition, both juvenile steelhead trout and tidewater goby refugia areas within the lagoon would decrease if restoration of the lagoon does not occur due to high velocity breaches during storm events. Impacts to critical habitat would be exacerbated by habitat compression due to SLR and climatic changes that increase environmental stressors.

Tidewater gobies are currently thriving in Topanga lagoon despite the degraded and limited habitat onsite, with a population estimate of 90,000 individuals observed during a September 2022 translocation effort by the RCD, USFWS, and CDPR. Suitable water depth, salinity, and lack of aquatic predators (excepting crayfish) have facilitated a healthy population onsite since its natural migration to Topanga Lagoon in 2001. DNA analysis points to Malibu Lagoon as the natural source population (Jacobs and Swift 2001).

Under all build project scenarios, Alternatives 2-4, significant vegetation removal and ground disturbance would primarily occur outside of existing wetted areas onsite to minimize potential impacts to protected fish and their critical habitat. The exceptions are during demolition of the footings, abutments, and pier walls of the existing bridge. Work within wetted areas is estimated to last approximately six months over the four-year construction period and would require dewatering a 0.29 to 0.33-acre (depending on alternative selected) section of stream during active demolition and construction activities. Short term direct impacts associated with excavation, demolition, and dewatering activities, are likely to include increased turbidity and minor sound vibrations during installation of protective devices such as coffer dam and silt fences, and in the dewatered zone, removal of limited aquatic vegetation and reduction in available habitat. Indirect impacts to critical habitat could occur through both work within wetted areas and construction activities directly adjacent to them. Indirect impacts could include temporary vegetation removal that shades waterways during restoration, movement of soil and construction materials into the creek, and adjacent noise levels and other disturbing activities.

Although Alternative 2 would have the most ground disturbance during construction with implementation of standard animal protection practices, there is not expected to be an obvious difference between Alternatives 2-4 for temporary construction impacts to goby or steelhead critical habitat with implementation of Mitigation Measures. In the long term, critical habitat is expected to increase through the expansion of wetted areas and associated increases of the quantity and quality of adjacent native habitat.

Mitigation Measure 8 minimizes construction impacts on adjacent wetted areas by identifying BMPs to be implemented during construction. Mitigation Measures 1-6 identify protections for native habitats and protected trees, which are a key element to provide needed shade and structure for critical habitat. Measure 9 below provides additional measures to protect special-status fish, including steelhead and tidewater goby, and their critical habitat.

> **Mitigation Measure 9: Implement Section 7 Consultation Requirements.** Section 7 consultation with USFWS and NMFS/NOAA is required for the project as it involves federally endangered species and their critical habitat. All USFWS/NMFS/NOAA permit requirements will be implemented. In the event there is a conflict between USFWS/NMFS/NOAA requirements, and

other project permits or mitigation measures, the most protective measures for biological resources will be implemented.

With incorporation of Mitigation Measures 1-3, 6-9 the project may affect, but is not likely to adversely affect, critical habitat. Impacts would be less than significant with mitigation measures.

5.8.3 Special-Status Plants. One special-status plant, southern California black walnut (*Juglans californica*), was observed onsite in the project area during field surveys in 2020-23 in low numbers, as discussed below.

No other special-status plant species had a high or moderate potential to occur within the BSA. See the Plant Species Observed, Appendix O, and Potential for Occurrence, Special-Status Species, Appendix Q, for the full list of special-status species observed and considered for this analysis.

5.8.3.1 Southern California Black Walnut. Black walnut is a CDFW Special Plant, and on the California Native Plant Society Watchlist in category 4.2. This species is found in woodlands and along riparian areas in the southern half of the state. It takes the form of a large shrub with 1-5 trunks, or a small single-trunked tree. Southern California black walnut has thick bark that is deeply channeled at maturity and has large, pinnately compound leaves with 11-19 lance-shaped leaflets with toothed margins and no hair in the vein angles. Winter deciduous, this species is fire hardy, and its nuts were eaten historically by the Chumash Indians of the Channel Islands of California.

Walnuts were sporadically distributed in the riparian habitat north of Rodeo Grounds Lane, west of Topanga Creek, and east of Topanga Canyon Blvd. Walnuts are generally located on slopes that would not be affected during grading. The exception is two black walnuts identified in the general seepage pit OWTS area.

5.8.3.2 Impact Analysis-Special-status Plants. If Alternative 1, No Project/Managed Decline, is selected, onsite habitats would continue to degrade due to ongoing anthropogenic impacts, the continued spread of invasive species, increased environmental stressors due to climate change, and habitat compression due to SLR. This would put further pressure on the few remaining individuals of sensitive walnut onsite and decrease the chance of other special-status plant species to colonize the project area.

Impacts to special status plants for Alternatives 2-4 as limited to the potential seepage pit OWTS area. In the event this OWTS option is selected, indirect impacts to two black walnut trees could occur during seepage pit installation. In the event, any project element would occur within the protected zone of a southern California black walnut, tree protection measures outlined in Mitigation Measures 5 and 6 would apply.

There is a small potential that special-status plants could colonize the size or be found onsite prior to construction. With implementation of Mitigation Measure 10, impacts to special-status plants would be less than significant through preconstruction surveys with plant avoidance or propagule salvage if found. Incorporation of special-status plants into the Habitat Restoration Plan would ensure that the project results in a net benefit to them.

Mitigation Measure 10: Special-Status Plant Protections. The following measures shall be implemented to avoid and minimize impacts to special-status plants:

- Preconstruction plant surveys shall occur in the appropriate blooming period preceding construction, and again within two-weeks prior to construction activities affecting vegetation.
- In the event a special-status plant is identified, steps shall be taken to avoid, or if infeasible, collect propagules for propagation and installation onsite. CDFW, USFWS, and CCC shall be coordinated with to discuss findings and actions.

- Special-status plants shall be incorporated into the HRAMP plant palette and sourced from genetically appropriate stock. Species shall be chosen that are well matched to onsite soils, exposure, and water regime:
    - Southern California black walnut shall be included.
    - The following species shall be considered for inclusion: Coulter's saltbush (*Atriplex coulteri*), Malibu baccharis (*Baccharis malibuensis*), Lewis' evening-primrose (*Camissoniopsis lewisii*), Santa Monica dudleya (*Dudleya cymosa* ssp. *ovatifolia*), white-veined monardella (*Monardella hypoleuca* ssp. *hypoleuca*), and south coast branching phacelia (*Phacelia ramosissima* var. *austrolitoralis*).
    - Additional special-status wetland species shall be incorporated that would be expected in similar wetland systems in Santa Monica Bay.
    - Native species from the region identified by the Gabrieleño/Tongva tribe as traditionally important will be included.

The long-term goal of the project is to provide a net increase in the quality and quantity of native vegetation communities, which includes inclusion of appropriate special-status plants. The project is thereby expected to result in a significant net benefit to special-status plants. Alternative 2 would provide the greatest increase in native habitat restored followed by Alternatives 4, then 3. Alternative 4 has the benefit of providing more opportunities for beach strand and foredune species. Implementation of invasive management activities (Mitigation Measure 2), the HRAMP (Mitigation Measure 3), and tree replacement and protection policies (Mitigation Measures 5-6) as well as Mitigation Measure 10, would result in a net long-term benefit to special-status plants.

5.8.4 Animals. There were 13 special-status wildlife species documented in the terrestrial and freshwater aquatic areas of the project area during their protected life stage. An additional eight special-status wildlife species have a moderate and high potential to occur in the BSA. These species are discussed in further detail below.

Additional special-status species were observed onsite but would not be present during their sensitive life stage, and so would not be adversely affected by the project. This includes monarch butterfly, that is only present as individuals, even though suitable overwintering habitat is present in native and nonnative tree groves onsite. Twelve special-status birds also utilize the project area, but their protected nesting or roosting areas are not present onsite and would not be affected. These species include: great egret *(Ardea alba),* great blue heron (*Ardea herodias*), olive-sided flycatcher (*Contopus cooperi)*, snowy egret (*Egretta thula),* Caspian tern *(Hydroprogne caspia),* California gull (*Larus californicus),* long-billed curlew (*Numenius americanus),* double-crested cormorant *(Nannopterum auritum),* black-crowned night heron (*Nycticorax nycticorax),* osprey (*Pandion haliaetus),* brown pelican (*Pelecanus occidentalis),* and elegant tern (*Thalasseus elegans).* As these species are not expected to be present onsite during their protected life stage they are nor discussed further below. See *Appendices N* and *P* for more detailed information about them.

Migratory birds, raptors, and their nests are generally protected by the MBTA and the CFGC. Construction of the project could result in the direct impacts to special-status migratory birds and raptors, if any are present, during ground disturbance, vegetation removal, or adjacent demolition or construction activities.

5.8.4.1 Invertebrates. One special-status invertebrate in their protected state was documented onsite: a monarch butterfly (*Danaus plexippus*) overwintering site. One species, Crotch's bumblebee (*Bombus crotchii*) has a moderate potential to occur as discussed below.

Monarch Butterfly. Monarch butterfly is a candidate for listing under the federal endangered species act. A potential overwintering site for monarch butterfly was identified within the BSA and project area largely on the north side of Topanga Creek. While there are many similar groves throughout the local area which have the potential to serves as habitat if the identified overwintering site is impacted,

the monarchs instinctually return to specific overwintering site means impacts to a historical overwintering site can cause wider impacts to the local population even if alternative suitable habitat exists.

Overwintering sites can typically be broken into a Core Zone consisting of a roosting tree or trees which provide overnight shelter against wind chill, and a wider Shelter Zone of windbreak trees around the Core Zone, which provide shelter for daytime activities such as feeding. Both Zones make up an overwinter site. The Core Zone is within the northern edge of the project boundary, north of Topanga Creek, and outside of areas proposed for grading/restoration. Trees within the Core Zone would therefore not be removed or otherwise affected. The preliminary Potential Shelter Zone is also largely outside of the restoration grading footprint, although a small edge on the opposite south side of Topanga Creek overlaps with the restoration grading area and may involve removal of a single eucalyptus and an invasive plant species dominated understory in preparation for restoration activities and plantings. Restoration plantings would provide appropriate native trees, shrubs and herbaceous vegetation that would improve the habitat values for monarch butterfly and other wildlife over the long term. Impacts to monarch butterfly would be similar under Project Alternatives 2-4.

In order to protect monarch overwintering to the maximum extent feasible during construction, Mitigation Measure 11 would be required, which would include a species construction monitoring plan, clear identification and protection of roosting trees, avoidance of intense vibrations within 200 ft of roosting trees, and avoidance of butterfly harming pesticides or application methods within 200 ft of overwintering sites when monarchs may be present. Implementation of these avoidance measures would reduce potential project impacts to a less than significant level.

> **Mitigation Measure 11: Monarch Butterfly Overwintering Site Protection.** The following measures will be implemented to protect and minimize impact on protected overwintering monarchs:
>
> 1. During overwintering season (October 15-March15), prior to the start of construction, a monarch specialist/biological monitor shall conduct a roosting monarch survey every two weeks to monitor the size of the population and map the locations of roosting monarchs. Roosting monarch surveys shall follow the Xerces Society monarch count protocol.
>
> 2. To prevent disturbance of monarchs during the overwintering season by construction personnel or work activity, roosting trees will be flagged, and snow fencing, or a similar technique shall be used to cordon off monarch roost trees at a reasonable distance of at least 25ft away from the roosting monitor. The monitor shall determine the placement of the fencing to protect the monarchs while allowing work to continue.
>
> 3. While work is occurring in the project vicinity during the overwintering season, the monitor shall visit the property a minimum of two times per week to verify protection measures remain in place and document that roosting monarchs are not disturbed by work activities. The monitor shall have authority to stop work if monarchs show signs of unnatural disturbance. If monarchs are being disturbed or impacted, protection measures shall be relocated by the monitor in consultation with the supervisor.
>
> 4. Work crew shall be educated on the monarch protection measures and how the measures apply to their work.
>
> 5. During the overwintering season when monarchs are present, activities that could result in vibration and thus movement of monarch clusters, shall be avoided within 200 feet of occupied trees A qualified biologist can modify the buffer with approval of the regulatory agencies if adjacent activities are determined not be disturbing.

6. Aerial pesticide applications or pesticides that are harmful to butterflies will be avoided within 200 feet of overwintering sites when monarch overwintering is occurring. Small cut and paint efforts or directed spot spraying when it is not windy will be allowed if required to control invasive arundo treatments or other highly invasive species to avoid invasive regrowth in the project area. All weed treatments would be under the supervision of a qualified biologist to ensure no impacts to monarchs occur. Any weed treatments would also be under the supervision of a Qualified Applicator Certificate (QAC) and conducted per CDPR and California Department of Pesticide Regulation guidelines.

7. Monarch nectary plants shall be incorporated into the HRAMP plant palette near potential overwintering sites.

Crotch's Bumble Bee, a candidate for listing under the state endangered species act, has a moderate potential to be present. *Bombus* sp. were observed onsite but were not definitively identified as *B. crotchii.* Generalist foragers that use a wide variety of flowering plants, Crotch's bumblebee is best suited to flowers with short corollas due to their short tongue length. Key food plant families include Fabaceae, Apocynaceae, Asteraceae, Lamiaceae, Hydrophyllacae, Asclepiadaceae and Boraginaceae (Thorp et al. 1983; Richardson 2017, CDFW 2019) and are present onsite.

The Crotch bumble bee is nearly endemic to California and occupies grasslands and shrublands in southern to central California. A 25% decrease in range and 97% decrease in abundance has been recently documented. Like most bumble bees, this species usually nests underground (Williams *et al.* 2014). Colony size and overwintering sites are unclear, but the species likely overwinters in soft soil (Goulson 2010), or under leaf litter or other debris (Williams et al. 2014, CDFW 2019)

The temporary loss of potential habitat under Alternatives 2-4, is not expected to be significant because of the abundance of similar suitable habitat surrounding the Project area and because restoration of currently disturbed areas will improve foraging opportunities. Individual adults are mobile and can move away from construction disturbance if present. Damage to an underground nest during construction, however, could result in injury or mortality of individuals or the entire colony. Mitigation Measure 12 would require presence/absence surveys for Crotch's bumble bees and avoidance of any nests to the extent feasible, consultation with CDFW to identify appropriate measures to minimize impacts and avoid take to the maximum extent feasible, and replacement of habitat if occupied by the species. Implementation of this mitigation measure would reduce potential impacts to the species and occupied habitat (if present) to a less-than significant-level.

All project alternatives would benefit Crotch's bumblebee, if present, over the long-term by significantly increasing native flowering plant diversity and reducing human sources of disturbance associated with trespass and arundo management. Alternative 2 would provide the most benefit as it maximizes the acreage of habitat restored.

Mitigation Measure 12: Crotch's Bumble Bee Protections. The following measures will be implemented to protect and minimize impacts to Crotch's bumble bees:

1. Surveys for Crotch's bumblebee shall be conducted within one year of vegetation removal/ground disturbance by a qualified entomologist familiar with the identification, behavior, and life history of the species. A minimum of three surveys during peak flying season shall be conducted when the species is most likely to be detected above ground, between March 1 to September 1 (Thorp et al. 1983). Non-lethal survey methodology shall be used and photo

vouchers for species confirmation will be obtained (CBBA 2023). At minimum, a survey report should provide the following:

- A description and map of the survey area, focusing on areas that could provide suitable habitat for Crotch's bumble bee.
- Field survey conditions that should include name(s) of qualified entomologist(s) and brief qualifications; date and time of survey; survey duration; general weather conditions; survey goals, and species searched.
- Map(s) showing the location of nests/colonies.

2. If Crotch's bumble bee is detected, the following will be implemented:

- The qualified entomologist shall:
    - Identify the location of all nests within and adjacent to the project site.
    - Provide a summary of the physical (e.g., soil, moisture, slope) and biological (e.g., plant composition) conditions where each nest/colony is found. This shall include native plant composition (e.g., density, cover, and abundance) within impacted habitat (e.g., species list separated by vegetation class; density, cover, and abundance of each species).
    - Establish a 15-meter no disturbance buffer zone around any identified nest(s) to reduce the risk of disturbance or accidental take. The buffer zone will be expanded as necessary to prevent disturbance or take to the extent feasible.
- If complete avoidance of the buffer zone is not feasible, consultation with CDFW shall occur to identify any additional measures needed to avoid impact to the species, confirm allowable activities within the buffer zone, and determine if take authorization from CDFW is required.
- Floral resources associated with Crotch's bumble bee that require removal during restoration activities shall be replaced at a 1:1 ratio and with guidance from CDFW. Floral resources will be planted within 200 meters of the original plant location or in the most centrally available location relative to identified Crotch's bumble bee nests and be located no more than 1.5 km from the nest sites.
- The Habitat Restoration and Adaptive Management Plan will include native and local plant species preferred by Crotch's bumblebee within the plant palette to further support the existence and expansion of the species onsite.

5.8.4.2 Fishes. Topanga Lagoon and Creek support four protected fish species including tidewater goby, arroyo chub, California grunion, and southern steelhead trout.

Tidewater Goby. Once common in coastal lagoon systems from Oregon to the US-Mexico border, the Federally Endangered tidewater goby was extirpated from most systems in the Santa Monica Bay by the 1980's (Swift et al. 1989), with the only population remaining in the lagoon at Pt. Mugu. Historically present in Malibu Lagoon, a translocation of about 50 individuals in 1991 resulted in the re-establishment of a population there (Manion 1993). By 2001, tidewater gobies had migrated down the coast to recolonize Topanga Lagoon and DNA analysis indicated that Malibu had been the source population (Jacobs and Swift 2001). Incidental visual monitoring has been tracking the population in Topanga Lagoon since 2008, and more focused surveys were initiated in 2020 in anticipation of the need to better examine the impacts and benefits of the proposed restoration project alternatives. Tidewater goby has continued to be abundant at Topanga lagoon since its recolonization in 2001, with 90,000 individuals estimated in Fall 2022. Currently Topanga Lagoon supports the most robust population of tidewater goby in Santa Monica Bay. It also occurs in Malibu Lagoon in more limited-numbers but has not been seen in Big Sycamore Lagoon since 2013. See Appendix G, Tidewater Goby Technical Report, for more detail.

Although the population of tidewater gobies appears relatively stable under the existing condition (Alternative 1), the space available to support this population is small and constrained and estimated at 5

acres of critical habitat onsite. SLR is anticipated to constrain the species to an even smaller habitat area and thereby make it more vulnerable to anthropogenic effects and extreme weather events. Given the role of Topanga Lagoon as an important meta population for the species within Santa Monica Bay, protection and enhancement of goby habitat has regional importance.

This project's restoration design intentionally avoids grading wetted areas to the maximum extent feasible to minimize impacts to goby, and all aquatic species. Work within wetted areas will occur during removal and replacement of existing bridge supports and pier walls. Elements of the bridge design are also intended to reduce impacts to aquatic species. This includes elimination of any middle-bent column and foundation, and use of a precast girder or steel truss bridge structure. These project elements avoid installation of trestle falsework with driven piles in wetted areas and thus reduced potential construction impacts.

There are five acres of mapped tidewater goby critical habitat onsite, and an estimated 0.33 acre of that are estimated to be temporarily disturbed during removal of the existing bridge supports and pier wall under all project build alternatives. Relocation of tidewater gobies during construction to the creek area would be into adjacent suitable habitat or as otherwise directed by USFWS approvals. Assessment of carrying capacity and crowding will be made at the time of relocation in coordination with USFWS to ensure that there is sufficient area to support any fish that are moved. With implementation of these mitigation measures, the project may still be considered to have a temporary adverse effect on tidewater goby during the relocation and will require coordination with USFWS regarding acceptable levels of take. Post-construction, the proposed Alternatives are expected to provide long term benefits to tidewater goby and its critical habitat.

Although construction within wetted areas has been limited to the maximum extent feasible, work within wetted areas and areas adjacent to tidewater goby habitat will occur. Grading and construction adjacent to tidewater goby habitat is anticipated to last intermittently for approximately 24 months. The more limited work within tidewater goby habitat during removal of the old bridge and dewatering is anticipated to last approximately six months. Direct and indirect impacts to individual gobies could occur during construction activities. Direct impacts could include injury or mortality of individual gobies during in-water construction or dewatering, injury due to underwater sound levels caused by installing coffer dam and exclusion devices, and temporary loss of between 0.28-0.33 acre (depending on alternative selected) of critical habitat within the lagoon. Indirect construction impacts include forced movement of individual gobies to avoid sound or vibrations and dewatered area, and degradation of habitat quality due to water quality, potential reduction in shading, increased water turbidity, and sediment changes.

To avoid potential significant impacts during construction to tidewater goby, implementation of Mitigation Measures 13-15 would be required, which includes underwater sound monitoring, dewatering and fish rescue plan, and monitoring during in-water construction activities. With implementation of these mitigation measures, the project may affect, but is not likely to adversely affect, tidewater goby or its critical habitat.

> **Mitigation Measure 13: Fish Protection Measures During Work in Wetted Areas**: Formal consultation with USFWS/NMFS will further refine these measures and the Project will comply with all permit requirements. The following measures will be implemented to protect and minimize impacts on tidewater goby, steelhead trout, their critical habitat, and other aquatic species during construction:
>
> 1. Cofferdam, sediment curtain, and/or another approved NMFS/USFWS approved method will be used to cordon off the small area (approximately 0.28-0.33 acre) around the existing bridge abutment to both exclude fish and wildlife and contain any materials so they are unable to move out of the work area. Final construction design will meet all permit conditions and be developed by the contractor in coordination with CDPR.
>
>   - The cofferdam will not be fully dewatered until the supervising biologist determines that no fish remain within the area.

- Dewatering will be done slowly with supervision to ensure that any fish trapped in the area can be captured and relocated reducing the risk of injury or stress.

- Pumps will be properly screened to prevent fish from entering the intake.

- Dewatering and flow diversion will comply with permit requirements from USFWS and NMFS.

- Once the supervising biologist has confirmed that the work area is isolated, all fish are excluded, and there is no risk of entraining fish, then the pump screen may be removed.

- Water removed from the work area will be directed to an adjacent upslope holding area according to permit requirements before either being infiltrated into the existing fill or released into the lagoon or ocean downstream of the work area.

- Water quality testing including turbidity, temperature, salinity, dissolved oxygen, pH, and conductivity, nutrients (and potentially metals if required) will be monitored and documented at the start, middle and end of each day.

- Blocking nets providing a buffer area outside the work zone will remain in place until all work is completed, and the coffer dam removed.

  - Blocking nets will be inspected at least three times a day (start, middle, end) or more if requested by the supervising biologist. If fish are impinged on the net, or weather/flow conditions change significantly, the supervising biologist can increase inspection efforts.

- Silt curtains may also be installed inside the blocking nets to further reduce potential for water quality impacts.

2. All construction activities within or directly adjacent to the lagoon, creek, and wetted areas will occur preferentially outside of the steelhead migration season (~December- March). In the event, this time frame cannot be avoided, measures shall be implemented with the approval of NMFS, CDFW and CCC to avoid impacts such as allowing passage through a protected portion of the work area and implementation of additional BMPs to buffer fish from adjacent work, such as use of silt curtains within the wetted edge and silt fence along the dry edge, etc.).

3. If fish upstream are observed in distress, a fish kill occurs, or water quality problems (including equipment leaks or spills) occurs, the supervising biologist will immediately stop work, contact the relevant agencies and work with the contractor to correct the problem.

4. Upon completion of the removal of the old bridge within the coffer dam area, water quality will be assessed within the work area before removal of the walls. Flow will be restored slowly, and fish will remain excluded upstream of the work area pending confirmation that water parameters are suitable for direct release into the lower lagoon.

Mitigation Measure 14: Fish Relocation Measures. The following measures will be implemented to protect and minimize direct impacts on special-status fish species. Formal consultation with USFWS/NMFS will further refine these measures and the Project will comply with all permit requirements.

1. All fish will be relocated out of the Project area by a permitted biologist prior to work within the lagoon, creek, and wetted areas. The fish will be relocated in an approved

location upstream (or downstream if conditions are suitable). Assessment of carrying capacity and crowding will be made at the time of relocation in conjunction with USFWS to ensure that there is sufficient area to support any fish that are moved.

2. Downstream and upstream blocking nets (having no greater than 1/8inch mesh) will be secured to both banks and the bottom to prevent movement downstream or upstream of the work area in the main lagoon.

3. Fish will be herded upstream above the limit of the proposed work area and then seining will continue until all fish are captured. The upstream blocking net will be installed and secured so that no fish can move back into the work area.

4. Fish that are not herded but captured in the seine nets will be placed in buckets of cool, clean water collected from an undisturbed area of the lagoon with bubblers attached at the sides and then immediately hand carried upstream above the upstream blocking net or downstream into the main lagoon if conditions are suitable.

5. Fish will not be crowded or held in buckets for more than 10 minutes.

6. Fish handling will be minimized while the supervising biologist documents the species, number, size class, and condition of release.

7. Individuals handling fish will ensure that their hands are clean and free of potentially harmful substances such as sunscreen, insect repellent, etc.

8. Should there be any mortality, the fish incidentally killed will be preserved whole on ice then frozen, data on species, size and cause of mortality will be documented, and the remains delivered to the appropriate agencies.

9. If the limits of incidental take are approached, the supervising biologist will postpone work until the appropriate agency is notified and a plan developed to further reduce potential for further stress or injury.

Mitigation Measure 15: Fish Hydroacoustic Buffering Measures. The following measures will be implemented to protect and minimize direct and indirect impacts on special-status fish species from hydroacoustics. Formal consultation with USFWS/NMFS will further refine these measures and the Project will comply with all permit requirements.

1. Construction of the bridge foundation and footings will be completed within the existing fill material.

2. Construction of the temporary bridge will avoid placement of any foundations within or immediately adjacent to the wetted area and any construction will be completed within existing fill material.

3. Construction of the coffer dam or other devices within or immediately adjacent to the wetted area associated with removal of the existing bridge will comply with all Caltrans requirements as outlined in the Technical Guidance for Assessment and Mitigation of Hydroacoustic Effects of Pile Driving on Fish (2020).

Over the long-term, all project build alternatives will provide a net benefit to tidewater goby through provision of increased habitat area and refugia from SLR and storm surges. The increased lagoon area proposed in all alternatives is also anticipated to maintain dissolved oxygen and temperature levels like existing conditions that remain within the preferred range for tidewater goby. Because the breaching pattern will remain storm driven and not managed, influx of brackish or marine species that prey on tidewater goby

is not anticipated to colonize. Invasive predatory species other than red swamp crayfish are not present in Topanga Creek and monitoring will document any future changes in fish community composition that could negatively impact tidewater goby. Due to the dominant freshwater characteristics of the system, it is not expected that these potential marine predatory fish species could become established if introduced.

Alternative 2 provides the most acreage of new and restored aquatic habitat that could support all life stages of tidewater gobies. This enlarged lagoon footprint would immediately provide a more extensive and diverse array of habitat resources that could better buffer tidewater goby from the effect of SLR and storm surges. The increased wetted areas allow the potential for the natural evolution of wetland, marsh, riparian and transitional habitat that shift to accommodate rising sea levels. With its increase in size, the lagoon is anticipated to breach slightly less frequently, but stay passable for longer periods of time and provide increased refugia area for tidewater gobies and juvenile steelhead.

Alternatives 3 and 4 provide more limited benefits as there is no expansion on the east side of the existing lagoon. These alternatives could accommodate the western secondary channel shown in Alternative 2, which would slightly improve their benefits as compared to the existing condition. The breach pattern for these alternatives is expected to be the same or slightly less frequently connected and provides less refugia habitat for tidewater gobies.

Arroyo Chub. Chub is a CDFW Species of Special Concern. It is seen occasionally in Topanga Creek within the project area when surface water is present but is more prevalent upstream. This species can survive in low oxygen concentrations and wide temperature fluctuations (Castleberry and Cech 1986). Chubs are largely found in slow-moving water at depths greater than 40 cm (Wells and Diana 1975). They are most common in streams with gradients of less than 2.5% slope (Feeney and Swift 2008) and where water temperatures range from 10 to 28 °C (J. O'Brien, CDFW, unpublished data). The chub breeding season is February-August, during which fertilized eggs drop onto vegetation and substrate hatch within a few days. Chubs eat algae, insects, and small crustaceans (CDFW 2022).

Arroyo chub is frequently encountered upstream of the project area but are rarely found onsite. For this reason, they would be less affected by the long-term habitat degradation and habitat compression associated with SLR than other special-status species. Implementation of Alternative 1, No Project/Managed Decline is therefore not anticipated to have a significant impact on chub.

If present onsite, individual chubs could be directly killed or injured by construction activities in the water. Indirect water quality impacts are less likely given the scarcity of the species in the project area and its ability to move upstream away from construction impact. Although these impacts are expected to be less than significant, Mitigation Measures 13-15 would provide additional protections to this species.

Alternatives 2-4 would benefit arroyo chub by increasing the area of wetted habitat and improving general riparian habitat quality. Alternative 2 provides the greatest benefit as it provides more freshwater wetted restoration acreage. For all alternatives, chub would be protected by preconstruction surveys and exclusion from work areas via coffer dams or other methods.

California Grunion. California grunion is an indigenous endemic marine fish and cultural icon that is considered locally sensitive by CDPR. Midnight grunion runs have fascinated people for generations, inspiring music, film, and television shows. Primarily found in southern California, these silversides surf waves onto sandy beaches for spawning in the spring and summer months, on the nights following high semilunar tides of the new and full moons. They bury their eggs a few centimeters under the surface, then return to the ocean, leaving the eggs to incubate in the warm, moist sand onshore until tides rise again to wash them out to hatch (Martin 2015).

Topanga Beach is an important spawning beach and has been monitored extensively. Grunion run reliably there from as early as late February through July, in numbers greater than the median run size across the state. The runs documented at Topanga Beach frequently include what is known as an exceptional run,

where thousands of fish cover the beach, making this an important site regionally (Martin et al. 2020). Overwash of the species into the lagoon has also been observed by RCDSMM staff, most recently in 2022.

Under Alternative 1, No Project/Managed Decline, no direct measures would be taken to improve beach areas that are used by grunion for spawning. SLR is anticipated to reduce the available space for this activity and adversely affect the species over the long-term. The current beach configuration already contains narrow areas that are not suitable for grunion because no dry sand remains exposed at high tide. The west end of Topanga Beach tends to lose sand and become exposed cobble during the summer months, making it unsuitable spawning habitat. Erosion of the lagoon berm may harm both eggs located within the berm sand and larval and juvenile grunion within the lagoon. Adverse impacts to grunion will continue to worsen over time due to storm damage and rising sea levels if no action is taken.

Under Alternatives 2-4, California grunion and their egg masses could be injured or killed during sediment extraction and disposal activities. Available suitable spawning habitat could also be reduced if construction activities occur within or directly adjacent to it. These impacts are expected to be less than significant as sediment extraction and disposal activities can be timed to avoid California grunion spawning season, usually from late February through July and the equipment hauling route will be located above the mean high tide line. To ensure that the project design features will avoid potential significant impacts to California grunion, Mitigation Measure 16 will be implemented.

Mitigation Measure 16: Grunion Protection Measures. The following measures will be implemented to protect and minimize direct and indirect impacts to California grunion:

1. During construction activities on the south side of the PCH during the grunion season (March-August) the following measures apply:

    - Bright lights at night will not be permitted. Night lighting on the beach face should not exceed 100 mlux, approximately the light of a full moon to avoid spawning impacts (Simons et al., 2022).

    - Construction will avoid work within 10 feet of the Higher High Tide (HHT) line (as represented by the highest limit of dry wrack) as this area can be used for grunion spawning. If avoidance of this area is infeasible during construction, a qualified biologist will only permit work within the avoidance zone if it can be confirmed that spawning did not occur in that area since the last full or new moon. Spawning runs can be forecast, within four nights after a full or new moon, at the highest tides and for two hours beyond. If significant spawning is documented, the areas should be marked and protected from disturbance until the next full or new moon.

    - A qualified biologist shall conduct grunion monitoring for 30 minutes prior to, and two hours following, the predicted start of each nightly spawning event. Sufficient qualified biologists shall be employed to ensure that the entire construction site is monitored during the predicted grunion run. The magnitude and extent of a spawning event shall be defined in 300-foot segments of beach using the Walker Scale (Martin et al 2021). Every individual fish shall be counted to determine the Walker Scale value (e.g., 0, 1, 2, 3, 4, or 5) of each 300-foot segment within the proposed work area.

2. Education programs developed for the project shall incorporate grunion to both minimize and mitigate impacts to grunion associated with the anticipated increase in beach use and provide regional educational resources about the grunion that addresses a gap in statewide programs. Recommended elements include:

    - Interpretive signage providing information about grunion, rules and regulations for recreational fishing, and how the species can be protected.

- Develop and implement grunion run education programs similar to those in place at Cabrillo Beach in San Pedro with the Cabrillo Marine Aquarium, and La Jolla Shores with the Birch Aquarium at Scripps.

3. Post-construction the following management measures shall be implemented:

   - Mechanical beach grooming will not occur onsite in order to retain the natural deposition of wrack along the beach. Trash and debris should be removed by hand, as necessary.

   - Vehicle use on the beach shall be limited to that required for emergency response and occasional required maintenance. All vehicles must drive above the HHT line March-September unless no grunion spawning occurred in the task location during the last full or new moon.

With implementation of this mitigation measure, project construction and long-term impacts to grunion would be less than significant.

All project build alternatives provide some increase to the beach area, which would provide greater resilience to SLR. Removal of the fill on the west side of the lagoon will decrease the beach slope, providing potentially additional beach face that could support colonization of intertidal organisms that are important food resources for grunion and other species. Alternative 4 provides the most benefit for grunion as it maximizes the increase in beach habitat, which in turn increases spawning opportunities. Dune restoration may increase beach resilience by storing sand. The wider beach and greater amount of sediment available will provide the greatest benefit to the beach and the beach-spawning grunion.

Steelhead Trout - Southern California (Population 10). Southern California steelhead trout is listed as Federally Endangered and State Candidate Endangered. Topanga Lagoon is one of the last remaining coastal systems supporting a reproducing population of steelhead trout in the Southern California DPS. Topanga Creek is identified as a Core 1 priority habitat for southern steelhead trout (NMFS 2012), with replacement of the PCH bridge and expansion of the lagoon identified as recovery actions. Restoration of Topanga Lagoon, including the replacement of the constraining bridge supporting PCH, is listed as a top priority for Caltrans District 7 in the statewide Fish Passage Barrier Removal list (PAD ID#716891). The PCH bridge over Topanga lagoon was identified as a partial Fish Passage Barrier by CalTrout (2006).

Preservation of both life history forms (anadromous steelhead and resident rainbow trout) is considered a high priority in the NMFS Recovery Plan (NMFS 2012). Both anadromous and resident *O. mykiss* have been documented within the Topanga Creek watershed since 2001, although there has been limited opportunity for immigration or emigration from the creek during drought conditions. Since it is difficult to detect the difference between resident and anadromous individuals visually, we use the term *O. mykiss* to reference both.

A main goal of the restoration design effort was to maintain, and if possible, improve fish passage for steelhead through widening the PCH bridge and reducing peak flow velocities over a wider area, which would afford more time for adult steelhead to migrate into the creek to spawn. Another was to provide for a greater quality and quantity of wetted habitats to better buffer steelhead trout and other aquatic species from SLR and climate change stressors. Neither of these goals would be met with implementation of Alternative 1, No Project Managed Decline. Further degradation of steelhead critical habitat is anticipated to occur under this Alternative due to ongoing human impacts, expansion of invasive weeds, and increased edge effects from adjacent developments.

Although construction within wetted areas has been limited to the maximum extent feasible, work within wetted areas and areas adjacent to tidewater goby habitat will occur. Grading and construction adjacent to

tidewater goby habitat is anticipated to last intermittently for approximately 24 months. The more limited work within tidewater goby habitat during removal of the old bridge and dewatering is anticipated to last approximately six months. Direct and indirect impacts to individual gobies could occur during construction activities. Direct impacts could include injury or mortality of individual gobies during in-water construction or dewatering, injury due to underwater sound levels caused by installing coffer dam and exclusion devices, and temporary loss of between 0.28-0.33 acre (depending on alternative selected) of critical habitat within the lagoon. Indirect construction impacts include forced movement of individual gobies to avoid sound or vibrations and dewatered area, and degradation of habitat quality due to water quality, potential reduction in shading, increased water turbidity, and sediment changes.

Although construction within wetted areas has been limited to the maximum extent feasible, work within wetted areas and areas adjacent to steelhead habitat will occur. Grading and construction adjacent to Topanga Creek is anticipated to last intermittently for approximately 24 months. Work within wetted areas is anticipated to last about 6 months and involve ~0.3 acre of disturbance during dewatering and removal and replacement of existing bridge supports and pier walls. Elements of the bridge design are also intended to reduce impacts to aquatic species. This includes elimination of any middle-bent column and foundation, and use of a precast girder or steel truss bridge structure. These project elements avoid installation of trestle falsework with driven piles in wetted areas and thus reduce potential construction impacts.

Even with limited disturbance within and adjacent to wetted areas, impacts to individual steelhead could occur during construction activities. Steelhead occupy Topanga Creek and Lagoon within the project area, during migration into or out of the creek when the lagoon is connected to the ocean. Impacts to steelhead could include direct mortality during in-water construction or dewatering, injury due to underwater sound levels caused by piling driving. Indirect construction impacts include forced movement to avoid sound or vibrations and degradation of habitat quality due to water quality, water turbidity, and sediment changes.

To avoid potential significant impacts during construction to tidewater goby, implementation of Mitigation Measures 13-15 would be required, which includes underwater sound monitoring, dewatering and fish rescue plan, and monitoring during in-water construction activities. With implementation of these mitigation measures, the project may affect, but is not likely to adversely affect, steelhead or its critical habitat. Construction impacts to steelhead would be less than significant with this mitigation.

Under Alternative 2, the lagoon will breach slightly less frequently because of its larger footprint; fish passage, however, will be improved as there will be an increase in time that flow velocities are in the preferred range for adults. Alternative 2 provides expanded refugia habitat during breaching events compared to the existing condition (Alternative 1) or Alternatives 3 or 4.

Alternative 2 also provides the largest increase in area and diversity of potential rearing habitat for juvenile steelhead due to the incorporation of the western secondary channel. However, if its western secondary channel were incorporated into either Alternative 3 or 4, then these benefits would be increased for those alternatives, as well. The western channel and eastern side expansion of wetted lagoon habitat in Alternative 2 would provide the most additional food and shelter resources for steelhead especially in the face of SLR compared to the other alternatives.

5.8.4.3 Reptiles and Amphibians. There are no special-status amphibians with a moderate or high potential to occur within the terrestrial or freshwater/brackish aquatic habitats within the Project area and none were observed on site during surveys.

Three special-status reptiles were identified onsite during surveys: San Bernardino ringneck snake (*Diadophis punctatus modestus*), coast mountain kingsnake (*Lampropeltis multifasciata*), and two-striped garter snake (*Thamnophis hammondii*). Five additional special-status reptiles were not observed but have a moderate or high potential to occur: California legless lizard (*Anniella* spp.), Southern California legless lizard (*Anniella stebbinsi*), coastal whiptail (*Aspidoscelis tigris stejnegeri*), coast horned lizard

(*Phrynosoma blainvillii*), and coast patch-nosed snake (*Salvadora hexalepis virgultea*). All these species are discussed further below.

Two additional special-status species were determined to have a low potential to be onsite: western pond turtle (*Emys marmorata*) and arboreal salamander (*Aneides legubris).* Pond turtles are not expected onsite prior to restoration due to high disturbance levels and limited pool areas with adjacent basking sites. They could potentially move into the site from upstream areas post restoration. Arboreal salamander is unlikely to be encountered due to its historic decline in the SMMs.

California and Southern California Legless Lizards. California and Southern California legless lizards are CDFW Species of Special Concern and prefer moist loose soil with a high moisture content. They usually forage at the base of plants either on the surface or just below but are more typically encountered under objects or during excavation in moist soils. Within the project area, legless lizards are most likely to be found in vegetated moist sandy soils at the back of the beach, or soft soil areas along the creek that are moist, or leaf littered. (Zeiner et al. 2000).

The species designation of legless lizards is complicated. Using genetics to examine the *Anniella* species complex, it appears there are more species of legless lizards in Southern California than previously thought (Papenfuss & Parham 2013). However, species designation is not agreed upon in the scientific community, therefore it is possible that more than one species of legless lizard could be present at Topanga Lagoon, but it cannot be determined at this time. Through long-term monitoring using pitfall traps, SMMNRA have detected *A. stebbinsi* in the Santa Monica Mountains, albeit rarely (Delaney et al. 2021). CDPR staff have also encountered this genus in remnant dune habitat within the vegetated PCH road edge in Point Mugu State Park.

Coastal Whiptail. Coastal whiptail is a CDFW Watch List species found throughout the Santa Monica Mountains (Delaney & Riley 2019; Delaney et al. 2021). This species is found in a variety of ecosystems, primarily hot and dry areas with sparse foliage, including chaparral, woodland, and riparian areas. While this species is not rare, they require more habitat specificity than more common reptiles. For example, SMMNRA staff detects coastal whiptails most often in chaparral. Coastal whiptails are most likely to be encountered onsite in the less disturbed scrub areas along the knoll near the PCH or within the northern boundaries of the Project area.

San Bernardino Ringneck Snake. San Bernardino ringneck snakes are found secretive and typically found under rocks, wood, bark, and boards. San Bernardino ringneck snake is endemic to California and is a CDFW Special Animal. While this species is not rare, they require more habitat specificity than more common reptiles. San Bernardino ringneck snake prefers moist habitats, including wet meadows, rocky hillsides, gardens, farmland, grassland, chaparral, mixed coniferous forests, and woodlands. San Bernardino ringneck snake is most likely to be encountered onsite in the less disturbed scrub areas along the knoll near the PCH or within the northern boundaries of the Project area. This species was detected during least Bell's vireo protocol surveys in 2021.

Coast Mountain Kingsnake. Coast mountain kingsnake is considered locally sensitive by NPS and CDPR in the Santa Monica Mountains. This species is a habitat generalist, found in diverse habitats including coniferous forest, oak-pine woodlands, riparian woodland, chaparral, manzanita, coastal sage scrub, and wooded areas near a stream with rock outcrops, talus or rotting logs that are exposed to the sun. This species is active between 55-85 °F, spends most of its time underground, under surface objects, or inside rock crevices, and hibernates during winter. It has been documented preying upon lizards, small mammals, bird eggs and young, amphibians, and snakes (Nafis 2022).The species occurs in shady areas with oaks or riparian habitat within the Santa Monica Mountains. A confirmed sighting was made in the Project area by RCDSMM in 2021.

Coast Horned Lizard. Coast horned lizard (*Phrynosoma blainvillii*), a CDFW Species of Special Concern, is a flat-bodied oval-shaped lizard with scattered enlarged pointed scales on

the upper body and tail, and a large crown of spines on the head. They eat ants, especially harvester ants, and other small invertebrates such as spiders, beetles, termites, flies, honeybees, moth larvae, and grasshoppers. They are often found near ant hills feeding on ants. Coast horned lizards inhabits open areas of sandy soil and low vegetation in valleys, foothills and semiarid mountains and can be found in grasslands, coniferous forests, woodlands, and chaparral, with open areas and patches of loose soil; often being found in lowlands along sandy washes with scattered shrubs and along dirt roads. Populations have declined in the area but can frequently be encountered where open space and their food supply (harvester ants) has been protected (Fisher *et al.* 2002). Through SMMNRA long-term monitoring and collaboration with California State University Northridge graduate student Sarah Wenner, we know that coast horned lizards can be found throughout Topanga State Park (Delaney et al. 2021b). If present onsite, they are most likely to occur in the less disturbed scrub areas along the knoll near the PCH or within the scrub slopes along the northern boundaries of the Project area.

Coast Patch-nosed Snake. Coast patch-nosed snake, a CDFW California Species of Special Concern, is a fast, moderately-sized slender striped snake with smooth scales, large eyes, and an enlarged rostral (the scale over the tip of the snout.). It eats lizards, especially whiptails, small mammals, possibly small snakes, nestling birds, reptile eggs, and amphibians is considered uncommon along the southern coast area. Little is known about the natural history of this species. Coast patch-nosed snake inhabits semi-arid brushy areas and chaparral in canyons, rocky hillsides, and plains and burrows in loose soils. This subspecies of western patch-nosed snake occurs in California from the northern Carrizo Plains in San Luis Obispo County, south through the coastal zone, south and west of the deserts, into coastal northern Baja California. A large component of its diet consists of *Aspidoscelis* (whiptail) species, *this species* may be susceptible to decline in areas where *whiptails* are also noted as declining. Within the BSA, this species has a moderate potential to be found in the scrub areas associated with the steep slopes to the north and west, and near the hill north of PCH and west of TCB.

Two-striped Gartersnake. Two-striped gartersnake, a CDFW Species of Special Concern, is a medium-sized snake with a head barely wider than the neck and is primarily aquatic where it forages for food in and under water. It is typically found near water sources such as pools, creeks, cattle tanks, and other ephemeral wetlands, in rocky areas and association with oak woodlands, willow scrubs, coastal sage scrub, scrub oak chaparral, chaparral and other native brushland dominated communities. While these species are not rare, they require more habitat specificity than more common reptiles. For example, SMMNRA staff had detected two-striped garter snakes in non-urbanized riparian areas and streams (Delaney & Riley 2019). This snake is strongly associated with water and was observed in 2022 within Topanga Creek, both onsite at the northern terminus of the BSA and 1 km upstream.

Impact Analysis-Special-status Reptiles. Under Alternative 1, No Project/Managed Decline would keep in place the existing configuration and degraded nature of habitats onsite. Although no temporary disturbance to soils or vegetation would occur beyond the ongoing but limited management of fuel clearance zones, invasive weeds and hazardous trees by CDPR and partners, the habitat integrity and ecosystem health is anticipated to continue to decline as the impacts of disturbance, presence of invasive species, and unmanaged human activity increase. Habitat compression due to SLR and increased edge effects due to population growth are also anticipated. All these factors would affect sensitive herpetofauna and other fish and wildlife taxa.

Under all project build alternatives (2-4), reptile species could be directly impacted by construction activities due to direct mortality and loss of suitable foraging and refuge habitat. Loss of suitable foraging and refuge habitat is not expected to be potentially significant because of the abundance of similar suitable habitat surrounding the Project area. While these species are mobile and can move away from the Project area during construction activities, they are less visible than larger species and may be harmed during construction activities, if present.

To avoid potential significant impacts during construction on special-status reptile species, implementation of Mitigation Measure 17 would be required. This measure requires pre-construction surveys, and

development of a relocation plan for translocating animals to suitable habitats outside of the construction area, and use of exclusion materials to minimize animal reentry into the active work area.

Mitigation Measures 17: Herpetofauna Protection Measures.

1. Thirty days prior to ground disturbance or grading activities, a qualified biologist shall conduct pre-construction surveys to detect the presence of special-status herpetofauna. A minimum of three (3) preconstruction surveys shall be conducted during periods when the target species are most likely to be active. Periods of lower temperatures, generally December through February, should be avoided.

2. In the event special-status herpetofauna are identified during preconstruction surveys, a capture and relocation plan shall be developed for review and approval of CCC and CDFW. The plan shall, at a minimum, include the timing and location of the surveys, trapping and relocation methods and locations, species exclusions methods from active work areas, and required documentation/recordation data. Species specific guidance shall be included.

3. Exclusion fencing (e.g., 4'-6' high silt fence keyed in) shall be installed around the active work area to limit the potential for re-colonization of the site prior to construction activities. Fence stability shall be surveyed daily and repaired within 24 hours. The fenced area shall be cleared of herpetofauna and other wildlife, as feasible.

4. A qualified biologist will be present during vegetation removal or initial ground-disturbing activities immediately adjacent to or within habitat that supports populations of these species. Special attention shall be given to burrows and allowing animals to escape during earthwork. Earthwork and vegetation removal should be sequenced where feasible to facilitate animal movement towards open space areas.

With implementation of this mitigation measure, project construction impacts to special-status reptile species would be less than significant.

Alternatives 2-4 would all significantly benefit special-status herpetofauna over the long term. Alternative 2 provides the greatest benefit by maximizing restoration acres. Restored riparian vegetation would be attractive to ringneck snakes and coast mountain kingsnakes, among others. The restored stream and lagoon corridors would be highly suitable habitat for more aquatic species like the two two-striped garter snakes (*Thamnophis hammondii)* and western pond turtle (*Emys marmorata)*. The adjacent natural wash areas and sandy soils would be attractive to several special-status species known in areas upstream of the project, legless lizard (*Anniella spp.)* and Blainville's horned lizards (*Phrynosoma blainvillii)*, among others. The restoration of the flat area associated with the Topanga Motel would attract more coastal sage scrub species onsite. Alternatives 4 and 3 also provide these benefits, but to an increasingly lesser degree.

5.8.4.4 Birds. Two special-status species have been observed onsite, and have a moderate or high potential to occur with the project area during their protected life stage. These include Cooper's hawk (*Accipiter cooperi*) and yellow warbler (*Setophaga petechia*) and are discussed below.

Individuals of the following 12 special-status species were observed onsite, but are not expected during their protected life stage (nesting, nesting colony, communal roosts, wintering) and so are not discussed further here: great egret *(Ardea alba),* great blue heron (*Ardea herodias*), olive-sided flycatcher (*Contopus cooperi)*, snowy egret (*Egretta thula),* Caspian tern *(Hydroprogne caspia),* California gull (*Larus californicus),* long-billed curlew (*Numenius americanus),* double-crested cormorant *(Nannopterum auritum),* black-crowned night heron (*Nycticorax nycticorax),* osprey (*Pandion haliaetus*), brown pelican (Pelecanus occidentalis), and elegant tern (*Thalasseus elegans*). See Appendix P, Animal Species Observed and Appendix S, Potential for Occurrence – Special Status Wildlife for more detailed information.

Protocol surveys in 2021 for least Bell's vireo identified a low potential for the species to nest onsite as it is not known to breed within the Santa Monica Mountains, although structurally suitable habitat is present onsite.

Cooper's Hawk. Cooper's hawk is a CDFW Watch List species that is protected when nesting. It is a resident in wooded areas throughout the state, including urban woodland environments from 0-2,700 m. Although this species most typically uses dense stands of live oak, riparian deciduous, or other forest habitats near water, it has become more prevalent in urban habitats since the 1990s. Cooper's hawk feeds upon small birds, mammals and herpetofauna and typically utilizes a platform stick nest in deciduous trees or conifers near streams.

Cooper's hawk is resident along Topanga Creek and surrounding hills. Although no nesting activity has been documented in the BSA, the species was observed onsite during project bird surveys and eBird observations during 2020-22.

Yellow Warbler. Yellow warbler is a CDFW Species of Special Concern when nesting. This species breeds in riparian woodlands from coastal and desert lowlands up to 2,500 m in Sierra Nevada in CA and migrates south during the winter. It is usually found in riparian deciduous habitats in summer and visits woodland, forest, and shrub habitats during migration. Yellow warbler nests in an open cup placed 0.6 to 5 m above ground in a deciduous sapling or shrub and eats insects, spiders, and occasionally berries.

Yellow warbler has been documented by eBird observers as a transient in fall in the project area. Although it may potentially nest onsite along the creek corridor, it has few breeding-season records in the coastal Santa Monica Mountains and appears to favor inland habitats in Topanga Creek watershed. This species is expected to be a common transient through the project area.

Nesting Birds. Active bird nests are generally protected under the Migratory Bird Treaty Act and California Fish and Game Code. Bird nesting is expected to be abundant in vegetated areas onsite and present on the exterior of onsite structures. Nesting season is generally between February 1-August 1, but can span longer for raptors. Any construction scheduled during the nesting season will require preconstruction surveys for nesting birds with work typically halted or modified when near identified active nests to avoid impacts to birds and their young.

Impact Analysis-Special-status Birds and Nesting Birds. Under Alternative 1, No Project/Managed Decline, habitat integrity and ecosystem health are anticipated to continue to decline as the impacts of disturbance, presence of invasive species, and unmanaged human activity increase. Habitat compression due to SLR and increased edge effects due to population growth are also anticipated. All these factors would have a general adverse effect on protected birds and their nests over the long term.

Under Alternatives 2-4, temporary construction impacts to nesting birds could occur. Cooper's hawk and yellow warbler forage and roost onsite and have the potential to also nest onsite due to the presence of suitable habitat. Due to the mobility of these species, it is unlikely that mortality or injuries to individuals would occur. The temporary loss of foraging and nesting habitat is not expected to be significant because of the abundance of suitable habitat surrounding the Project area.

Direct impacts could occur during the nesting season that could result in mortality or injury to eggs or chicks. To reduce potential significant impacts to Cooper's hawk, yellow warbler, and other nesting birds, Mitigation Measure 18 would be implemented, which includes pre-construction nesting bird surveys, avoidance and minimization measures in the event nesting activity could be disturbed by project activities.

> **Mitigation Measure 18: Nesting Bird Protection**. If the nesting bird season cannot be avoided and construction or vegetation removal occurs between February 1 through August 1 (February 1-

September 15 for large tree removal/raptors), the project shall do the following to avoid and minimize impacts to nesting birds and raptors:

1. A qualified biologist should conduct a nesting bird study within two weeks of the anticipated start date, and again within two days prior to ground disturbance, to identify any active nests within 500 feet of the development footprint.

2. If an active nest is found, the nest shall be avoided, and a suitable avoidance buffer shall be delineated in the field where no adverse impacts may occur until the chicks have fledged the nest as determined by a qualified biologist. Construction buffers shall generally be 300 feet for passerines or up to 500 feet for raptors or as identified by a qualified biologist. Avoidance buffers may be modified at the discretion of the biologist in coordination with CCC and CDFW, depending on the species, location of the nest, species tolerance to human presence, and the type of construction-related noises and vibrations that would occur.

3. In the event a communal nesting site becomes established before completion of restoration activities, coordination with CCC, CDFW and USFWS will occur to determine the best avoidance and minimization measures. In the event it is determined that the site needs relocation, a relocation plan will be prepared for agency review. The plan will identify methods and locations for construction of new sites making use of recently used nest materials.

With implementation of Mitigation Measure 18, construction impacts to special-status and nesting birds would be less than significant.

Over the long-term, Alternatives 2-4 all facilitate increased bird nesting activities by providing more extensive and higher quality native habitats. Shore birds especially would benefit from the buffering of the beach from sea level rise, with alternative 4, providing the most benefit to beach and dune species. Additional special-status bird species are anticipated to be attracted to use the restored project area.

5.8.4.5 Terrestrial Mammals. Two special-status species were documented onsite. San Diego desert woodrat (*Neotoma lepida intermedia*) and mountain lion (*Puma concolor*). No other special-status terrestrial mammals with a moderate or high potential to be present are anticipated to utilize the project site.

San Diego Desert Woodrat. San Diego desert woodrat, a CDFW Species of Special Concern, is moderate-sized small mammals 9-15 inches long with large eyes and a relatively long tail. Its life span is not well studied, but the woodrat may live up to two years in the wild. San Diego desert woodrats are active year long and generally nocturnal. They eat buds, fruits, seeds, bark, leaves, and young shoots of many plant species, but prefer live oak, chamise, and buckwheat within coastal scrub (Meserve 1974), while prickly pear is preferred in more desert habitats. San Diego desert woodrats build large dens (or middens) “nests” which consist of vegetation and woody materials such as twigs, sticks, cactus, and rocks, with a preference for rock crevices when available. The species breeds from October to May, depending upon the habitat.

Although desert woodrats are less common than the more common big-eared woodrat onsite, they are plentiful in good habitat within the Santa Monica Mountains and Simi Hills (Riley 2021). While both species are generally sympatric, they are often locally separated by habitat. They are also thought to be competitors, with big-eared woodrat being potentially behaviorally dominant (Cameron 1971, Cameron and Davies 1972, though see Meserve 1974). Six individuals were captured during SMMNRA surveys in 2021 in areas west of the knoll and along the northern boundary of the Project area near areas of cactus scrub.

Impact Analysis-San Diego Desert Woodrat. Under Alternative 1, No Project/Managed Decline, habitat integrity and ecosystem health are anticipated to continue to decline as the impacts of disturbance, presence of invasive species, and unmanaged human activity increase. Habitat compression due to SLR and increased edge effects due to population growth are also anticipated. All these factors would have a general adverse effect on protected woodrats.

Under Alternatives 2-4, temporary construction impacts to desert woodrat could occur in the form of loss of foraging habitat, displacement, and direct mortality, if individuals are present during construction activities. The loss of foraging habitat is not expected to be significant because of the abundance of suitable habitat surrounding the Project area and the small area of impacts to natural communities onsite. Impacts to active nest sites, especially when young are present, would be significant.

To reduce potential construction impacts to San Diego desert woodrat, Mitigation Measure 19 would be implemented, which includes pre-construction surveys for woodrat middens, midden avoidance, and midden and animal relocation, if required.

> **Mitigation Measure 19: San Diego Desert Woodrat Protection**. The following measures will be implemented to protect and minimize impacts on protected woodrats:
>
> 1. Exclusion fencing (e.g., 4'-6' high silt fence keyed in) shall be installed around the active work area to limit the potential for re-colonization of the site prior to construction activities. Fence stability shall be surveyed daily and repaired within 24 hours.
>
> 2. Thirty days prior to construction activities, a qualified biologist shall conduct a survey within the proposed construction disturbance zone and within 200 feet of the disturbance zone for San Diego desert woodrat.
>
> 3. If inactive woodrat nests are found, they will be disassembled and relocated out of the active work area under the supervision of a qualified biologist.
>
> 4. If active San Diego desert woodrat nests (stick houses) are identified within the disturbance zone, a construction fence shall be erected around the nest site adequate to provide the woodrat sufficient foraging habitat at the discretion of the qualified biologist. Clearing and construction within the fenced area shall be postponed or halted until young have left the nest. The biologist shall be present during those periods when disturbance activities will occur near active nest areas to avoid inadvertent impacts to these nests.
>
> 5. If San Diego desert woodrat nest avoidance is not possible, the project biologist shall clear vegetation from areas immediately surrounding the active nests, followed by a night without further disturbance to allow woodrats to vacate the nest. Preference will be given to non-breeding-season destruction of the nests (May through October) and relocation of adults shall target undeveloped areas of the project, including salvage of nest-building material—rocks, sticks, etc. Each occupied nest shall subsequently be gently disturbed by a qualified wildlife biologist to entice any remaining woodrats to leave the nest and seek refuge outside the Project construction area. The stick nests shall be carefully removed from the Project construction area and be placed near suitable vegetation or rocky substrate like original nest location. The project biologist shall document all woodrat nests moved and provide a written report to the CCC.
>
> 6. Results of the surveys and relocation efforts shall be provided to the CCC and CDFW.

Within the implementation of this mitigation measure, impacts to desert woodrat would be less than significant.

Alternatives 2-4 will all significantly benefit San Diego desert woodrat over the long term by increasing the extent and quality of preferred scrub habitat onsite. The area where the species appears to be most prevalent is just west of the knoll along the PCH and this area is not anticipated to be graded. Preconstruction surveys will identify and avoid active woodrat nests during construction.

Mountain Lion. Although the project area does not represent high quality habitat due to its small size and degraded nature, it is connected to adjacent large areas of open space and can provide food, shelter resources, and be part of a movement corridor. Mountain lion is currently under review for listing by CDFW and is considered locally sensitive by SMMNRA and CDPR. Mountain lions are known and anticipated to use the site occasionally, but not for natal denning. SMMNRA ecologists have been tracking mountain lions using GPS collars since 2002 in the Santa Monica Mountains. Between 2019-2020, one female (P75) utilized the northern edge of the Project area on November 1, 2019, likely while feeding on a nearby kill, and again on April 5, 2020. (Figure 51).

Impact Analysis-Mountain Lion. Due to the mobility of the mountain lion, Alternative 1, No Project/Managed Decline, is not anticipated to significantly affect the species. Mountain lions can shift to preferred areas to avoid the impacts of increasing disturbance, presence of invasive species, and unmanaged human activity associated with this alternative.

No significant impacts to mountain lions would occur during construction of Alternatives 2-4 as the species is not known or expected to have natal dens on or near the Project area. The project is unlikely to adversely affect mountain lion during construction due to the species' limited use of the site, its mobility to avoid harm, and the presence of biological monitors onsite during vegetation removal and ground disturbing activities.

Alternatives 2-4 provide a small but positive benefit to mountain lion by improving the quality and quantity of native habitats within its home range.

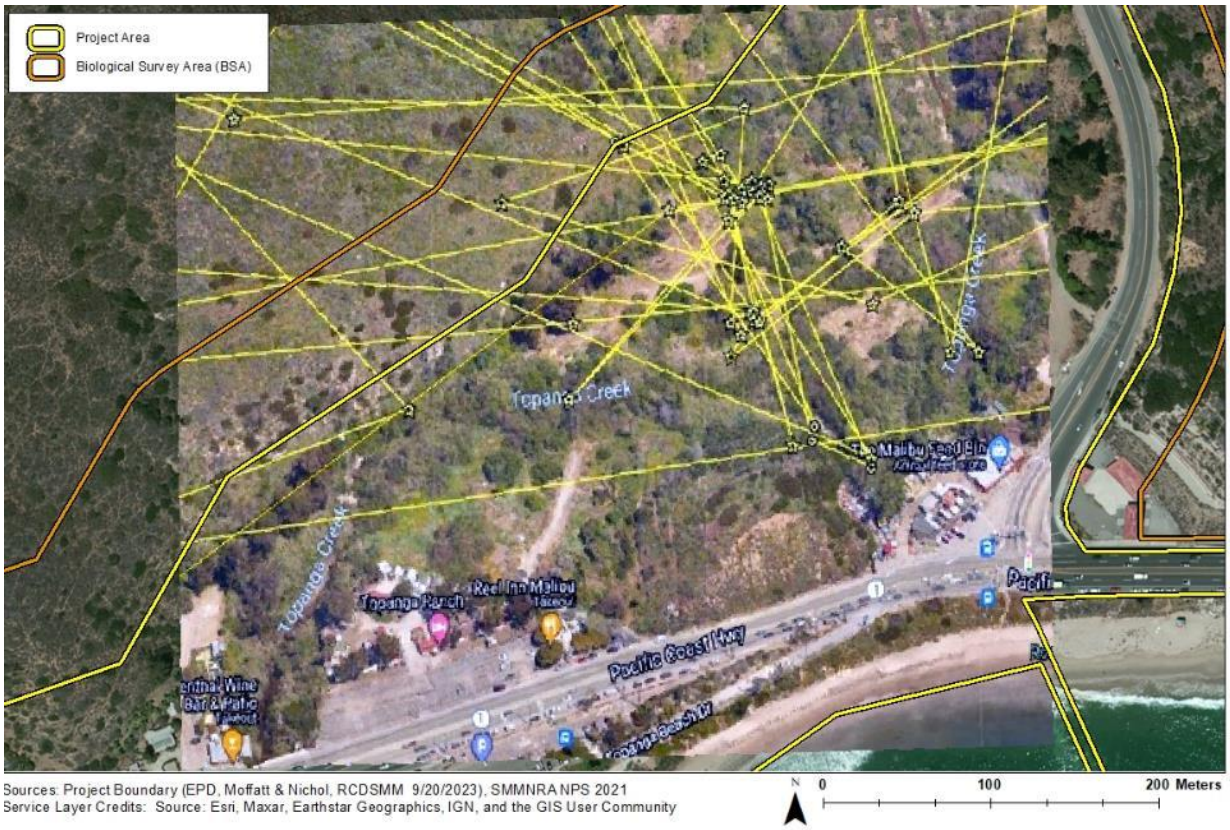


Figure 51. GPS Locations for Subadult Female Mountain Lion P75 in the Topanga Lagoon Restoration area, 2019-2020.

5.8.4.6 Special-status Bats. Three of seven bat species documented onsite via acoustic surveys were identified as special-status species and included: silver-haired bat (*Lasionycteris noctivagans*), western red bat (*Lasiurus frantzii*). and Yuma myotis (*Myotis yumanensis*). These are discussed in detail below.

Silver-haired Bat. Silver-haired bat is a CDFW Special Animal and a medium priority for the Western Bat Working Group (WBWG). A "solitary" lasiurine tribe bat and generally considered a forest-dwelling species associated primarily with north temperate zone conifer and mixed conifer/hardwood forests, the silver-haired bat may be one of western North America's most ecologically misunderstood bats. Its occurrence in winter and during seasonal migrations in low elevation xeric habitats gives a hint to its probably overall more diverse habitat preferences, which helps also to explain its occurrence in Topanga Canyon. Females form maternity roosts almost exclusively in trees, typically inside natural hollows and (e.g., bird-excavated) cavities or behind exfoliating bark of large diameter snags. Hibernating individuals may be found in tree hollows including trees hollowed by disease or wildfire, behind exfoliating bark, in rock crevices, and occasionally under wood piles or in leaf litter. Silver-haired bat would be expected to use areas onsite for foraging as it typically forages above the tree canopy, over open meadows, and along water courses within riparian habitats. It was uncommonly encountered during surveys (recorded on 3-4 nights, but fewer than 25 call files/night).

Western Red Bat. Western red bat is a CDFW Species of Special Concern and WBWG high priority. Western red bat is a "solitary" species, often truly solitary with occasionally (especially male) individuals congregate in small numbers (e.g., 3, 4 or 5 individuals). The western red bat roosts primarily in the foliage of trees or shrubs, and occasionally in rock crevices and, most often in relatively cold periods, leaf litter. The use of rock crevices is most prevalent when such habitat is near or adjacent to the species' favored day roost habitats: riparian corridors with large cottonwood, sycamores, or alder trees. Favored foraging habitats are forest edge adjacent to streams or open fields and open riparian corridors. Consequently, where healthy riparian habitats have remained intact in the western U.S., the

species is a common member of the bat cohort, albeit almost always in small numbers. Reduction in amount and health of riparian corridors, reduced stream flows, and lowered water tables – features often associated in the west to a combination of climate change and a suite of anthropogenic activities – has resulted in sufficiently reduced population numbers. This species was rarely encountered during surveys (recorded on only 1 or 2 nights, < 5 call files/night).

Yuma Myotis. Yuma myotis is a CDFW Special Animal and a low-medium priority for the WBWG. Yuma myotis is usually associated with permanent sources of water including rivers, streams, lakes, ponds, and reservoirs. but also uses tinajas in the arid west. It occurs in a variety of habitats including riparian, arid scrublands and deserts, and forests. The species is a roosting generalist and utilizes bridges, buildings, cliff crevices, caves, mines, lava tubes, and trees and forages over ponds and/or slow-moving streams. This species was rarely encountered during surveys (recorded on only 1 or 2 nights, < 5 call files/night).

Impact Analysis-Special-status Bats. Under Alternative 1, No Project/Managed Decline, habitat integrity and ecosystem health are anticipated to continue to decline as the impacts of disturbance, presence of invasive species, and unmanaged human activity increase. Habitat compression due to SLR and increased edge effects due to population growth are also anticipated. All these factors would have a general adverse effect on protected bats over the long term.

Under alternatives 2-4, direct impacts to special-status bat species could occur through the temporary loss of foraging habitat and direct mortality if individuals are roosting on site during construction activities. Potential roosting habitat include manufactured structures such as bridges and abandoned buildings, as well as tree hollows, exfoliated tree bark, rock crevices, and tree or shrub foliage, especially dead palm fronds. Alternative 2 is anticipated to have greater chance for impacts to potential bat habitat as it involves full removal of the Topanga Ranch Motel and its deteriorating structures and involves more habitat disturbance. To avoid potential significant impacts during construction, implementation of Mitigation Measure 20 will be required to ensure no roosting bats will be impacted.

> **Mitigation Measure 20: Bat Roost Measures**. The most suitable bat roosting habitats on the Project area are along the PCH bridge, within the motel, business or lifeguard structures, and within oak, palms, and other large, mature trees. Rock crevices could also be used. Bats are at their most vulnerable during their maternity roosting period (~May 1 to October 31) and during hibernation periods (~December 1 to March 31).
>
> The following measures will be implemented to protect and minimize impacts on protected and roosting bats:
>
> 1. When feasible, disturbance to suitable bat roosting habitat should be scheduled in November and April, or otherwise outside of sensitive hibernation and roosting periods.
>
> 2. Within two weeks prior to disturbance of potential bat roosting sites (large trees, structures, rocky crevices), a qualified bat specialist shall conduct a visual and acoustic pre-construction survey of the Project area and surrounding 200 feet for possible roosting habitat. The bat specialist shall document all survey results and prepare a summary report to the CCC and CDFW.
>
> 3. In the event no roosting bats are present within the survey area, one-way exclusion devices should be installed prior to structure demolition to exclude bat use and avoid their potential harm.
>
> 4. If potential roosting sites are identified, an additional survey to pinpoint roosting locations should occur within seven (7 days) prior to disturbing activities. The biologist, in coordination with CDFW and CCC, shall refine a 200-foot or other agreed upon buffer to keep in place during construction until the roosting site is confirmed to be no longer in use

for hibernation or dependent young. Night lighting for construction shall not be directed towards these roost sites.

5. Large tree cutting or removal shall be supervised by a qualified biologist to document the presence or absence of bats that might be affected. A local bat rehabilitation facility shall be available in the event tree-felling results in unanticipated injury to any bat.

6. If bat roosts are impacted during construction, the project applicant will provide replacement roosts within similar habitat and with a gap no greater than 3.8 centimeters and interior surface comparable to that of the original roost. The replacement roost should be swabbed with bat guano and urine collected from the original roost.

With implementation of these measures, impacts to the three special-status bat species would be less than significant.

Alternatives 2-4 will all significantly benefit special-status bats over the long term by increasing the extent and quality of foraging and roosting habitats onsite. Restoration plantings will include a substantial number of new native trees which will increase available roosts sites.

5.8.4.7 Wildlife Corridors. Impacts to wildlife movement corridors and habitat fragmented through development can be detrimental to populations of species that rely on these areas for seasonal migration (usually one direction per season), interpopulation movement (long-term genetic exchange), and daily movements within an animal's territory (small travel pathways). Small travel pathways facilitate movement for daily home range activities such as foraging and escape from predators; however, they also provide connection between outlying populations and larger movement corridors, permitting an increase in gene flow between populations. Larger linkages between habitat types can extend for miles between primary habitat areas and occur on a regional scale throughout California. Habitat linkages facilitate movement between populations located in discrete areas and populations located within larger habitat areas. Even where patches of pristine habitat are fragmented, the movement between wildlife populations is facilitated through habitat linkages, i.e., migration corridors and movement corridors.

Within the project boundary, there is abundant cover and forage for a variety of fish and wildlife, albeit it is highly disturbed and patchy due to large areas dominated by invasive weeds. Onsite movement of fish and wildlife between habitat patches is therefore generally not limited.

Fish and wildlife movement between the project site and adjacent areas has some limitations, however. The project boundary is abutted to the south by the PCH and the Pacific Ocean. To the east, Topanga Canyon Boulevard forms a barrier, as does the nearly sheer hillside beyond. To the west and north, the project area is abutted primarily by undeveloped vegetated mountainous terrain and the Topanga Creek corridor, which provides cover for wildlife passage to the upper Topanga Creek watershed and into the large undeveloped portions of the Santa Monica Mountains. The project boundary functionally comprises the southern terminus of otherwise continuous terrestrial wildlands to the north and northwest. For this reason, the surrounding environment to the south and east is often impassable for terrestrial and freshwater limited species.

For species that tolerate or thrive in marine habitats, such as steelhead trout, tidewater goby and grunion, the project provides an important corridor between the resources associated with the Topanga Creek watershed and others within the Santa Monica Bay. Steelhead rely on access to the Pacific Ocean and connectivity to upstream spawning sites to support their anadromous life history. Although tidewater gobies prefer shallow fresh/brackish habitats with a muted tidal influence, they have been documented moving between watersheds, underlining the importance of Topanga Lagoon as an important movement corridor. Topanga Beach is an important site for grunion spawning in Santa Monica Bay.

Impact Analysis-Wildlife Corridors. The goal of this project is to restore the habitats within the project boundary to a more natural condition. Alternatives 2-4 will increase the utility of the space for fish and wildlife movement and provide buffering from sea level rise impacts. Estuarine habitats support a wide variety of wildlife due to the nexus of saltwater, freshwater, upland, and riparian habitats of which they are comprised and by which they are surrounded, and it follows that restoring an estuarine habitat would have a large beneficial impact to the number of species of wildlife.

Under Alternative 1, No Project/Managed Decline, unmanaged human incursion is expected to increase into the wildlife corridor overtime and will continue to deteriorate resources values present onsite. Over the past few decades, CDPR and RCD have observed an increase in human waste, creek modification, fires, encampments and the associated trash and vegetation removal within and directly adjacent to the creek corridor. This trend is expected to increase with the apparent rise in the unhoused and increasing pressures to access open space areas due to population growth trends.

Alternative 1 would not protect or enhance wildlife corridors onsite. The ability of fish and wildlife to use the project area would decrease without intervention due to hydrologic changes from climate change, reduction in freshwater flow, build-up of sediment, and the rise of the sea level. Therefore, although no direct physical changes to wildlife corridors would occur under this alternative from project construction, the existing ecological conditions would continue to gradually decline reducing the quality and refugia provided in movement corridors onsite with significant effects on aquatic species.

Construction impacts to wildlife movement values could occur under Alternatives 2-4. These are especially relevant to migrating fish such as tidewater goby and steelhead trout. Impacts would take the form of direct injury or death of animals, temporary disturbance or removal of vegetation cover, temporary blockage of movement routes, and the presence of disturbing noise or lighting. With implementation of Mitigation Measures 6-19, construction impacts to movement corridors are anticipated to be less than significant.

Over the long-term, Alternatives 2-4 will be significant net benefit to fish movement through the project area. Alternative 2 provides the greatest benefit to movement corridors as it maximizes restoration acres within aquatic and riparian habitats and will improve the quality of available resources there.

Operations of the project post-construction are not expected to adversely impact wildlife corridors. The bridge and Topanga Beach area improvements are not expected to generate additional pressures on movement corridors under any of the build alternatives. Development is reduced under Alternative 2 as the Topanga Ranch Motel and most onsite business leases are removed. Development of the interpretive pavilion, limited park facilities, and parking lot improvements are not anticipated to significantly increase human activity and encroachment/environmental damage due to volunteer trails, and unmanaged use is anticipated to decrease. Although Alternatives 3 and 4 provide for the option of overnight accommodations, operational impacts to the general creek corridor are generally anticipated to be like existing conditions as business leases are removed. Therefore, no mitigation measures are required because operational impacts are anticipated to be less than significant.

5.9 Marine Resources

This section summarizes the results of the surveys conducted by CRM in 2022 and 2023 to assess the marine resources present and that could potentially be affected by the proposed project. Biological resources that are found primarily along the beach, or more inland in the fresh/brackish waters of Topanga Lagoon and Creek, or terrestrial areas are discussed in other sections of this document.

Marine surveys assessed the nearshore deposition area, pipeline alignment, and the intertidal area for a 1-mile section of shoreline ranging from the mouth of Topanga Lagoon to the eastern terminus of Ratner Beach. The intent of the surveys was to determine the seafloor composition, marine habitats, and species present, identify species that could potentially utilize the project area and assess the potential of the project to impact them.

We also provide an impact analysis for each marine special-status biological resource category. When impacts would be the same for specific species, these are grouped for analysis.

5.9.1 Bottom Habitat Classifications. Figures 52 and 53 show the distribution of subtidal and intertidal habitats onsite and representative photographs.

Subtidal surveys identified that most of the survey area was composed of Unconsolidated Bottom (sand) for areas deeper than -20 ft. Between -6 to 20 feet, Subtidal Consolidated Rubble, and Subtidal Unconsolidated-Cobble were prevalent. Subtidal Sand-Cobble Rubble was prevalent at the western terminus of the project area and extended to at least -25 feet deep. From the mouth of Topanga Lagoon to Mastro's point, this habitat type was found more shallowly between -5 to -15 feet deep. Table 19 identifies the mapped acreages per subtidal habitat type.

Table 19. Marine Subtidal Habitat Types 2022-2023.

Habitat	Acres	%
Subtidal Unconsolidated Sand	137.3	65.2
Subtidal Unconsolidated Cobble	16.7	7.9
Subtidal Consolidated Rubble	36.6	17.4
Subtidal Cobble/Rubble*	20	9.5
Total	**210.6**	

Notes: Sand was present in each of the listed cobble and rubble areas.
** Acreages determined by Google Aerial Photos (2012-2016),*
CDFW Kelp Bed Maximum Extent (2016), CRM dive surveys (2022/2023)

Near the western terminus of the project boundary, Topanga Beach was flanked by a thin band of Intertidal Cobble that transitioned to Mixed Cobble-Rubble at greater depths. Closer to the W side of Mastro's Point Subtidal Sand-Cobble-Rubble was more prevalent at shallower depths and transitioned at -6 feet deep to Unconsolidated-Cobble with some limited Consolidated-Rubble. Reefs in this area were generally < 3 ft high, and partially or fully covered by sand. The reefs generally increased in height in the vicinity of Maestros Point. Some surfgrass was observed at about the -12 to -15 MLLW depth.

East of Mastro's Point, Ratner Beach was armored by riprap, which transitioned in the intertidal to areas dominated by Sand, Mixed Sand-Cobble, and Cobble. Bedrock Platforms were also present.

The nearshore deposition area surveyed in 2023 was modified from the polygon identified in 2022 to avoid sensitive bottom habitats during sediment placement and to minimize effects resulting from sediment movement post placement. Preliminary modeling results from project engineers (Moffatt and Nichol, Integral), as well as feedback from CCC, USACE and NOAA staff were used to identify a larger and deeper deposition zone.

Table 20 identifies the acreages per habitat type in the intertidal zone.

The vast majority of the nearshore nourishment zone was composed of Unconsolidated Bottom (sand) as was typical for areas deeper than -20 ft throughout the survey area. The pipeline alignment servicing the nourishment zone crosses from Beach Sand, through Subtidal Sand-Cobble-Rubble, Subtidal Consolidated-Rubble, Subtidal Unconsolidated-Cobble to terminate in Subtidal Unconsolidated-Sand.

Table 20. Marine Intertidal Habitat Types 2022-2023.

	Topanga Beach		Ratner Beach		Study Area	
Habitat Types	**Acres**	**% Total**	**Acres**	**% Total**	**Acres**	**% Total**
Riprap	0.4	2.8	3.1	15.7	3.5	10.3
Sand	5.8	40.6	5.9	29.8	11.7	34.3
Sand/Cobble*	0.0	0.0	2.5	12.6	2.5	7.4
Cobble	2.3	16.4	1.8	9.1	4.1	12.1
Rubble/Cobble**	5.7	40.1	6	30.3	11.7	34.4
Rubble/Platform	0.0	0.0	0.5	2.5	0.5	1.5
Total	**14.2**	**100.0**	**19.8**	**100.0**	**34.0**	**100.0**

Source: CRM 2023.
** Mixed sediments; sand dominant*
***Mixed sediments, rubble dominant*

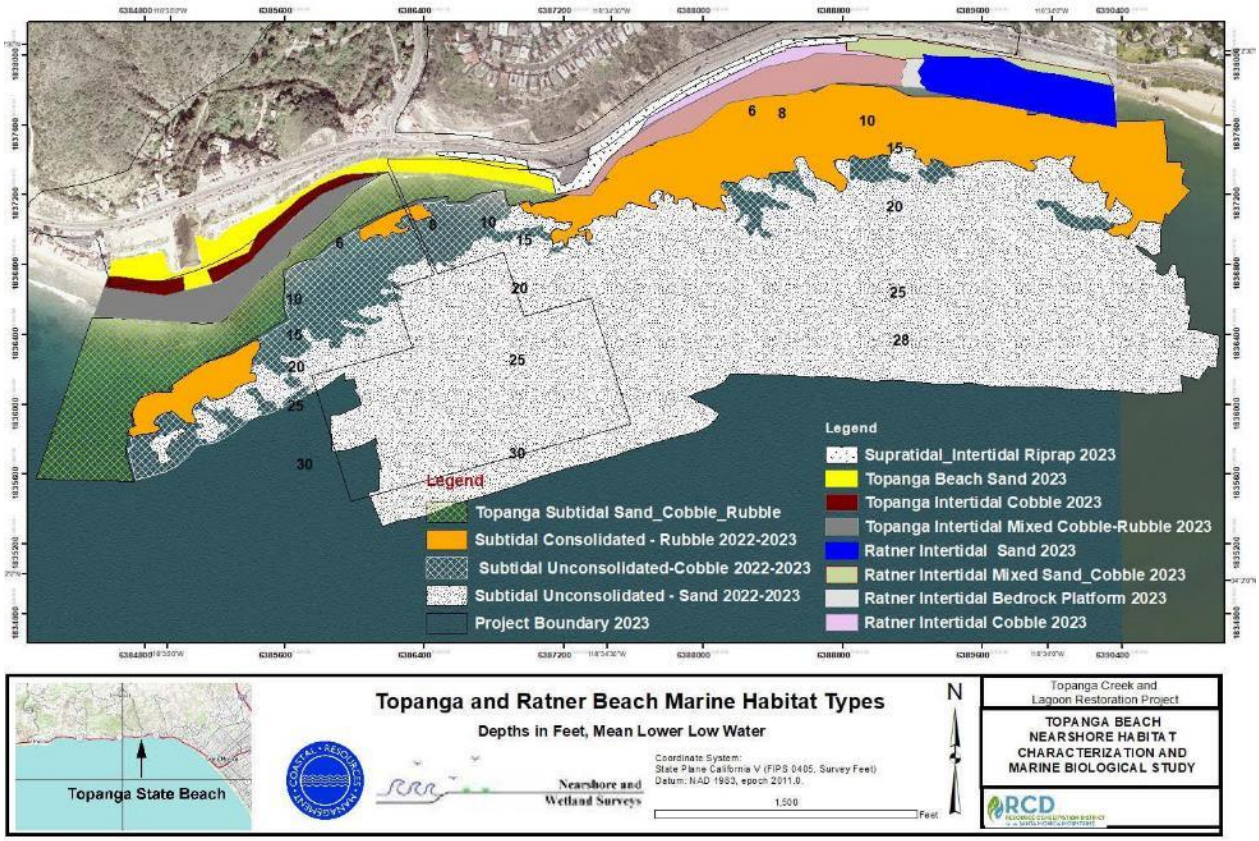


Figure 52. Bottom Habitat Classifications. Coastal Resources Management 2022, 2023.

Unconsolidated Bottom Sand with Sand Dollars.

Intermixed Unconsolidated Bottom – Sand /Rock Bottom-Rubble. Note covering of sand over the rocks that are colonized by turf algae.

Intermixed Unconsolidated Bottom - Sand/Rock Bottom – Rubble. Located on the seaward side of a more extensive rubble reef. A moderate covering of filamentous algae, encrusting algae, and tunicates on the sides and upper surface.

Rock Bottom – Rubble (3 to 6 ft high) with high cover of the gorgonian (*Muricea californica*).

Topanga Beach W, Rocky Intertidal. Cobble and Small Boulder Rocky Intertidal Habitat West of Topanga Lagoon.

Topanga Beach E. Cobble and Sand Intertidal to the East of the Topanga Lifeguard Station

Figure 53. Photographs of Bottom Habitats. CRM 2022-23.

Riprap Protection at Mastro's Point, and Cobble and Rubble (boulder) Intertidal Immediately East of Mastro's Point

Boulder and Bedrock Platform near the Intersection of Coastline Drive and Coast Highway Along Ratner Beach

Figure 53. Photographs of Bottom Habitats (cont.). CRM 2022-23.

5.9.2 Biological Habitats. Figure 54 summarizes the biological habitats present within the survey area and where applicable, Essential Fish Habitat (EFH) and EFH Habitat Areas of Particular Concern (HAPC) were identified for each classification. Table 20 describes the habitats and identifies species of interest associated with them. Representative photographs are shown in Figure 55.

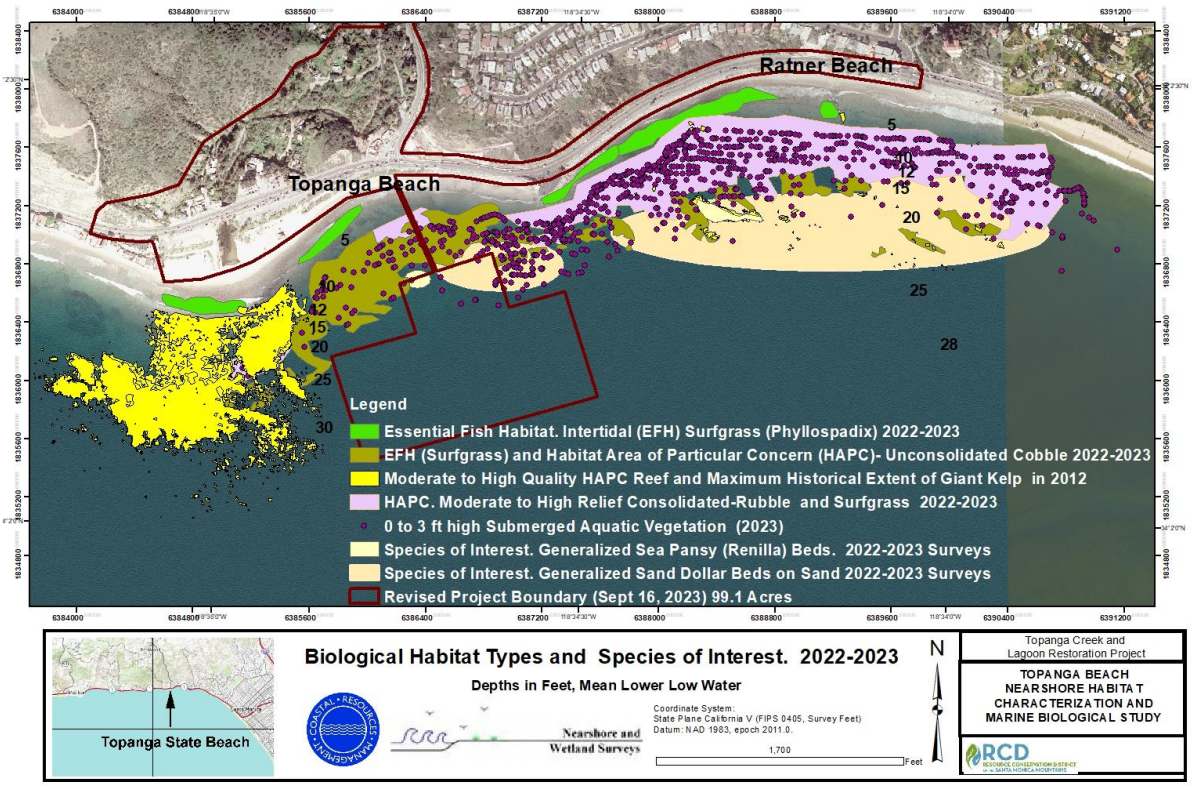


Figure 54. Marine **Biological Habitats.** CRM 2023.

Table 20. Marine Biological Habitats.

Habitat Type/Species of Interest	Description	Approximate Acreage and Depth Range
Intertidal		
Unconsolidated-Sand	Low-to-High Value. Potentially high value due to the presence of California Grunion spawning habitat along both Topanga and Ratner beaches. Invertebrates (amphipods, sand crabs, polychaetes, and clams support shorebirds populations and fish on higher tides. Portions of the sand habitat are mixed with cobble.	11.7 acres. 2.7 acres of sand/cobble mix -2 to +7 ft MLLW
Unconsolidated-Cobble	Essential Fish Habitat-Rocky Reef Habitat of Particular Concern (HAPC). Low-Moderate Biological Value. Generally supports short-lived, sand tolerant and sand loving species of algae (i.e., coralline algae, encrusting red/brown algae, low turf algae (i.e., Gelidium and Zonaria) opportunistic green algae) due to regular periods of accretion and erosion. Characteristics of the high and mid Topanga intertidal are also present at Ratner Beach. Portions mixed in with rubble fields	4.6 acres. 11.7 acres of Rubble/Cobble mix -2 to +7 ft MLLW
Consolidated-Rock (Rubble)	Essential Fish Habitat- Rocky Reef HAPC. Moderate-to-High Value. Rubble/Boulder habitat is more common at Ratner Beach than Topanga Beach. Greater degree of tide pool depressions supporting intertidal invertebrates and algae. Supports a greater diversity of Aquatic Bed-Algae (i.e., foliose reds and brown algae) as well as small sand tolerate/loving algae, and colonial tube worms (*Phragmatopoma*) at the base of the rocks. Supports Aquatic-Bed Rooted vascular plants (surfgrass).	0.5-acre boulder/bedrock platform. 11.7 acres of Rubble/Cobble mix (see above) -2 to +7 ft MLLW
Aquatic Bed-Algae	Common to both Topanga and Ratner beaches. Low-moderate biological value in unconsolidated cobble/gravel fields; moderate-to-high value in Consolidated-Rock (boulder/bedrock) habitat particularly at Ratner Beach due to increased habitat stability and biological diversity of algal community	16.8 acres -2 to +5 ft MLLW
Aquatic Bed-Rooted Vascular (Surfgrass, Phyllospadix)	Essential Fish Habitat and HAPC. Common to both Topanga and Ratner rocky intertidal, although healthier intertidal surfgrass beds are found in the Ratner Beach intertidal. Less healthy and patchier intertidal surfgrass in the Topanga intertidal is likely due to less stable habitat (unconsolidated cobble/gravel) and effects of Topanga Creek/Lagoon runoff.	4.0 acres -2 to +1 ft MLLW
Subtidal		
Unconsolidated-Sand	Low-Moderate Value. Species of interest in the sand habitat include the sand dollar (*Dendraster excentricus*) that form extensive, and low-to-dense beds offshore of Topanga Beach and Ratner Beach and the sea pansy (*Renilla kollekerii*) which is present in a low-density aggregation off Topanga Beach at an approximate depth of -15 ft MLLW. Other species found within this habitat include a community of benthic infauna, and macro-epibenthic sand stars, cancer crabs, occasional lobsters, whelks, hermit crabs, sand bass, halibut, and sting rays.	137.3 acres -2 to -30 ft MLLW
Unconsolidated-Cobble	Essential Fish Habitat-Rocky Reef HAPC. Low-Moderate Biological Value. Similar to the intertidal, Cobble generally supports short-lived, sand tolerant and sand loving species of algae (i.e., coralline algae,	16.7 acres

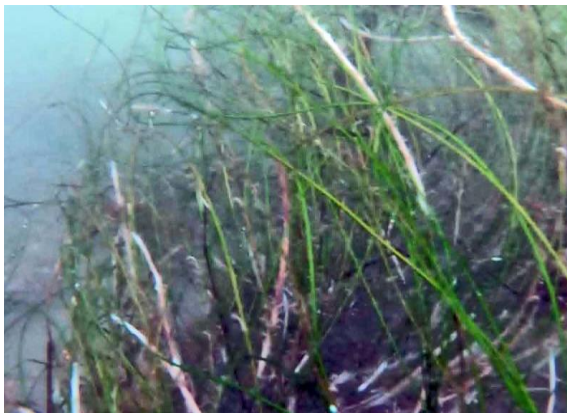
	encrusting red and brown algae, low turf algae, and. opportunistic green algae) due to regular periods of habitat instability, and sand accretion and erosion. Dominant but not continuous and mixed with sand from the Topanga Point Break to areas approaching Maestro's Point to depths of about -17 ft. Similarly occurs off Ratner Beach, but not as common as offshore Topanga Beach.	~2 to -17 ft MLLW
Consolidated-Rock (Rubble)	Essential Fish Habitat (Rocky Reef). Moderate-to-High Value. Rock (Rubble/Boulder/Bedrock) habitat is more common offshore of Ratner Beach than Topanga Beach. Supports a greater biodiversity of marine life than cobble/gravel habitat, including invertebrates and algae. Supports a greater diversity of Aquatic Bed-Algae than cobble/gravel intertidal i.e., foliose reds and brown algae) as well as and small sand tolerate/loving algae as the base of the rock. Supports Aquatic-Bed Rooted vascular plants (surfgrass). Lobsters commonly observed in Consolidated Rock habitat off both Topanga and Ratner beaches in 2023.	36.6 acres -2 to -17 ft MLLW
Aquatic Bed-Submerged Aquatic Vegetation (Algae)	Algae <3 ft in height is common to both Topanga and Ratner subtidal habitats, includes turf covering and upright reds and brown algae. Cover and habitat for invertebrates, fish, and foraging habitat for fish. Low-moderate biological value in unconsolidated cobble/gravel fields; moderate-to-high value in Consolidated-Rock (boulder/bed rock habitat, particularly at Ratner Beach due to increased habitat stability and biological diversity of algal community. Giant kelp (*Macrocystis pyrifera*) is absent from either area, although historically it formed a canopy as recently as 2012 off the Topanga point break in front of Topanga Creek and to a much smaller degree, off Ratner Beach. Other kelps (>3 ft high) are uncommon and include E*gregia menziesii* and *Desmarestia ligulata*. Invasive seaweeds present include *Sargassum muticum* which was uncommon at either Topanga or Ratner during the 2023 dive surveys.	53 acres -2 to -17 ft MLLW
Aquatic Bed-Rooted Vascular Surfgrass *Phyllospadix torreyi*)	Essential Fish Habitat-Habitat Area of Particular Concern. Present in the Topanga and Ratner subtidal extending from -2 to approximately 15' MLLW. Larger and healthier surfgrass beds are found off Ratner Beach than off Topanga Beach. Observed in low relief habitat partially covered by sand as well as in higher relief Consolidated-Rock habitat. Nursery habitat for California lobsters (*Panulirus interruptus*).	36.6 acres -2 to -17 ft MLLW
Canopy-Kelp (*Macrocystis pyrifera*)	Essential Fish Habitat-Habitat Area of Particular Concern. Canopy kelp HAPC includes those waters, substrate, and other biogenic habitat associated with canopy-forming kelp. Historical kelp canopy areas in the project area include the Point surf break in front of Topanga Creek at depths from -5 to -40 ft, and a minor bed off Ratner Beach at a depth of approximately -20. Currently, there are no areas in the project area where kelp expresses any surface canopy.	35 acres -5 to -40 ft MLLW
Reef-Sandcastle Tube Worms (*Phragmatopoma californica*	Sandcastle tube worms-*Phragmatopoma californica*. *Phragmatopoma* is a reef-building polychaete worm that collectively builds honeycomb-like tubes out of sand grains filtered out of turbulent eddies around reef bases. Found individually or in colonies on sand-influenced reefs. Present off Topanga Beach and Ratner Beach, more abundant in the Ratner Beach subtidal.	No estimate but presumed to be throughout hard bottom areas. -2 to -17 ft MLLW

Reef-Gorgonians (*Muricea californica* and *M. fruticosa*),	Gorgonians (sea whips) form colonies on rocky reefs in areas of moderate-to-high water movement. Present off Topanga and Ratner Beaches. Denser colonies off Ratner Beach are primarily in Consolidated Rubble habitat.	No estimate but presumed to be through hard bottom areas. -10 to -17 ft MLLW
Reef-California Spiny Lobster (*Panulirus interruptus*)	Juvenile and adult lobsters were common offshore of both Topanga and Ratner beaches primarily in Consolidated-Rock/Rubble due to the protective features of crevices and overhangs, secondarily in Unconsolidated Cobble Gravel and Unconsolidated Sand where they appeared to be foraging.	No estimate but presumed to be through hard bottom areas.
Consolidated Sand-Sand Dollars (*Dendraster excentricus*)	Found in Unconsolidated Sand habitat. Present in low-density to high-density beds offshore of both Topanga and Ratner beaches in clean sand habitat.	36 acres 5 to -15 ft MLLW
Sea Pansy (*Renilla kollekerii*)	Present in Unconsolidated Sand habitat in a small, concentrated area immediately west of the inner edge of the proposed dredge nourishment area at depths between -12 and -15 ft MLLW-	0.4 acre -12 to -15 ft MLLW

Source: CRM 2023.

Aquatic Vegetation-Algae. Low relief boulder reef heavily included by sand. Upright red algae (*Gracilariopsis*), articulated coralline algae present on the rocks.

Aquatic Vegetation-Algae. Reef top of 3 ft high boulder with the red algae (*Gelidium robustum)* encrusted with ectoprocts (bryozoans).



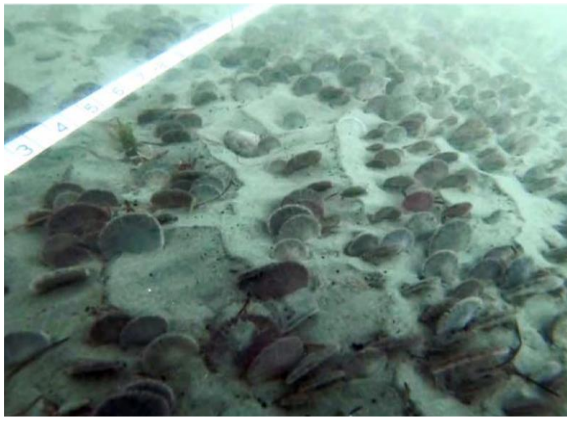
Aquatic Bed-Rooted Vascular Vegetation-Surfgrass. Along Transect T4.

Reef-Dominated by Gorgonians. Gorgonian on the upper surfaces of rocks. Muricea *californica* (golden), *M. fruticosa* (brown).

Unconsolidated Sand Bottom-Polychaete Worm Community. A pipefish is next to the tube, likely feeding on amphipods or caprellids that use *Diopatra* tube as attachment.

School of Sargo (*Anisotremus davidsonii*) in **rocky reef habitat** on the 12’ isobath off Ratner Beach.

Figure 55. P**hotographs of Biological Habitats.** CRM 2022, 2023.



Unconsolidated Sand Bottom-Sand Dollar Beds. Along Dive Transect T4.

Unconsolidated Sand Bottom-Polychaete Worm Community. *Diopatra* spp. tube worms. A pipefish (*Sygnathus leptorhynchus)* is next to the tube, likely feeding on amphipods or caprellids that use *Diopatra* tube as attachment.

Lobsters observed in crevices and in open areas of the reef.

Reef-building colony of the Sandcastle Tube Worm, *Phragmatopoma californica*.

Sea Pansy (*Renilla kollekerii*) along the -15' Isobath at Topanga Beach

Low-Relief Boulders and Cobble Interspersed Between Sand Channels Were Common Along the -12' MLLW Isobath at Topanga Beach

Figure 55. P**hotographs of Biological Habitats (cont.).** CRM 2022, 2023.

5.9.3 Observed Marine Species. This section identifies the marine species observed during dive and intertidal surveys within specific areas. A complete species list is found in Appendix N, Marine Surveys (Appendix 3) with information provided on their relative level of abundance and native versus invasive status.

5.9.3.1 Dive Surveys. A total of 54 taxa of marine organisms were observed in 2023 along the eight dive transects along Topanga and Ratner Beaches at depths between -5 and -15 ft MLLW. This included 21 species of algae, 1 seagrass, 22 species of invertebrates, and 10 species of fish. Forty-three were associated with rock, 9 were sand bottom organisms, and 2 were associated with both habitat types.

In 2022, 35 species were observed along Topanga Beach during four deeper transects between ~9 to ~30 ft deep. Observed species included seven algae and one seagrass, 21 invertebrates, and six species of fish. Twenty taxa were found in low-relief reef habitat and while 15 were associated with sand bottom habitat.

Rock Bottom/Intermittent Bottom (Sand/Rock Bottom-Rubble). The conditions and suite of species found within this habitat were consistent with previous studies. This habitat was inundated with silt and sand. and dominated by spermophyte and sand-resistant algal species and included: brown alga (oyster thief (*Colpomenia sinuosa),* flattened acid kelp (*Desmarestia ligulata*), featherboa kelp (*Egregia menziesii)*, *Taonia lennebackeriae*, chainbladder kelp (*Cystoseira osmundacea*), banded fanweed (*Zonaria farlowii*,)), sea lettuce (*Ulva* spp.), red coralline alga (*Corallina vancouveriensis, C. chilensis, Lithothrix aspergillum, Lithophyllum* spp.), red alga (*Ahnfeltia plicata, Chondracanthus canaliculatus, Gelidium* spp*., Gymnogongrus leptophyllus*, *Rhodymenia* spp. and diatoms. *Sargassum muticum* thalli were also observed. Patches of surf grass were rare and relatively unhealthy along Topanga Beach but were more abundant and healthier along Ratner Beach.

Rare to common occurring motile macrofauna included predators such as wavy top snails (*Megastraea undosa),* bat stars (*Asterina miniata*), California cone snails (*Californiconus californicus),* purple olive snail (*Callianax biplicata*), nudibranch *(Flabellina iodinea*) and octopus (*Octopus bimaculatus)*. Omnivores/scavengers included sheep crab *(Loxorhynchus grandis*), spiny lobster (*Panulirus interrupt*us) and cancer crab (*Cancer antennarius)*. Herbivores included the California sea hare *(Aplysia californica),* Sessile invertebrate, suspension feeding forms included gorgonians (*Muricea californica, M. fruticose)*, snail (*Serpulorbis squamigerus)*, sandcastle tubeworm (*Phragmatopoma californica*), ectoproct (*Bugulina neritina*), hydroid Ag*laophenia struthionides*, reef building polychaete worms (*Phragmatopoma*), rock boring clam (*Zirfaea pil*sbryi), stalked sea squirt *(Styela montereyensis),* and sand dollar (*Dendraster excentricu*s).

Fishes observed during dive surveys in rocky bottom habitat included painted greenlings (*Oxylebius pictu*s), kelp perch (*Brachyistius frenatus*), black perch (*Embiotoca jackson*i), sargo (*Anisotremus davidsonii*), kelp bass (*Paralabrax clathratus*), garibaldi (*Hypsypops rubicundus*), and horn sharks (*Heterodontus franciscanus*).

Unconsolidated Sand Bottom. The macrofauna observed are known to be common throughout southern California nearshore sandy bottom environments and change seasonally and over the long-term (Morin et al. 1985, Davis and VanBlaricom 1978).

The suspension feeding sessile tube worm (*Diopatra* sp*.)* was widely distributed, the most abundant taxa observed and occurred throughout the sand bottom areas. Suspension feeding sand dollar (*Dendraster excentricus*) beds with both adults and juveniles were present inshore of the 20 ft contour. Other sessile species included the suspension/filter feeding brittle star (*Amphiodia occidentalis)* and the sea pen (*Virgularia* sp.). Sand bottom motile invertebrates included the predatory sand star (*Astropecten armatus)* and the sea star (*Pisaster giganteas),* and scavengers/omnivores such as the hermit crab (*Isocheles pilous)*, and juvenile and subadult cancer crabs (*Romaleion antennarium*).

Fishes seen along the dive transects included pipefish (*Sygnathus leptorhynchus*), speckled sand dabs *(Citharichthys stigmaeus*), California halibut (*Paralichthys californicus*)-a CDFW managed species, barred sand bass *(Paralabrax nebulifer*), spotted sand bass (*Paralabrax maculatofasciatus*), round sting ray *(Urolophus halleri*).

5.9.3.2 Intertidal Surveys. 82 taxa of plants and invertebrates were recorded during the 2022-2023 intertidal reconnaissance surveys along Topanga and Ratner Beaches. Species richness generally increased moving west. Red algae and gastropods contributed the highest number of species followed by brown algae and gastropods. Several species were consistently abundant: green algae (E*nteromorpha* sp.), a brown algae ectocarpoid "fuzz," filamentous red algae, colonial diatoms, and the blue-clawed hermit crab (*Pagurus samuelis)*. These taxa were ubiquitous between the high tide zone and the low tide zone, but more frequently occurring within the mid intertidal zone.

Backshore Environment. The backshore habitat in Topanga was largely sand with, while Ratner was rockier and largely armored with riprap. The few types of organisms present were indicative of the "splash zone" environment, typified by species that are tolerant of long-periods of drying and thermal stress. Typical species observed included green algae (*Ulva* spp.), isopod (*Ligia* sp.), barnacle (*Chthamalus fissus/dalli* and *Balanus glandula*), lined shore crab (*Pachygrapsus crassipes*), hermit crab (*Pagurus samuelis*), limpet (*Lottia scutum*, *L. limatula*, and *L. scabra*), western gull (*Larus occidentalis*) and snowy egret (*Egretta thula*). Harbor seal (*Phoca vitulina*) and bottlenose dolphin (*Tursiops truncates*) were observed in the nearshore zone during intertidal surveys.

High-to-Mid Intertidal Zone. The species composition present during the 2022-23 surveys were characteristic of habitats frequently disturbed by wave action, sand scour, and sand deposition. This zone was characterized by an increase in algae and invertebrate species richness, and a corresponding increase in biological cover. Algae cover was up to 50% on the surface of rocks, and within tidepools. Common species included green algae (*Ulva californica*), brown algae (*Endarachne binghamiae*), and encrusting brown algae (*Ralfsia* sp.). Moderate-to-high numbers of the grazing black turban snail (*Tegula funebralis*), the scavenging hairy hermit crab (*Pagurus hirsutiusculus*, and lined shore crabs (*Pachygrapsus crassipes*) were seen. Within the tidepools and the lower tide levels, red algae became dominant, with high cover of articulated corallines (*Bossiella orbigina*, *Corallina chiliensis*, and *Lithothrix aspergillum*), as well as upright reds (*Gelidium coulte*ri, *G. robustum*, *Laurencia pacifica)*, and encrusting reds (*Lithophyllum* sp. and *Peyssonnelia* sp.). Tidal invertebrates included a mix of limpets *(Lottia limatula*, *L. strigatella*, *and Fissurella volcano*), periwinkle snails (*Littorina* spp.), chitons *(Nuttalina californica*), and mussels (*Mytilus californianus,* invasive *M. edulis/galloprovincialis*). Occasional sea hares (*Aplysia vaccaria, A. californica*), wavy top snails *(Megastraea undosa*), and anemones (*Anthopleura sola*) were also present in the tide pools.

Low Tide Zone. Many of the species present in the high-mid mid intertidal were present within the lower intertidal. Algae cover was 50% greater in this zone and included surfgrass (*Phyllospadix torreyi*), larger brown macrophytes feather boa kelp (*Egregia menziesii*), red algae (*Chondracanthus canaliculatus* and *Gastroclonium subarticulatum*), and invasive (*Sargassum muticum)*. Surf grass was patchy and unhealthy in the Topanga Beach area but occurred in expansive beds along Ratner Beach. The sand tolerant brown algae (*Zonaria farlowii*) was found in small patches. The sandcastle colonial tube worm (*Phragmatopoma californica),* mussels*,* and anemones (*Anthopleura* spp.) were common to abundant, along with smaller colonies of the snail (*Thylacodes squamigerus).*

5.9.3.3 Impact Analysis-Marine Species.

Effects on Rocky Intertidal and Rocky Subtidal Organisms. Nearshore nourishment activities have the potential to affect reef animals and plants through potential burial of individuals and their hard bottom habitat. Impacts are anticipated to be limited to sessile or slow-moving species, as mobile species would tend to be able to relocate out of harm's way. This would occur not through the direct placement of material on rocky reef area, but movement of deposited materials due to the littoral current and wave movement. Impacts to tunicate (*Styela montereyensis*), gorgonians, and solitary

corals *(Balanophyllia elegans*) via burial and scour have been documented (Rosenthal *et al* 1974, ACOE 1982). Increased turbidity from suspended sediments could reduce light levels necessary for seaweed and surfgrass to survive. Giant kelp is particularly sensitive to reduction in light levels due to increased turbidity and sedimentation effects that affect sporophyll production (Foster and Schiel, 1985). Recovery of reef-associated organisms to disturbances may take up to five years (Turner et. al, 1969) and varies per taxa nomic group.

The placement of a discharge pipeline, vessel anchors, and anchor chains across hard bottom habitat could adversely affect this bottom habitat and damage sensitive resources such as surfgrass beds and sea whip colonies. Thus, mitigation measures should be implemented to avoid damage to these resources.

Organisms living in the intermixed rocky and sandy area inshore of the proposed sediment discharge area in the "intermixed unconsolidated zone" will be less affected by burial because the prevailing littoral current is easterly. Boulders in this zone tend to be isolated and small-to-moderate sized and are typically low in biological diversity due to constant scour and burial that naturally occurs in the project area. Surfgrass and sea whips colonies are common within this habitat and the lower edges of these rocky surfaces may be temporarily exposed to increases in bedload movement.

Depending on how far organisms are located east from the discharge point, there could potentially be some observable low-level burial and behavioral response effects on organisms near and/or past Mastro's Point, but sediment thickness in this area, approximately 2,000 ft past the point of sediment discharge, is expected to be minimal, thus reducing the likelihood of permanent long-term impacts. Therefore, adverse impacts if they occur, are expected to be temporary. If these resources are affected, full recovery is expected over the course of one to five years.

Effects on Sand Bottom Organisms. Sand bottom, epibenthic organisms such as tube dwelling polychaete worms sand dollars, sand stars, sea stars, and cancer crabs are the most common organisms that might be in the pathway of nearshore bedload sediment redistribution. These organisms could be adversely affected by full or partial burial along a decreasing impact gradient from the point of discharge to the nearshore waters east of Mastro's Point.

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Sand dollar beds were located approximately 400 ft directly inshore of the proposed discharge point at depths between -14 to -20 ft MLLW. However, the leading (offshore edge) could seasonally migrate offshore nearer to the discharge point during fall/winter periods (Morin et al, 1985) and thus be more susceptible to sediment discharge and bedload movement. Depending on the rate, volume, thickness of dredge disposal material and direction of movement, sand dollars, and other sand bottom species could be initially buried and potentially suffer high mortality where sediment thickness exceeds the animals' ability to dig themselves out.

Seasonally, sand dollars and other sand-dwelling organisms can recover from periodic shallow burial related to swell and surge activity particularly if burial is slow and/or does not cover the organism. Other sand bottom dwelling organisms, like motile sand stars, sea stars, and cancer crabs can behaviorally react to sediment bedload increases and respond quicker than sessile organisms like sand dollars or tube worms.

The placement of a discharge pipe, anchors, and anchor chains in the sand bottom habitat could result in damage to sand dollar beds. Mitigation measures should be implemented to avoid damage, where possible, to sand dollar beds.

The presence of larger grained material (gravel, cobble) material to be deposited has the potential to shift portions of the unconsolidated sand bottom into a more intermixed bottom if the larger sized materials are piled too thickly or do not disperse (CCC staff, *pers. comm*, March 2023).

Based upon the preliminary, predicted sediment redistribution analysis, there will be some degree of mortality within the initial sand bottom discharge zone of both infaunal organisms (those living in the

sediments such as worms, crustaceans, and clams) and epifaunal organism. Mortality of sand stars, sea stars, sand dollars will occur where burial is quick and deep. With increasing distance to the east, burial effects will be reduced because: 1) rate of sediment redistribution will likely be slower and 2) depth of burial will be reduced. Infaunal organisms and epibenthic organisms within the zone of discharge will be initially buried, but over time, larval settlement will occur, and the seafloor will again be colonized by infaunal organisms and epifaunal organisms.

Recovery of benthic infaunal and epibenthic community affected by sediment discharge will begin upon cessation of sediment discharge, and recovery will occur over a period of one-to-five years. No long-term adverse effects because of sediment discharge offshore of Topanga Beach are anticipated,

Invasive Species Effects. Invasive species could also be introduced by equipment during construction or monitoring, with marine vessels being the most likely avenue via their submerged parts or ballast discharge. Other potential contamination routes include submersible pumps, pipelines, diving gear and other submerged materials or equipment. The introduction of invasive species could cause permanent changes in species composition or interactions. Ultimately, changes in these communities could prevent re-establishment of native biological populations.

To minimize impacts to epibenthic and infaunal communities through burial, turbidity, and damage from construction, marine species present in the project area disturbed by construction activities, and from the potential introduction of invasive marine species, the following mitigation will be implemented.

> **Mitigation Measure 20: Reduce Impacts to Marine Habitats and Species**: The following measures will be implemented at a minimum. Additional measures required by the regulatory agencies in project approvals will also be incorporated. When a conflict exists between specific measures, the most protective will be implemented.
>
> - Prior to construction, conduct focused surveys of marine biological habitats and communities between the shoreline and approximately -20 ft MLLW, particularly within the proposed pipeline corridor to identify marine resources and potential project impacts prior to project initiation. Consultation with the resource agencies will occur to implement the best methods for resource impact avoidance and minimization.
> - Avoid placement of pipelines across rocky intertidal boulder fields, subtidal rocky reefs, surfgrass beds, kelp beds (if present), gorgonian and sandcastle tube worm beds, and sand dollar beds. If possible, use risers to avoid impacts to these areas, or reroute pipelines into sand channels between reefs and around kelp beds and sand dollar beds.
> - Avoid anchoring of support vessels over hard bottom habitat to minimize damage to sensitive habitat and surfgrass beds.
> - Methods will be utilized to control the flow of sediment into different parts of the nourishment area to allow natural movement of material and minimize deep direct burial of resources. Preliminary model results suggest that the deeper portions of the nourishment area may be preferable as they would result in less sediment deposition down coast.
> - A qualified biologist will monitor the placement of marine equipment and structures, and deposition of nourishment material to identify potential threats to marine resources for avoidance and assess compliance with marine permit conditions. In the event marine resources are threatened by project activities, the monitor will have authority to stop work until agency consultation occurs and the issue is resolved.
> - To limit the spread of invasive marine species during project construction, all project support vessels shall have underwater surfaces cleaned before entering Southern California waters and immediately prior to transiting to the offshore construction area. Additionally, and regardless of vessel size, ballast water for all project vessels must be managed consistent with California State Lands Commission (CSLC) ballast management regulations, and Biofouling Removal and Hull Husbandry Reporting Forms shall be submitted to CSLC staff.

5.9.4 Special-Status Marine Resources. This section summarizes the special-status marine resources, per category, which have been observed or are anticipated to be present within the project area and the potential impacts of the project upon them.

Summary tables of the special-status marine resources considered are included in Appendix N, Marine Resources (Appendix 4). The species included in these tables are based on a review of the California Natural Diversity Database, USFWS IPAC, and NOAA Fisheries Species Directory, EFH Viewer, compilation of current and historical site surveys and the opinion of the marine consultants conducting the surveys and regulatory agency staff.

Only resources that are known to be present onsite or have a moderate-high probability of being present, are discussed in detail below. We also provide an impact analysis for each special-status biological resource category. When impacts would be the same for specific resources, these are grouped for analysis.

5.9.4.1 Habitats.

Giant Kelp, (*Macrocystis pyrifera)*. Giant Kelp is considered a Habitat Area of Particular Concern (HAPC) for Fisheries Management Plan (FMP) Species under the Magnuson-Stevens Fishery Conservation and Management Act. Giant kelp is absent from the surveyed areas, with only a single occurrence near the east end of Topanga Beach near Mastro's Point. In reviewing the kelp beds for the area from 1989-2016 and overlaying them on the seafloor mosaic, there was no indication of kelp within the -12 to 30 depth zone in the vicinity of the nearshore nourishment activities (Figure 56). Historically, kelp has shown little recovery in the area since 2014. The greatest cover of kelp has historically been off Topanga Creek and reefs to the west off Las Tunas, where subtidal rocky habitat is greatest. A smaller patch has been documented off Ratner Beach. There is a low-to-moderate potential of giant kelp occurring in areas that could be affected by marine activities, depending on yearly recruitment and habitat quality.

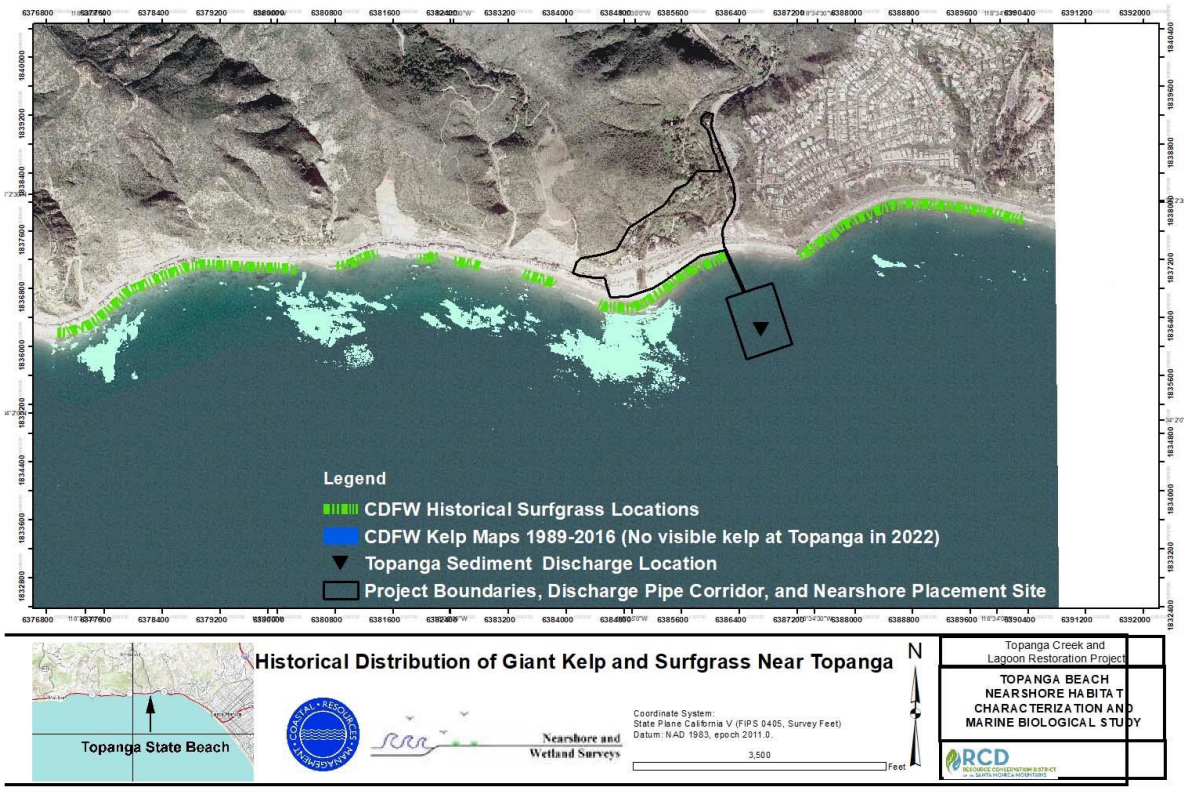

Figure 56. H**istorical Distribution of Giant Kelp and Surfgrass Near the Project Area.** CRM 2022. Note that a slightly older nearshore nourishment zone is shown in this graphic. See Figure 54 for current polygon.

Surfgrass (*Phyllospadix torreyi*). Surfgrass occurs in rocky shoreline and rocky subtidal habitats at depths to approximately -20 feet and was more prevalent along Ratner Beach. Its sensitivity is related to its use by invertebrates and fishes as nursery habitat and its susceptibility to long-term damage because it is a very slow growing species. Revegetation occurs very slowly through initial seeding and eventually the spreading of roots and rhizomes over surfaces of rocks.

It is a Habitat of Particular Concern (HPAC) by the National Marine Fisheries Service because juvenile olive rockfish (*Sebastes serranoides*), a Fisheries Management Plan (FMP) groundfish species, utilize surfgrass beds as nursery habitat. Surfgrass is also an extremely important nursery habitat for juvenile lobsters.

Surfgrass was present both intertidally and subtidally in the survey area in small numbers. Its distribution appears limited based upon this study and earlier studies conducted between 1974 and 1998 (Figure 56). It has been a constant in the low intertidal field surveys within the CDFW database for Topanga and Rather Beaches and was present intertidally in 1994 and 1997. Subtidally it was present in 1974 (Egstrom 1974), present in 1994 (CRM 1994), and absent in 1997 (CRM 1997). This species has a moderate potential to be in areas disturbed by project activities at depths to -20 ft MLLW on higher relief boulder and reef habitat.

Impact Analysis-Habitats. Mitigation Measure 20 will minimize impacts to surfgrass and giant kelp, if present, to a less than significant level by requiring preconstruction surveys for habitat avoidance. In the event these species are found within the disturbance zone, agency consultation will occur to identify approved measures for impact avoidance and minimization. No significant difference between project build alternatives is expected to marine habitats.

5.9.4.2 Fishes.

Tidewater Goby (*Eucyclogobius newberryi*). This federally endangered species is discussed in detail in Section 4.3.6.2 as it found abundantly in Topanga Lagoon, one of three known metapopulations occurring within Santa Monica Bay within the last decade. Although the species has been documented repopulating Topanga Lagoon from Malibu Lagoon, the species has a low likelihood to occur within the marine areas affected by the project as it would only likely enter the ocean when the lagoon sandbar is breached.

Bocaccio *(Sebastes paucispinis)*. Bocaccio are found throughout southern California reefs and soft bottoms typically at depths below 60 ft, although they can occasionally be found shallower, especially juveniles. While populations of bocaccio are endangered in the northwest, they are common in California and are a Federal Fisheries Management Plan (FMP) Groundfish species. They are caught both commercially and recreationally. They have a moderate potential to be in the general area of Topanga but are unlikely to be present in the Topanga sediment renourishment project area due to a lack of quality reef habitat. This species has not been observed in the project area during recent or historical surveys.

California halibut (*Paralichthys californicus*). This species was observed during project surveys, juvenile and adult halibut have a moderate-to-high potential to occur in the shallow sandy bottom habitats of the project area. The California halibut does not have a formal special species status, but it is considered a sensitive species by resource agencies because of its commercial value and a continued region-wide reduction of its nursery habitat in bays and wetlands. CDFW manages this fishery through the Northern and Central California Finfish Research and Management Project.

California Grunion *(Leuresthes tenuis).* This species is considered locally sensitive by CDPR and is known to be present and utilize Topanga Beach for spawning annually. Grunion is therefore assumed to be potentially present within the nearshore areas of the proposed project.

The California grunion (*Leuresthes tenuis*) is a fish that uses the high intertidal sandy beach habitat of many southern California beaches as spawning habitat (Walker, 1952), including many Los Angeles County Beaches. The grunion is a member of the silversides family, Atherinidae, along with the jacksmelt and topsmelt. They normally occur from Point Conception, California, to Point Abreojos, Baja California. Occasionally, they are found farther north to Monterey Bay, California and south to San Juanico Bay, Baja California. They inhabit the nearshore waters from the surf to a depth of 60 feet. The grunion is a nonmigratory species. Grunion use the energy of waves to strand themselves onto sandy beaches generally over a 3–4-night period following the highest semi lunar tides for spawning runs.

Typically, grunion "runs" last about 1 to 2 hours (Walker, 1952). Females dig themselves tail-first into wet sand. The males then curl around the females and deposit milt. Normally, the eggs develop above the water line buried in moist sands and are triggered to hatch in nine days at the high tide of the next new or full moon by waves that reach high enough on shore to wash out the sand and carry the eggs into the ocean (Walker, 1952; Middaugh et al., 1983 in Darken et al., 1998). If the eggs are washed out to sea during the next high tides, they hatch rapidly into free swimming larvae (Walker, 1952). If the waves do not reach the eggs, as happens frequently along the southern California coast, the eggs are able to remain viable for at least two more weeks (Walker, 1952) and up to 35 days (Darken et al., 1998). This period encompasses the next two highest semi lunar tides. However, hatching success decreases over time (Darken et al., 1998).

Spawning occurs from March through August, and occasionally in February and September. Peak spawning period is between late March and early June. After July, spawning is erratic, and the number of fish observed in a grunion run greatly decreases. (Walker, 1952).

Grunion spawning habitat (sandy beaches) is considered "sensitive" because of the overlap between beach spawning activity and shoreline management activities such as 1) the removal of debris and grooming beaches by mechanical means that rake, remove, or crush eggs; 2) beach erosion; 3) harbor construction; 4) pollution, as well as beach nourishment activities.

Impact Analysis-Fishes. Due to the mobile nature of fish, they are not anticipated to be significantly affected by direct injury or mortality due to nearshore deposition activities. No difference between project build alternatives is expected. Mitigation Measure 9 requires implementation of measures identified during USFWS and NMFS consultation and will therefore further protect sensitive fish from project impacts.

Potential impacts to fish in the event handling is required to relocate them out of harm's way is identified in Mitigation Measure 14. Potential impacts to grunion when spawning are addressed in Mitigation Measure 16 and includes avoiding night lighting, habitat compaction or construction activity in areas occupied by grunion or their eggs along the beach.

Impacts to fishes are assumed to not be significantly different for Alternatives 2-4.

5.9.4.3 Marine Reptiles.

Green Sea Turtle (*Chelonia mydas*). Only the federally threatened green sea turtle has the potential to occur in project's nearshore areas. Known from southern Alaska to Baja California, this species is infrequently encountered in Southern California, and usually found in warner waters around San Diego area and southwards. It has been rarely observed off Santa Monica Bay and usually during warmer El Nino events. In the last 40 years, 4 strandings and one death have been documented in the Santa Monic Bay. There is no evidence of breeding in Santa Monica Bay, although food resources are present in the form of algae, sea grasses, and invertebrates. In summary, the presence of green sea turtle during the project development is possible, but unlikely.

In July 2023, NOAA proposed critical habitat for the green sea turtle in nearshore waters (from the mean high-water line to 20 meters depth), including the US West Coast. The proposed critical habitat covers a large amount of the nearshore water habitat in the southern California region (Figure 57) between the Mexican Border and Santa Monica Bay including the Topanga Beach project area (Bryant Chesney, NOAA, *personal communication*). Proposed critical habitat includes the area from Mean High Water to depths of -20 m, and a maximum of 10 km offshore.

Figure 57. Critical Habitat Within the Project Area. Source: https://www.fisheries.noaa.gov/action/proposed-rule-designate-critical-habitat-green-sea-turtles

Impact Analysis-Green Sea Turtle. Proposed critical habitat for green sea turtle is not likely to be affected by Alternative 1. If present, minor and temporary effects could occur to proposed green sea turtle critical habit during nearshore nourishment activities that could occur under Alternatives 2-4. These could include short-term sediment movement onto surfgrass, a potential food source, and disturbance of individual during pipeline construction, or sediment placement. No difference between project build alternatives is expected, beyond some potential increase in beach widths associated with Alternative 4. Mitigation Measure 20 requires preconstruction surveys for avoidance of food resources such as surfgrass and monitoring during construction so that individual turtles, if present, can be avoided. No additional mitigation is required.

5.9.4.4 Marine Mammals.

California Gray Whale (*Eschrichtius robustus*). Gray whales have a moderate-to-high potential to be present offshore of Topanga between December and May and individuals could be found nearshore near or passing through the Topanga project area. The potential for individuals to be closer to shore is greatest between March and May when cow/calf pairs travel closer to shore on their northbound migration, sometimes as close as the surf zone, although the vast majority are found traversing between Palos Verdes and Point Dume on a more direct route that bypasses the inshore waters of western Los Angeles County.

The California gray whale eastern pacific population was removed from the Federal Endangered Species List in 1994, due to recovery of population numbers to near the estimated sustainable population size. Gray whales migrate through the Southern California Bight (SCB) twice each year, traveling between its feeding grounds in Alaska and its breeding grounds in Baja California. The southern migration between Point Conception and the Mexican Border occurs from December through February, with pregnant females moving through the area first. The northward migration begins in February and lasts through May, peaking in March (Bonnell and Dailey, 1993). Solitary animals generally lead the northbound migration with cow-calf pairs following 1 to 2 months later (Foster and Schiel 1985). Gray whales migrate within 125 miles (200 km) of the shoreline, and many are sighted within 9 miles (15 km) of shore. On the northbound migration, cow-calf pairs more closely follow the shoreline rather than the offshore route (Bonnell and Dailey, 1993).

Bottlenose Dolphin (*Tursiops truncates*). Bottlenose dolphins are found both offshore and in coastal waters, including harbors, bays, gulfs, and estuaries. In the United States, bottlenose dolphins are found along the West Coast off California, Oregon, and Washington; in the Hawaiian Islands; along the East Coast from Massachusetts to Florida; throughout the Gulf of Mexico; and in the Caribbean. Bottlenose dolphins can thrive in many environments and feed on a variety of prey such as fish, squid, crabs, and shrimp. This species was observed offshore of the Biological Study Area (BSA) during the 2023 subtidal surveys conducted by CRM.

Harbor Seal (*Phoca vitulina*). Harbor seals are one of the most common marine mammals in temperate coastal habitats along the northern Atlantic and Pacific coasts of North America, Europe, and Asia. In western North America, they are found from Baja California to the Bering Sea. The harbor seal's diet consists mainly of fish, shellfish, and crustaceans. This species was observed offshore of the BSA during the 2023 subtidal surveys conducted by CRM.

Impact Analysis-Marine Mammals. Gray whale, bottlenose dolphin, harbor seal and other marine mammals are unlikely to be impacted during placement of sediments into the nearshore due to their mobility. No difference of impacts between project build alternatives is expected. Mitigation Measure 20 requires monitoring during construction for mobile marine species so that they can be avoided. No additional mitigation is required.

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APPENDIX
A

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memorandum

date	July 10, 2023
to	Rosie Dagit, Resource Conservation District of the Santa Monica Mountains
cc	Tom Barnes, ESA Stephanie Breeden, ESA
from	Robert Sweet, ESA Daniel Swenson, ESA
subject	Aquatic Resources Delineation Update for the Topanga Lagoon Restoration Project

Introduction

The Topanga Lagoon Restoration Project (project) involves the expansion of the Topanga Creek and Lagoon ecosystem, demolition and replacement of the Pacific Coast Highway (PCH) or California State Route 1 bridge (SR-1 #53-0035), development of visitor services in lower Topanga State Park, and the relocation of County of Los Angeles Department of Beaches and Harbors (DBH) facilities on Topanga Beach under threat of sea level rise (SLR). A jurisdictional delineation report was drafted for the project in 2020 that identified existing aquatic resources within proximity of the project. The Resource Conservation District of the Santa Monica Mountains (RCDSMM) has requested that Environmental Science Associates (ESA) conduct a follow-on delineation and an update to the 2020 ARDR. The 2020 ARDR and other available documentation presented below in **Table 1, Existing Aquatic Resource Documentation**, were reviewed prior to conducting the follow-on delineation and preparation of the update. The delineation of aquatic resources within the survey area was conducted on May 31, June 1, and June 2 of 2023 by ESA Biologists Amanda French and Robert Sweet. This memorandum presents the existing conditions, regulatory framework, survey methodology, and the results of the follow-on delineation.

TABLE 1
EXISTING AQUATIC RESOURCE DOCUMENTATION

Documentation	Preparer	Date
Technical Memorandum: 2020 Wetland Condition Assessment for the Topanga Lagoon Restoration Project	The Bay Foundation	March 2020
Jurisdictional Delineation Report, Topanga Lagoon Restoration Project	WRA	August 2020
Biological Assessment and Preliminary Impact Analysis, Topanga Lagoon Restoration Project	LADRP and RCDSMM	April 2022
Topanga Lagoon Restoration Project, Draft Environmental Impact Report (Draft EIR)	ESA	September 2022

Survey Location

The survey for the follow-on delineation was conducted within and immediately adjacent to the Topanga Lagoon, in unincorporated Los Angeles County, CA (**Figure 1, Regional Location**; see figures attached to the end of this memorandum). The Topanga Lagoon extends beneath the PCH, falls partially within Topanga State Park and Topanga County Beach, and empties into the Pacific Ocean (**Figure 2, Vicinity Map**). It is situated within Section 00, Township 1 South and Range 16 West, in the Topanga U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle (**Figure 3, USGS Topographic Map**).

Directions to the Survey Area

From the U.S. Army Corps of Engineers (USACE) Los Angeles office (915 Wilshire Boulevard, Los Angeles, CA 90017), get on CA-110 N from S Bixel Street. Follow CA-110 N for 0.3 mile to I-10W and continue for 12.1 miles. Take the exit for CA-1N and continue for 5.8 miles to Topanga County Beach.

Contact Information

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Existing Conditions

Survey Area

The 63.43-acre survey area includes the approximately 44-acre project site and surrounding 100-foot buffer.

Vegetation Communities and Land Cover Types

A total of 24 vegetation communities and land cover types were mapped within the survey area and described in detail in the 2020 jurisdictional delineation report and Draft EIR listed above in Table 1. The vegetation communities have been organized into five groups presented in **Table 2, Vegetation Communities and Land Cover Types within the Survey Area** below, including woodland, shrubland, and herbaceous communities; other/developed land cover; and waterways (see **Figure 4, Vegetation Communities and Land Cover Types**).

Most woodland communities mapped within the survey area are dominated by a mixture of native riparian tree species including California sycamore (*Platanus racemosa*), red willow (*Salix laevigata*), and arroyo willow (*S. lasiolepis*), interspersed by non-native trees such as bluegum (*Eucalyptus globulus*). Shrubland communities are dominated by native upland shrub species including California brittlebush (*Encelia californica*), lemonadeberry (*Rhus integrifolia*), and black sage (*Salvia mellifera*). The herbaceous communities mapped within the survey area, including those noted within the understory of the woodland and shrubland communities, consist almost exclusively of non-native grasses and forbs such as garden nasturtium (*Tropaeoleum majus*), wild radish (*Raphanus* sp.), and various bromes (*Bromus* spp.). Other/developed land cover includes paved and/or unvegetated areas within or immediately adjacent to the PCH, Topanga Canyon Boulevard, or Topanga Ranch Motel, and the sandy beach located along Topanga County Beach. Two waterways were mapped within the survey area and include open stream channel and the Pacific Ocean.

TABLE 2
VEGETATION COMMUNITIES AND LAND COVER TYPES WITHIN THE SURVEY AREA

Vegetation Community/Land Cover Type	Area (Acres)
Woodland Communities	
California Sycamore Woodland/Willow and Mulefat Understory	10.83
Arroyo Willow Stands	3.11
California Sycamore Trees	0.13
Coast Live Oak Tree	0.02
Cottonwood Trees	0.01
Non-Native Tree Stands	2.59
Shrubland Communities	
Black Sage-Coastal Sage-Laurel Sumac	0.31
Coastal Sage-Ashyleaf Buckwheat	0.80
California Brittlebush-Coastal Sage	0.56
Ashyleaf Buckwheat Shrubland	1.40
Lemonade Berry Scrub	7.21
Purple Sage-Ashyleaf Buckwheat/Annual Herb	0.53
Coastal Sage Scrub (disturbed)	1.34

Vegetation Community/Land Cover Type	Area (Acres)
Mixed Native and Non-Native Riparian	0.48
Herbaceous Communities	
Giant Wildrye Grassland	0.18
Saltgrass Patch	0.07
Non-Native Grasses and Forbs	3.40
Arundo Stands	3.12
Other/Developed Land Cover	
Barren/Sparsely Vegetated	2.47
Developed/Landscaped	9.42
Paved Areas and Roads	7.61
Sand	7.85
Waterways	
Stream Channel	1.64
Ocean	1.25
Total	**63.43**

SOURCE: ESA. 2022. Topanga Lagoon Restoration Project, Draft Environmental Impact Report. September 2022.

Topography and Soils

Topography within the survey area generally slopes from northeast to southwest along Topanga Creek and ranges in elevation from approximately 70 feet above mean sea level (amsl) at Topanga Canyon Boulevard to 0 feet amsl at the Pacific Ocean. Four soil types were mapped within the survey area (see **Figure 5, Soils**):

- Abaft-Beaches complex, 0 to 5 percent slopes.
- Chumash-Boades-Malibu association, 30 to 75 percent slopes.
- Elder fine sandy loam, coastal, 0 to 2 percent slopes.
- Mipolomol-Topanga association, 30 to 75 percent slopes.[1]

Soil mapping was not available for the southern portion of the Pacific Ocean shoreline and is not included in Figure 5. A brief description of each soil type is provided below.

Abaft-Beaches complex, 0 to 5 percent slopes

This soil type was mapped throughout the southern portion of the survey area. It is considered excessively drained and consists of alluvium and/or eolian sands. The depth to a restrictive feature is more than 80 inches, and a typical profile consists of sand from 0 to 79 inches. This soil type does not support components with a hydric soil rating.

[1] Natural Resources Conservation Service (NRCS). 2023. Web Soil Survey. https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm. Accessed March 13, 2023.

Chumash-Boades-Malibu association, 30 to 75 slopes

This soil type was mapped along the northwest boundary of the survey area. It is considered somewhat excessively drained and consists of colluvium and/or residuum weathered from sandstone and shale. The depth to paralithic bedrock is between 4 and 22 inches, and a typical profile consists of gravelly loam from 0 to 7 inches and weathered bedrock from 7 to 17 inches. This soil type does not support components with a hydric soil rating.

Elder Fine Sandy Loam, coastal, 0 to 2 percent slopes

This soil type was mapped throughout the central portion of the survey area. It is considered well drained and consists of alluvium derived from sandstone and shale. The depth to a restrictive feature is over 80 inches, and a typical profile consists of fine sandy loam from 0 to 43 inches, fine sandy loam from 43 to 51 inches, loamy sand from 51 to 52 inches, and fine sandy loam from 52 to 60 inches. This soil type does not support components with a hydric soil rating.

Mipolomol-Topanga association, 30 to 75 percent slopes

This soil type was mapped throughout the eastern boundary of the survey area. It is considered well drained and consists of colluvium derived from sandstone and shale, residuum weathered from sandstone and shale, and/or residuum weathered from slate. The depth to a paralithic bedrock is between 4 and 14 inches, and a typical profile consists of gravelly loam from 0 to 15 inches, gravelly clay loam from 15 to 18 inches, and bedrock from 18 to 28 inches. This soil type does not support components with a hydric soil rating.

Hydrology

The survey area is located within the Garapito Creek watershed (USGS Hydrologic Unit Code 12-180701040401)[2]. Site hydrology generally flows in a northeast-southwest direction, with additional sources flowing in from the east and the west, and ultimately terminating at the Pacific Ocean. Due to its proximity to the Pacific Ocean, the Topanga Lagoon receives tidal inundation. A total of eight drainages were identified to convey flows within the survey area. Topanga Creek (Drainage 1) flows through the central portion of the survey area and terminates at Topanga Lagoon/Pacific Ocean, while Drainages 2–5 convey flows from surrounding areas and connect directly to Drainage 1. Although Drainages 6–8 convey flows into the survey area, they ultimately do not reach Drainage 1. The National Wetlands Inventory (NWI)[3] and National Hydrography Dataset (NHD)[4] were queried to identify known aquatic resources within the survey area, the results of which are depicted in **Figure 6, Hydrology**. NWI characterizes Drainage 1 as Riverine lined with Freshwater Forested/Shrub Wetland, and Drainage 6 as Riverine. NHD characterizes Drainage 1, 6, and 8 as Stream/River and the Topanga County Beach as Coastline. Although the placement and actual boundaries of the aquatic features differed somewhat from the information gathered in the field, the NWI and NHD databases were helpful in the general characterization of the hydrologic flow within survey area.

Climate

The survey area experiences a Mediterranean climate characterized by warm, dry summers and cool winters with relatively low rainfall. Average highs for the region range between 64.5º Fahrenheit (F) in the winter (December

2 United States Geological Survey (USGS). 2023. Watershed Boundary Dataset.

3 U.S. Fish and Wildlife Service (USFWS). 2023. National Wetlands Inventory. https://www.fws.gov/wetlands/data/Mapper.html.

4 U.S. Geological Survey (USGS). 2023a. National Hydrography Dataset. https://www.usgs.gov/national-hydrography.

and January) and 69.5º F in the summer (July and August), while average lows range between 50.5º F in in the winter and 62.5º F in the summer.[5]

Agricultural Applied Climate Information System Climate Data

The Agricultural Applied Climate Information System (AgACIS) Wetlands (WETS) climate table for Santa Monica, California is included below in **Table 3, WETS Table: Monthly Total Precipitation for Santa Monica, CA,** for 2013 through 2023. The follow-on delineation for the project site occurred between May 31 and June 2, 2023, and historically (over a 10-year sampling period), the month of May has experienced an average rainfall level of 0.32 inch. During May of 2023, 0.76 inch of precipitation was recorded in the region, which is above the annual average. Based on site conditions and review of the AgACIS data provided in Table 3, it appears conditions at the time of the delineation were wetter than normal[6].

TABLE 3
WETS TABLE: MONTHLY TOTAL PRECIPITATION FOR SANTA MONICA, CA

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2013	1.49	0.13	1.03	T	0.17	0	0.03	0	0	0.2	0.21	M0.07	3.33
2014	T	3.5	0.5	0.25	0	0	T	0.03	T	0.31	0.41	3.52	8.52
2015	1.23	0.28	2.61	0.24	0.39	0.03	0.41	T	2.23	0.01	0.07	1.14	8.64
2016	2.32	0.61	1.93	0.23	0.12	T	0	0	T	0.38	0.9	4.15	10.64
2017	7.81	4.23	0.19	0.22	0.11	T	0	T	0.11	T	0.07	T	12.74
2018	1.52	0.13	4.09	0.03	0.09	T	T	0	0	0.62	1.86	2.05	10.39
2019	6.27	4.98	2.46	0.05	1.39	T	T	0	0.12	0	1.46	4.66	21.39
2020	0.49	0.12	4.6	2.18	0.15	0	0	T	0	0	M0.06	M1.29	8.89
2021	1.76	T	1.14	T	T	T	0.1	0.02	T	0.66	0	M7.05	10.73
2022	0.03	0.01	1.1	0.51	0	T	0	M0.00	0.33	0.01	1.61	2.5	6.1
2023	7.44	5.16	7.22	0.02	0.76	M0.00	--	--	--	--	--	--	20.6
Mean (2013–2023)	**3.04**	**1.92**	**2.44**	**0.41**	**0.32**	**0.01**	**0.08**	**0.01**	**0.40**	**0.24**	**0.73**	**3.00**	**11.09**

SOURCE: United Stated Department of Agriculture (USDA). 2023. AgACIS Climate Data Retrieval.
NOTE: Data missing in any month have an “M” flag. A “T” indicates a trace of precipitation.

Antecedent Precipitation Tool

The Antecedent Precipitation Tool (APT; Version 1.0.20) was also used to evaluate climatic conditions at the survey area. A single point (34.2160, -118.5795) was placed within the survey area, and the APT Watershed Sampling Summary (**Attachment A, APT Results**) presents precipitation and climatic data for the survey area for approximately 2 months prior to the follow-on delineation. This data indicates that the survey area exhibited “Wetter than Normal” conditions and a Product score of 16. Additionally, the drought index (PDSI) indicated “Severe wetness.”

5 World Climate. 2023. Average Weather Data for Santa Monica, California. http://www.worldclimate.com/climate/us/california/santa-monica.

6 United Stated Department of Agriculture (USDA). 2023. AgACIS Climate Data Retrieval.

Regulatory Framework

Waters of the U.S.

Clean Water Act

Since its inception, the definition of the Waters of the U.S. has been a litigious issue. Most recently, the Supreme Court, ruling in *Sackett v. Environmental Protection Agency*, sharply limited the scope of the federal Clean Water Act's protection for the nation's waters. As a result of this decision, on August 29, 2023, the U.S. Environmental Protection Agency (EPA) and the USACE issued a final rule that amends the "Revised Definition of 'Waters of the United States'" to conform key aspects of the regulatory text to the U.S Supreme Court's decision.

Under the amended Revised Definition of "Waters of the United States," the term "waters of the United States" (waters of the U.S.) was defined as follows (33 CFR 328.3(a)):

(1) Waters which are:

(i) Currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;

(ii) The territorial seas; or

(iii) Interstate waters;

(2) Impoundments of waters otherwise defined as waters of the U.S. under this definition, other than impoundments of waters identified under paragraph (a)(5) of this section; To meet this category, you must be able to demonstrate that the current impoundment would have met the criteria of a water of the U.S. at the time of impoundment. Meaning that prior to the impoundment the feature would have met (a)(1), (a)(3), (a)(4) or (a)(5). This usually requires using historic aerial photos/maps or historic topo maps.

(3) Tributaries of waters identified in paragraph (a)(1) or (2) of this section that are relatively permanent, standing or continuously flowing bodies of water;

(4) Wetlands adjacent to the following waters:

(i) Waters identified in paragraph (a)(1) of this section; or

(ii) Relatively permanent, standing or continuously flowing bodies of water identified in paragraph (a)(2) or (a)(3) of this section and with a continuous surface connection to those waters;

(5) Intrastate lakes and ponds not identified in paragraphs (a)(1) through (4) of this section that are relatively permanent, standing or continuously flowing bodies of water with a continuous surface connection to the waters identified in paragraph (a)(1) or (a)(3) of this section.

In addition, the amended regulations include eight types of excluded waters (33 CFR 328.3(b)) which are not waters of the U.S. even where they otherwise meet the terms of paragraphs (a)(2) through (5) of this section:

(1) Waste treatment systems, including treatment ponds or lagoons, designed to meet the requirements of the Clean Water Act;

(2) Prior converted cropland designated by the Secretary of Agriculture. The exclusion would cease upon a change of use, which means that the area is no longer available for the production of agricultural

commodities. Notwithstanding the determination of an area's status as prior converted cropland by any other Federal agency, for the purposes of the Clean Water Act, the final authority regarding Clean Water Act jurisdiction remains with EPA;

(3) Ditches (including roadside ditches) excavated wholly in and draining only dry land and that do not carry a relatively permanent flow of water;

(4) Artificially irrigated areas that would revert to dry land if the irrigation ceased;

(5) Artificial lakes or ponds created by excavating or diking dry land to collect and retain water and which are used exclusively for such purposes as stock watering, irrigation, settling basins, or rice growing;

(6) Artificial reflecting or swimming pools or other small ornamental bodies of water created by excavating or diking dry land to retain water for primarily aesthetic reasons;

(7) Waterfilled depressions created in dry land incidental to construction activity and pits excavated in dry land for the purpose of obtaining fill, sand, or gravel unless and until the construction or excavation operation is abandoned and the resulting body of water meets the definition of waters of the U.S.; and

(8) Swales and erosional features (e.g., gullies, small washes) characterized by low volume, infrequent, or short duration flow.

Rivers and Harbors Act

Section 10 of the Rivers and Harbors Act (RHA) (33 United States Code [U.S.C.] § 403) requires authorization from the USACE for work or structures in or affecting navigable waters of the U.S. The term "navigable waters of the U.S." includes those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible to use to transport interstate or foreign commerce. A determination of navigability, once made, applies laterally over the entire surface of the waterbody, and is not extinguished by later actions or events which impede or destroy navigable capacity (33 CFR §329.4).

Section 14 of the RHA of 1899 (33 U.S.C. § 408), commonly referred to as "Section 408," authorizes the USACE to grant permission to alter, occupy, or use a USACE civil works project if the Secretary determines that the activity will not be injurious to the public interest and will not impair the usefulness of the project. The extent of RHA jurisdiction is denoted by the Mean High-Water line (MHW).

Waters of the State

Most projects involving waterbodies or drainages are regulated by the RWQCB, the principal State agency overseeing water quality of the State at the local/regional level. The survey area is located within the region of the Los Angeles RWQCB. RWQCBs are responsible for implementing Section 401 of the CWA.

In the absence of waters of the U.S., waters may be regulated under the Porter-Cologne Water Quality Control Act if project activities, discharges, or proposed activities or discharges could affect California's surface, coastal, or groundwaters. The permit submitted by the applicant and issued by RWQCB is either a Water Quality Certification in the presence of waters of the U.S. or a Waste Discharge Requirement (WDR) in the absence of waters of the U.S.

The State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to waters of the State (State Wetland Definition and Procedures), as prepared by the State Water Resources Control Board, was adopted

April 2, 2019, and revised April 6, 2021. The State Wetland Definition and Procedures include a definition for wetland waters of the State as well as exclusions for certain artificial wetlands, as listed below.

The Water Code defines "waters of the State" broadly to include "any surface water or groundwater, including saline waters, within the boundaries of the state." "Waters of the State" includes all "waters of the U.S." The following wetlands are waters of the State:

1. Natural wetlands,
2. Wetlands created by modification of a surface water of the state, and
3. Artificial wetlands that meet any of the following criteria:
    a. Approved by an agency as compensatory mitigation for impacts to other waters of the State, except where the approving agency explicitly identifies the mitigation as being of limited duration;
    b. Specifically identified in a water quality control plan as a wetland or other water of the state;
    c. Resulted from historic human activity, is not subject to ongoing operation and maintenance, and has become a relatively permanent part of the natural landscape; or
    d. Greater than or equal to one acre in size, unless the artificial wetland was constructed, and is currently used and maintained, primarily for one or more of the following purposes (i.e., the following artificial wetlands are not waters of the State unless they also satisfy the criteria set forth in 2, 3a, or 3b):
        i. Industrial or municipal wastewater treatment or disposal,
        ii. Settling of sediment,
        iii. Detention, retention, infiltration, or treatment of stormwater runoff and other pollutants or runoff subject to regulation under a municipal, construction, or industrial stormwater permitting program,
        iv. Treatment of surface waters,
        v. Agricultural crop irrigation or stock watering
        vi. Fire suppression,
        vii. Industrial processing or cooling,
        viii. Active surface mining – even if the site is managed for interim wetlands functions and values,
        ix. Log storage,
        x. Treatment, storage, or distribution of recycled water, or
        xi. Maximizing groundwater recharge (this does not include wetlands that have incidental groundwater recharge benefits); or
        xii. Fields flooded for rice growing.

Rivers, Streams, and Lakes

Pursuant to Division 2, Chapter 6, Section 1600 et seq. of the State Fish and Game Code (FGC), the California Department of Fish and Wildlife (CDFW) regulates all diversions, obstructions, or changes to the natural flow or bed, channel, or bank of any river, stream, or lake that supports fish or wildlife. A notification of a Lake or Streambed Alteration must be submitted to CDFW for "any activity that may substantially change the bed, channel, or bank of any river, stream, or lake." In addition, CDFW has authority under the FGC over wetland and riparian habitats associated with lakes and streams. The CDFW reviews proposed actions and, if necessary, submits to the applicant a proposal that includes measures to protect affected fish and wildlife resources. The

final proposal that is mutually agreed upon by CDFW and the applicant is the Lake or Streambed Alteration Agreement (LSAA).

Fish and Game Code Section 2785 defines riparian habitat as "lands which contain habitat which grows close to and depends upon soil moisture from a nearby freshwater source." Additionally, the CDFW Notification Instructions and Process guide characterizes the riparian zone as "the area that surrounds a channel or lake and supports (or can support) vegetation that is dependent on surface or subsurface flow."[7] Furthermore, this CDFW guide calls for the analysis of impacts to the riparian zone up to the outer landward edge of the drip line of riparian vegetation.

Coastal Wetlands and Waters

Coastal Zone Management Act

The Coastal Zone Management Act of 1972 (16 U.S.C. ch. 33 § 1451 et seq.), administered by the National Oceanic and Atmospheric Administration (NOAA), provides for the management of the nation's coastal resources, including the Great Lakes. The goal is to "preserve, protect, develop, and where possible, to restore or enhance the resources of the nation's coastal zone." Each federal agency activity within or outside of the coastal zone that affects any land or water use or natural resources of the coastal zone must be carried out in a matter that is consistent to the maximum extent practicable with the enforceable policies of the approved State management programs.

California Coastal Act

The Coastal Act (Pub. Res. Code §30000 et seq.) was enacted to establish policies and guidelines that provide direction for the conservation and development of the California coastline. The Coastal Act established the California Coastal Commission (CCC) and created a State and local government partnership to ensure that public concerns regarding coastal development are addressed. The basic goals of this program are to:

1. Protect, maintain, and, where feasible, enhance and restore the overall quality of the coastal zone environment and its natural and artificial resources;
2. Ensure orderly, balanced utilization and conservation of coastal zone resources, taking into account the social and economic needs of the people of the state;
3. Maximize public access to and along the coast and maximize public recreational opportunities in the coastal zone consistent with sound resource conservation principles and constitutionally protected rights of private property owners;
4. Ensure priority for coastal-dependent and coastal-related development over other development on the coast; and
5. Encourage state and local initiatives and cooperation in preparing procedures to implement coordinated planning and development for mutually beneficial uses, including educational uses, in the coastal zone.

The CCC serves as the coastal management and regulatory agency with jurisdiction over the Coastal Zone (Pub. Res. Code §30103). The CCC is responsible for assisting in the preparation, review, and certification of Local Coastal Programs/Local Coastal Plans (LCPs), which are developed by municipalities for that portion of their

[7] California Department of Fish and Wildlife (CDFW). 2021. Notification Instructions and Process. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=37873.

jurisdiction that falls within the coastal zone. Following certification of the LCP, regulatory responsibility then is delegated to the local jurisdiction, although the CCC retains jurisdiction over the immediate shoreline.

Coastal Act Sections 30231, 30121 and 30236 – Wetlands

Section 30231: The biological productivity and the quality of coastal waters, streams, wetlands, estuaries, and lakes appropriate to maintain optimum populations of marine organisms and for the protection of human health shall be maintained and, where feasible, restored through, among other means, minimizing adverse effects of waste water discharges and entrainment, controlling runoff, preventing depletion of groundwater supplies and substantial interference with surface waterflow, encouraging wastewater reclamation, maintaining natural vegetation buffer areas that protect riparian habitats, and minimizing alteration of natural streams.

Section 30121 Wetland: "Wetland" means lands within the coastal zone that may be covered periodically or permanently with shallow water and include saltwater marshes, freshwater marshes, open or closed brackish water marshes, swamps, mudflats, and fens.

Section 30236 Water Supply and Flood Control: Channelization, dams, or other substantial alterations of rivers and streams shall incorporate the best mitigation measures feasible, and be limited to: (l) necessary water supply projects, (2) flood control projects where no other method for protecting existing structures in the flood plain is feasible and where such protection is necessary for public safety or to protect existing development, or (3) developments where the primary function is the improvement of fish and wildlife habitat.

Coastal Act Section 30115 – Sea (Non-wetland Waters)

In addition to wetlands within the coastal zone, the CCC regulates the sea, or non-wetland waters. "Sea" means the Pacific Ocean and all harbors, bays, channels, estuaries, salt marshes, sloughs, and other areas subject to tidal action through any connection with the Pacific Ocean, excluding non-estuarine rivers, streams, tributaries, creeks, and flood control and drainage channels.

Santa Monica Mountains Local Coastal Program/Plan

The Santa Monica Mountains LCP [8]specifically refers to and regulates all development within the Santa Monica Mountains west of the City of Los Angeles, east of Ventura County, and south of the coastal zone boundary, excluding the City of Malibu. The LCP provides protection for various natural resources as part of the development process including but not limited to native vegetation communities, native trees of a specified size and species, various sensitive plant and wildlife species identified by the California Native Plant Society (CNPS) and/or CDFW, riparian corridors, wetlands, etc. As referenced in Section 22.44.1880 of the LCP, and defined in the California Coastal Act (Pub. Res. Code §30519, 30600.5, 30601 and 30603), wetlands are characterized as follows:

> *Wetland shall be defined as land where the water table is at, near, or above the land surface long enough to promote the formation of hydric soils or to support the growth of hydrophytes, and shall also include those types of wetlands where vegetation is lacking and soil is poorly developed or absent as a result of frequent and drastic fluctuations of surface water levels, wave action, water flow, turbidity or high concentrations of salts or other substances in the substrate. Such wetlands can be recognized by the presence of surface water or saturated substrate at some*

[8] Los Angeles County Planning. 2023. Santa Monica Mountains Local Coastal Program. https://planning.lacounty.gov/long-range-planning/santa-monica-mountains-local-coastal-program/

time during each year and their location within, or adjacent to, vegetated wetlands or deep-water habitats.

Methodology

Field data were collected using an Eos Arrow 100® Global Navigation Satellite System receiver, which provides Satellite-based Augmentation System corrections processing in the field and can provide 60 cm real-time horizontal accuracy. Photos taken during the delineation are provided in **Attachment B, Photographic Log**.

The delineation was conducted by walking throughout the survey area to identify, document, and delineate potentially jurisdictional features. Features were delineated based on current regulations and any available methodology/guidelines, as described below.

Waters of the U.S.

Waters of the U.S. were delineated in accordance with USACE Los Angeles District *Minimum Standards for Acceptance of Aquatic Resources Delineation Reports*[9] and *Updated Map and Drawing Standards for the South Pacific Division Regulatory Program.*[10]

Wetlands

The delineation used the "Routine Determination Method" as described in the *1987 Corps of Engineers Wetland Delineation Manual,*[11] hereafter called the "1987 Manual." The 1987 Manual was used in conjunction with the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0),*[12] hereafter called the "Arid West Supplement." For areas where the 1987 Manual and the Arid West Supplement differ, the Arid West Supplement was followed. Wetlands and waters were classified using commonly accepted habitat types; however, the Cowardin classification[13] of each feature type was noted, as well.

To determine the extent of potential jurisdictional wetlands, the 1987 Manual and Arid West Supplement were used as a guide for identifying wetland characteristics. Three positive wetland parameters must normally be present for an area to be considered a wetland: (1) dominance of wetland vegetation, (2) presence of hydric soils, and (3) presence of wetland hydrology. The presence or absence of positive indicators for wetland vegetation, soils, and hydrology was assessed per the 1987 Manual and Arid West Supplement guidelines. Data points were taken within suspected wetlands and a paired point was taken (where applicable) in nearby upland areas. Data points were recorded on Arid West Region wetland determination data forms, which are provided in **Attachment C, Data Sheets**.

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9 U.S. Army Corps of Engineers (USACE). 2017. Special Public Notice: Minimum Standards for Acceptance of Aquatic Resources Delineation Reports. Los Angeles District. March 16. Available at: https://www.spl.usace.army.mil/Portals/17/Users/251/43/2043/Final%20Delin%20report%20standards%203-16-2017.pdf?ver=2017-03-16-170513-523.

10 U.S. Army Corps of Engineers (USACE). 2016. Updated Map and Drawing Standards for the South Pacific Division Regulatory Program. February 5. Available at: https://www.spd.usace.army.mil/Missions/Regulatory/Public-Notices-and-References/Article/651327/updated-map-and-drawing-standards/.

11 Environmental Laboratory, Department of the Army. 1987. Corps of Engineers Wetland Delineation Manual (Technical Report Y-87-1). U.S. Army Corps of Engineers. Waterways Experimental Station. Vicksburg, Mississippi.

12 U.S. Army Corps of Engineers (USACE). 2022. National Ordinary High Water Mark Field Delineation Manual for Rivers and Streams. November 2022.

13 Cowardin, Lewis M.1979. Classification of Wetlands and Deepwater Habitats of the United States. December 1979.

At each data point, a visual assessment of the dominant plant species within the vegetation community was made. Dominant species were assessed using the recommended "50/20" rule per the Arid West Supplement. Plants were identified to species using the *The Jepson Manual: Vascular Plants of California, Second Edition.*[14] The *Arid West 2020 Regional Wetland Plant List*[15] was used to determine the wetland indicator status of all plants. All plant species and their wetland indicator status were recorded and included in **Attachment D, Floral Compendium**.

Hydric soils were identified using soil indicators presented in the Arid West Supplement. Soils at each data point were characterized by color, texture, organic matter accumulation, and the presence or absence of hydric soil indicators. The coloration of the soil samples, matrix, and mottles was assessed using the *Munsell Soil Color Charts.*[16]

The presence of wetland hydrology was determined at each data point by the presence of one or more of the primary and/or secondary indicators, per guidance of the Arid West Supplement.

Other Waters of the U.S.

Federal jurisdiction over non-wetland waters of the U.S. extends to the ordinary high water mark (OHWM), defined in 33 CFR 328.3 as the line on the shore established by fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of the soil, destruction of terrestrial vegetation, or the presence of litter and debris. Delineation methods for the OHWM were completed in accordance with *National Ordinary High Water Mark Field Delineation Manual for Rivers and Streams.*[17], which included the establishment of assessment areas within potentially jurisdictional features to determine the presence/absence of HWM indicators. OHWM data sheets are provided in Attachment C.

Relatively Permanent and Significant Nexus Standards

Considering the 2023 decision made under Sackett v. EPA, it is presumed that ephemeral features are not considered waters of the U.S.; therefore, the SNS will no longer apply and determinations made for (a)(3) tributaries of (a)(1)/(a)(2) waters and (a)(5) Intrastate lakes and ponds, streams, or wetlands will implement the RPS to designate potential waters of the U.S. It is also presumed that only wetlands with a continuous surface connection to an (a)(3) tributary would constitute wetland waters of the U.S. As such, the SNS was not included in the delineation methodology.

As stated above, to determine whether an aquatic resource qualifies as a water of the U.S. under paragraph (a)(3) Tributaries of (a)(1) or (2) waters; (a)(4) Wetlands adjacent to an RPW (relatively permanent, standing, or continuously flowing bodies of water identified in paragraph (a)(2) or (a)(3)(i) of this section and with a continuous surface connection to those waters); or (a)(5) Intrastate lakes and ponds, streams, or wetlands not identified in paragraphs (a)(1) through (4) of this section, the Relatively Permanent Standard (RPS) may be applied.

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14 Baldwin et al. 2012. The Jepson Manual, Vascular Plants of California, Thoroughly Revised and Expanded. January 2012.

15 U.S. Army Corps of Engineers (USACE). 2020. National Wetlands Plant List, version 3.5 Arid West Region. Engineer Research and Development Center Cold Regions Research and Engineering Laboratory, Hanover, NH.

16 Munsell. 2000. Munsell soil color charts. Greta Macbeth, New Windsor, New York, USA.

17 U.S. Army Corps of Engineers (USACE). 2022. National Ordinary High Water Mark Field Delineation Manual for Rivers and Streams. November 2022.

The "relatively permanent standard" [RPS] means relatively permanent, standing or continuously flowing waters connected to paragraph (a)(1) waters, and waters with a continuous surface connection to such relatively permanent waters or to paragraph (a)(1) waters. The RPS encompasses surface waters that have flowing or standing water year-round or continuously during certain times of the year. Relatively permanent waters do not include surface waters with flowing or standing water for only a short duration in direct response to precipitation.

Applicability of the RPS was determined for all delineated streams: Under the RPS for (a)(3) tributaries or (a)(5) lakes, ponds, or streams, such aquatic resources must exhibit sufficient flow during certain times of the year. The phrase "certain times of the year" includes extended periods of standing or continuously flowing water occurring in the same geographic feature year after year, except in times of drought. In addition, these aquatic resources must exhibit a continuous surface connection (CSC) to (a)(1) or (a)(3)(i) waters. To determine whether the RPS applies, the flow characteristics of each stream were evaluated along the entire reach of the same Strahler stream order[18] (i.e., from the point of confluence, where two lower order streams meet to form the tributary, downstream to the point such tributary enters a higher order stream).

Tidal Waters

Clean Water Act

The HTL was identified in the field by the presence of physical indicators including debris deposits (e.g., dead vegetation, wood, and marine organisms) and/or the staining of cobble/boulders apparent along the shoreline and within Topanga Lagoon to the upstream extent of tidal influence along Drainage 1.

Rivers and Harbors Act

The MHW was delineated by plotting the mean high-water elevation (tidal datum-North American Vertical Datum of 1988 [NAVD88]) recorded over 18 years at the NOAA Santa Monica Tidal Station (Station ID: 9410840). The tidal datum analysis period or epoch ranged between 1984 and 2001, and the MHW includes the average of all the high-water heights observed over the 18-year period. Once the MHW elevation was determined, it was used to determine the extent of the tidal waters that are potentially jurisdictional under the RHA.

Waters of the State

Waters of the State were delineated up to the OHWM for drainages, the extent of tidal waters as defined by the CWA/RHA, and in accordance with the 1987 Manual and Arid West Supplement for wetlands, as described above for waters of the U.S.

Rivers, Streams, and Lakes

FGC Section 1600 resources were delineated to include streambanks up to the top of bank (TOB) (indicated by a break in slope) and the extent of riparian vegetation.

[18] Strahler, A.N. 1957. "Quantitative analysis of watershed geomorphology." American Geophysical Union Transactions 38: 913-920.

Coastal Wetlands and Waters

Coastal wetlands and waters were delineated to include streambanks up to the top of bank and any associated riparian vegetation as done for FGC Section 1600, and the extent of tidal waters as defined by the CWA/RHA.

Results

All aquatic features within the survey area were analyzed in the field to determine whether each may be considered jurisdictional with the applicable agencies. A total of eight drainages, two wetlands, and tidal waters (CWA and RHA) were identified within the survey area; each resource is described in detail below, including its relevance to each jurisdiction.

Waters of the U.S.

A total of two drainages (Drainage 1 and 2) and one wetland (Wetland 2) were identified and mapped as potential waters of the U.S. during the delineation. Drainages 3–5 exhibited OHWM indicators/connectivity to Drainage 1 and supported only facultative wetland plant species along their banks, which suggests they would be characterized as ephemeral aquatic features. They were dry during the delineation and did not meet criteria for an RPW or (a)(3) tributary. Drainages 6 and 7 exhibited OHWM indicators; however, they did not support riparian vegetation or demonstrate connectivity to an (a)(1) water. Therefore, they were characterized as ephemeral[19] features that would not meet criteria for RPWs or (a)(3) tributaries. Drainage 8 was delineated following completion of the delineation through the review of aerial imagery[20], and the limits of the OHWM were estimated. As determined for Drainages 6 and 7, this feature did not support riparian vegetation or appear to connect to an (a)(1) water; therefore, it was characterized as an ephemeral feature that would not meet criteria for an RPW or (a)(3) water. Potential waters of the U.S. mapped within the survey area are presented in **Table 4, Potential Waters of the U.S.**, and depicted in **Figure 7, Potential Waters of the U.S.**, and **Figure 8, Potential Tidal Waters of the U.S. and State.**

TABLE 4
POTENTIAL WATERS OF THE U.S.

Aquatic Feature	Cowardin Type	Dominant Vegetation/ Land Cover Type	OHWM (feet) (range)	Linear Feet	Acres
Topanga Creek (Drainage 1)	Riverine	Woodland Communities	13-40	2,352	1.52
Topanga Lagoon	Riverine	Waterways	40-100	449	0.75
Drainage 2	Riverine	Woodland Communities	0.5-1	106	0.002
Other Waters Total:				**2,907**	**2.28**
Wetland 1	Riverine	Shrubland Communities	--	--	0.014
Wetland 2	Riverine	Woodland Communities	--	--	0.014
Wetland Total:					**0.029**
Tidal Waters - Clean Water Act	Marine				
Other Tidal Waters	**Marine**	**Other/Developed Land Cover and Ocean**	**--**	**2,585**	**5.84**

19 U.S. Army Corps of Engineers (USACE). 2017. Definitions. https://www.poa.usace.army.mil/Portals/34/docs/regulatory/2017/2017-Nationwide-Definitions.pdf.

20 Google LLC. 2022. Google Earth Pro.

Aquatic Feature	Cowardin Type	Dominant Vegetation/ Land Cover Type	OHWM (feet) (range)	Linear Feet	Acres
Other Tidal Waters Total:				**2,585**	**5.84**
Tidal Waters – Rivers and Harbors Act					
Other Tidal Waters	**Marine**	**Other/Developed Land Cover and Ocean**	**--**	**2,585**	**3.29**
Other Tidal Waters Total:				**2,585**	**3.29**

Wetlands

Wetland 1(W1) is situated immediately downstream of Drainage 1, within Topanga Lagoon (see Table 4 and Figure 7). A total of two data points, a wetland data point (WDP) and upland data point (UDP) were collected within W1. Vegetation within WDP1 was dominated by California bulrush (*Schoenoplectus californicus,* obligate wetland plant species) and met the dominance test for hydrophytic vegetation. The soil matrix exhibited a layer of mucky modified loamy/clayey soil material 4 inches thick, within 6 inches of the soil surface; therefore, the Loamy Mucky Mineral (F1) hydric soil indicator was met. Two hydrology indicators, High Water Table (A2) and Saturation (A3), were met. Wetland 1 supported wetland vegetation, soils, and hydrology, and exhibited a surface connection to waters of the U.S... UDP1 was collected outside of Wetland 1 to identify a boundary and aid in mapping the extent of the feature. UDP1 supported some hydrophytic vegetation (e.g., arroyo willow and California bulrush); however, no wetland indicators were met.

Wetland 2 (W2) is situated at the upstream extent of Drainage 2 and appears to serve as its source of flow. A total of two data points, a wetland data point (WDP) and upland data point (UDP), were collected to determine whether the feature met criteria for wetland in accordance with the 1987 Manual and Arid West Supplement. Vegetation within WDP2 was dominated by cattail (*Typha latifolia,* obligate wetland plant species) and arroyo willow (facultative wetland plant species) and met the dominance test for hydrophytic vegetation. The soil matrix emitted a strong "rotten egg" smell; therefore, the Hydrogen Sulfide (A4) hydric soil indicator was met. Additionally, the soil matrix exhibited a layer of mucky modified loamy/clayey soil material 4 inches thick, within 6 inches of the soil surface; therefore, the Loamy Mucky Mineral (F1) hydric soil indicator was met. Three hydrology indicators—Surface Water (A1), High Water Table (A2), and Saturation (A3)—were met. Wetland 2 supported wetland vegetation, soils and hydrology, and exhibited a CSC to Drainage 2, as described below. UDP2 was collected outside of Wetland 2 to identify a boundary and aid in mapping the extent of the feature. UDP2 supported some hydrophytic vegetation (e.g., arroyo willow); however, no wetland indicators were met.

Wetland waters were not identified elsewhere, within the survey area. Delineators assessed conditions at data point SP1 and SP2, identified in the WRA jurisdictional delineation report, to verify conditions at these locations. A formal wetland delineation form, as referenced in the Arid West Supplement was not completed for this area; rather, delineators hand excavated soil at SP2, and investigated for signs of hydrology and hydrophytic vegetation at both SP1 and SP2. While wetland parameters were observed at SP1 (i.e., wetland hydrology and hydric soils) and SP2 (i.e., hydrophytic vegetation), it was determined that neither of the two data points, nor the immediate vicinity, would meet all three wetland parameters. [21]

[21] WRA. 2020. Jurisdictional Delineation Report, Topanga Lagoon Restoration Project

Other Waters of the U.S.

Drainage 1 (D1)

Drainage 1 was delineated based on the identification of OHWM indicators, which included, but were not limited to, a break in slope, change in particle-sized distribution (i.e., gravel to sand), change in vegetation type, and water staining. Flowing water was observed within the channel during the delineation. Because water was observed within the channel when the region (Santa Monica) is subject to drier conditions (see Table 3 – monthly total precipitation in June), it was determined that Drainage 1 likely flows for at least 3 months of a typical year, would, at a minimum, be characterized as an intermittent feature[22], and thus meets criteria for an RPW and an (a)(3) tributary, based on the presence of a CSC to an (a)(1) water (i.e., Pacific Ocean).

Drainage 2 (D2)

Drainage 2 was delineated based on the identification of OHWM indicators. Based on the presence of surface water (i.e., a CSC) to within approximately 5 feet of Drainage 1, which exhibits a clear CSC to an (a)(1) water (i.e., Pacific Ocean), Drainage 2 met criteria for an RPW and an (a)(3) tributary, as it functions as a CSC. The portion of Drainage 2 absent of flow exhibited clear OHWM indicators, and it is assumed that the feature maintains a clear hydrologic connection to Drainage 1.

Topanga Lagoon

Tidal influence extends upstream of the shoreline's HTL into the Topanga Lagoon; however, this tidal influence only occurs periodically (e.g., 1-2 times annually[23]) due to the lagoon being closed to the ocean for much of the year. Salinity testing conducted within the lagoon and adjacent Pacific Ocean comports with this observation. The lagoon functions primarily as a freshwater system and would not constitute tidal waters.

Tidal Waters of the U.S.

Tidal Waters

Clean Water Act

Pacific Ocean

The HTL was delineated based on the presence of visible debris deposits (i.e., dead vegetation, wood, and marine organisms) along the eastern and western portions of Topanga Beach, and by a clear break in slope and staining of cobble/boulders in the central portion of the beach, just east of Topanga Lagoon.

Rivers and Harbors Act

The MHW line was delineated at 4.5 feet NAVD88, as reported at the NOAA Santa Monica Tidal Station.

Waters of the State

Potential waters of the State mapped within the survey area are presented in **Table 5, Potential Waters of the State,** and depicted in **Figure 9, Potential Waters of the State**. Wetland 1 and 2 were delineated as described for waters of the U.S. and described as potential wetland waters of the State. Other waters of the State (Drainages 1–8) were delineated based on the identification of OHWM indicators, as done for waters of the U.S. OHWM

[22] Definitions. https://www.poa.usace.army.mil/Portals/34/docs/regulatory/2017/2017-Nationwide-Definitions.pdf.
[23] Pers Comm. 2023. R. Dagit with RCD.

indicators included, but were not limited to, a break in slope, change in particle-sized distribution (i.e., gravel to sand), change in vegetation type, and water staining. Drainage 8 was delineated through the review of aerial imagery[24], and the limits of the OHWM were estimated.

TABLE 5
POTENTIAL WATERS OF THE STATE

Aquatic Feature	Cowardin Type	Dominant Vegetation/ Land Cover Type	OHWM (range in feet)	Linear Feet	Acres
Topanga Creek (Drainage1)	Riverine	Woodland Communities	13–40	2,352	1.52
Topanga Lagoon	Riverine	Waterways	40-100	449	0.75
Drainage 2	Riverine	Woodland Communities	0.5–1	106	0.002
Drainage 3	Riverine	Woodland Communities	3–6	363	0.07
Drainage 4	Riverine	Woodland Communities	3–6	202	0.03
Drainage 5	Riverine	Woodland Communities	3–6	76	0.01
Drainage 6	Riverine	Shrubland Communities	2–4	169	0.02
Drainage 7	Riverine	Shrubland Communities	2–4	130	0.01
Drainage 8	Riverine	Shrubland Communities	2–4	302	0.03
Other Waters Total:			**--**	**4,148**	**2.44**
Wetland 1	Riverine	Shrubland Communities	--	--	0.014
Wetland 2	Riverine	Shrubland Communities	--	--	0.014
Wetland Total:			**--**	**--**	**0.029**
Tidal Waters - Clean Water Act	Marine				
Other Tidal Waters	Marine	Other/Developed Land Cover and Ocean	--	2,585	5.84
Other Tidal Waters Total:				**2,585**	**5.84**

Rivers, Streams, and Lakes

Rivers, streams, and lakes potentially subject to FGC Section 1600 mapped within the survey area are presented in **Table 6, Rivers, Streams, and Lakes**, and depicted in **Figure 10, Rivers, Streams, and Lakes.** Drainages 1–5 and Wetlands 1 and 2 were delineated based on the extent of riparian vegetation.25 Drainages 6 and 7 were delineated based on TOB indicators (i.e., break in slope). Drainage 8 was delineated through a review of aerial imagery, and the limits of the TOB were estimated.

24 Google LLC. 2022. Google Earth Pro.

25 U.S. Army Corps of Engineers (USACE). 2020. National Wetlands Plant List, version 3.5 Arid West Region. Engineer Research and Development Center Cold Regions Research and Engineering Laboratory, Hanover, NH.

TABLE 6
RIVERS, STREAMS, LAKES

Aquatic Feature	Cowardin Type	Dominant Vegetation/ Land Cover Type	TOB (range in feet)	Linear Feet	Acres
Drainages 1–5, Topanga Lagoon and Wetland 1 and 2	Riverine	Woodland/Shrubland Communities	--	--	18.45
Drainage 6	Riverine	Shrubland Communities	2–4	--	0.02
Drainage 7	Riverine	Shrubland Communities	2–4	--	0.01
Drainage 8	Riverine	Shrubland Communities	2–4	--	0.03
Totals:			**--**	**--**	**18.51**

Coastal Wetlands and Waters

Coastal wetlands and waters potentially subject to the California Coastal Act mapped within the survey area are presented in Table 7, Coastal Wetlands and Waters, and depicted in **Figure 11, Potential Coastal Wetlands and Waters**. Drainages 1–5 and Wetlands 1 and 2 were delineated based on the extent of riparian vegetation. Drainages 6 and 7 were delineated based on TOB indicators (i.e., break in slope). Drainage 8 was delineated through the review of aerial imagery, and the limits of the TOB were estimated. The extent of coastal waters along Topanga Beach was delineated along the MHW.

TABLE 7
COASTAL WETLANDS AND WATERS

Aquatic Feature	Cowardin Type	Dominant Vegetation/ Land Cover Type	TOB (feet) (average)	Linear Feet	Acres
Drainages 1–5, Topanga Lagoon and Wetland 1 and 2	Riverine	Woodland/Shrubland Communities	--	--	18.45
Drainage 6	Riverine	Shrubland Communities	4	--	0.02
Drainage 7	Riverine	Shrubland Communities	4	--	0.01
Drainage 8	Riverine	Shrubland Communities	4	--	0.03
Topanga Beach	Marine	Other/Developed Land Cover and Ocean	--	--	3.29
Totals:			--	--	21.79

Conclusions

Waters of the U.S. A total of 0.028 acre of potential non-tidal wetland and 2.28 acres (2,907 linear feet) of potential non-tidal other waters of the U.S. occur within the survey area. A total of 5.84 acres (2,585 linear feet) of tidal waters of the U.S. potentially jurisdictional under the CWA, and 3.29 acres (2,585 linear feet) of tidal waters of the U.S. potentially jurisdictional under the RHA, occur within the survey area.

Waters of the State. A total of 0.028 acres of potential wetland and 2.44 acres (4,148 linear feet) of potential non-wetland waters of the State occur within the survey area. A total of 5.84 acres (2,585 linear feet) of tidal waters of the State potentially jurisdictional under the CWA, and 3.29 acres (2,585 linear feet) of tidal waters of the State potentially jurisdictional under the RHA, occur within the survey area.

Rivers, Streams, and Lakes. A total of 18.51 acres of aquatic resources potentially jurisdictional under Section 1600 et seq. of the FGC occur within the survey area.

Coastal Wetlands and Waters. A total of 21.79 acres of coastal wetlands and waters potentially jurisdictional under the California Coastal Act occur within the survey area.

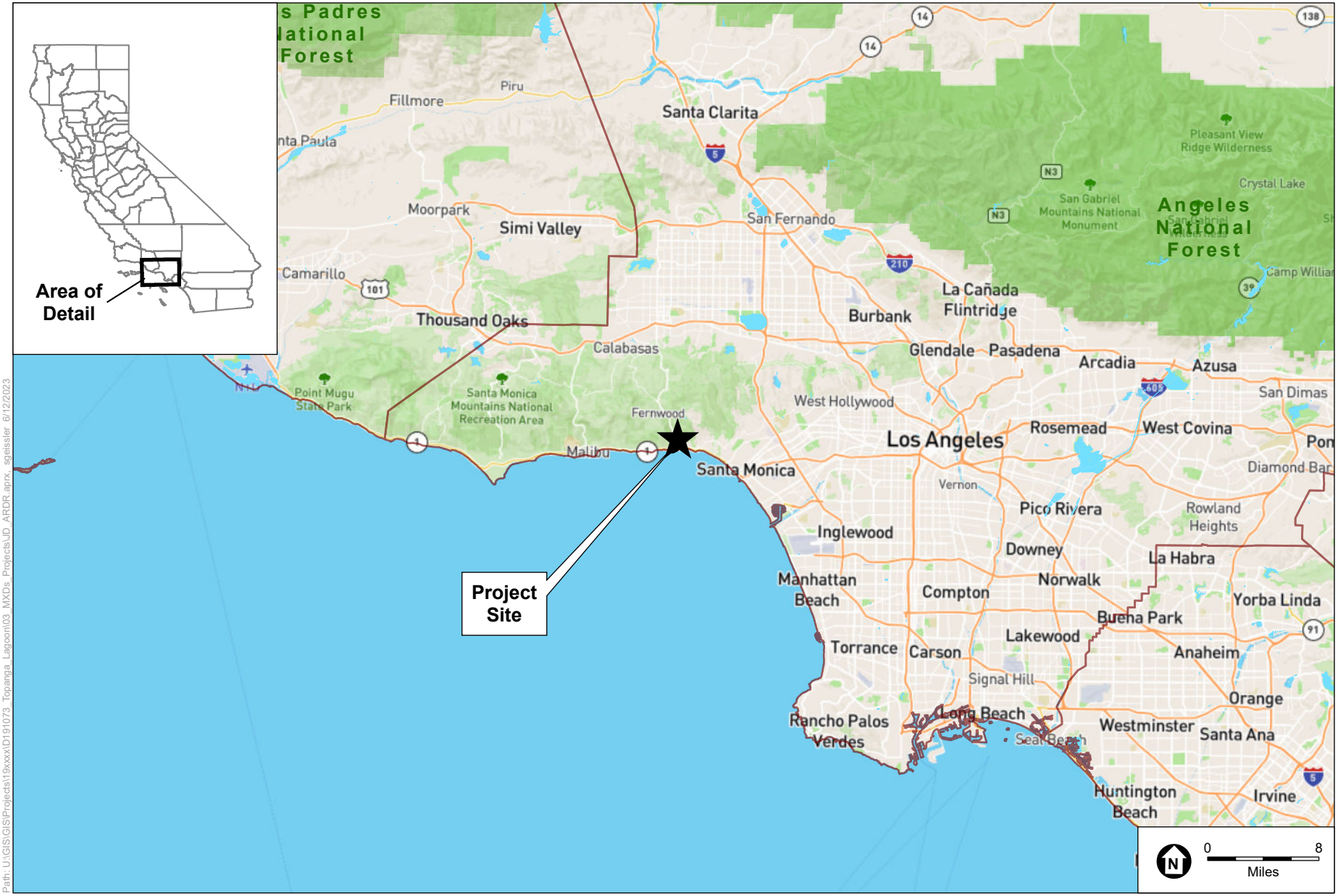
This report documents the aquatic resources boundary delineation and best professional judgment of ESA investigators. All conclusions presented should be considered preliminary and subject to change pending official review and verification by the appropriate regulatory agencies.

Figures

Figure 1, Regional Location
Figure 2, Vicinity Map
Figure 3, USGS Topographic Map
Figure 4, Vegetation Communities and Land Cover Types
Figure 5, Soils
Figure 6, Hydrology
Figure 7, Potential Waters of the U.S.
Figure 8, Potential Tidal Waters of the U.S. and State
Figure 9, Potential Waters of the State
Figure 10, Rivers, Streams, and Lakes
Figure 11, Potential Coastal Wetlands and Waters

Attachments

Attachment A, APT Results
Attachment B, Photographic Log
Attachment C, Data Sheets
Attachment D, Floral Compendium



SOURCE: ESRI; National Hydrography Dataset; DWR

Topanga Lagoon Restoration Project

Figure 1

Regional Location

ESA

Path: U:\GIS\GIS\Projects\19xxxx\D191073_Topanga_Lagoon\03_MXDs_Projects\JD_ARDR.aprx, sgeisler 6/12/2023

SOURCE: ESA, 2023

Topanga Lagoon Restoration Project

Figure 2

Vicinity Map

ESA

Path: U:\GIS\GIS\Projects\19xxxx\D191073_Topanga_Lagoon\03_MXDs_Projects\JD_ARDR aprx, sgeissler 6/14/2023

SOURCE: USGS Topographic Series (Topanga, CA); ESA, 2023

Topanga Lagoon Restoration Project

Figure 3
USGS Topographic Map

ESA

Survey Area Boundary

Woodland Communities

- Pr/Slae-Slas-Bs,California Sycamore Woodland / Willow and Mulefat Understory
- Sl,Arroyo Willow Stands
- Pr,California Sycamore Trees
- Qa,Coast Live Oak Tree
- Pf,Cottonwood Trees
- NNT,Non-Native Tree Stands

Shrubland Communities

- Sm-Ac-Ml,Black Sage - Coastal Sage - Laurel Sumac
- Ac-Eci,Coastal Sage - Ashyleaf Buckwheat
- Ecal-Ac,California Brittlebush - Coastal Sage
- Ecin,Ashyleaf Buckwheat Shrubland
- Ri,Lemonade Berry Scrub
- Sleu-Eci/AH,Purple Sage - Ashyleaf Buckwheat / annual herb
- CSSd,Coastal Sage Scrub (disturbed)
- NNR,Mixed Native and Non-Native Riparian

Herbaceous Communities

- Econ,Giant Wildrye Grassland
- Ds,Saltgrass Patch
- NNG,Non-Native Grasses and Forbs
- Ad,Arundo Stands

Other/Developed Landcover

- B/S,Barren / Sparsely Vegetated
- D/L,Developed / Landscaped
- P,Paved Areas and Roads
- S,Sand

Waterways

- SC,Stream Channel
- O,Ocean

0 350 Feet

Path: U:\GIS\GIS\Projects\19xxxx\D191073_Topanga_Lagoon\03_MXDs_Projects\JD_ARDR.aprx, sgeisler 6/12/2023

SOURCE: State Parks, 2022; ESA, 2023

Topanga Lagoon Restoration Project

Figure 4

Vegetation Communities and Land Cover Types

ESA

Survey Area Boundary

Soil Type

- 100 - Chumash-Boades-Malibu association, 30 to 75 percent slopes
- 1150LA - Abaft-Beaches complex, 0 to 5 percent slopes
- 120 - Mipolomol-Topanga association, 30 to 75 percent slopes
- 220 - Elder fine sandy loam, coastal, 0 to 2 percent slopes

Topanga Canyon Blvd
Clifftop Way
Malibu Vista Dr
Castlerock Rd
Kingsport Dr
Wakecrest Dr
Malibu Vista Dr
Wakecrest Dr
Coastline Dr
Tuna Canyon Rd
Rodeo Grounds Ln
Topanga Canyon Blvd
220
120
100
Malibu Feed Bin
Pacific Coast Hwy
Pacific Coast Hwy
Pacific Coast Hwy
Pacific Coast Hwy
Topanga County Beach
1150LA
Topanga Beach
No Soil Mapping Available
1

0 350 Feet

Path: U:\GIS\GIS\Projects\19xxxx\D191073_Topanga_Lagoon\03_MXDs_Projects\JD_ARDR.aprx, sgeissler 6/21/2023

SOURCE: NRCS, 2022; ESA, 2023

Topanga Lagoon Restoration Project

Figure 5

Soils

ESA

Path: U:\GIS\GIS\Projects\19xxxx\D191073_Topanga_Lagoon\03_MXDs_Projects\JD_ARDR.aprx, MCScott 9/14/2023

SOURCE: ESA, 2023

Topanga Lagoon Restoration Project

Figure 6

Hydrology

ESA

Survey Area Boundary

Potential Waters of the State

Non-Wetland (2.276 ac/2,967 LF)

Wetland (0.029 ac)

Field Data Collection

Ordinary High Water Mark (OHWM) Assessment Areas (AA)

Upland Data Point (UDP)

Wetland Data Point (WDP)

Photo Point Location / Direction

AA1
PP1
PP2
D1
D2
PP9
AA4
W2
PP12
WDP2
UDP2
PP10
PP11
AA2
PP3
PP4
PP5
AA3
Topanga Lagoon
W1
PP6
WDP1
PP7
PP8
UDP1

0 350 Feet

Path: U:\GIS\GIS\Projects\19xxxx\D191073_Topanga_Lagoon\03_MXDs_Projects\JD_ARDR.aprx, MCScott 9/14/2023

SOURCE: ESA, 2023

Topanga Lagoon Restoration Project

Figure 7

Potential Waters of the U.S.

ESA

Survey Area Boundary
MHW (Rivers and Harbors Act)
Clean Water Act
Non-Wetland (5.844 ac/2,585 LF)
Rivers and Harbors Act
Non-Wetland (3.285 ac/2,585 LF)
Field Data Collection
High Tide Line (Clean Water Act)
Photo Point Location / Direction

Topanga Canyon Blvd
Clifftop Way
Malibu Vista Dr
Castlerock Rd
Kingsport Dr
Wakecrest Dr
Coastline Dr
Rodeo Grounds Ln
Tuna Canyon Rd
Malibu Feed Bin
Pacific Coast Hwy
Topanga County Beach
Topanga Beach
PP14
PP15
PP16
PP17
1
0
350
Feet

Path: U:\GIS\GIS\Projects\19xxxx\D191073_Topanga_Lagoon\03_MXDs_Projects\JD_ARDR.aprx, MCScott 9/14/2023

SOURCE: ESA, 2023

Topanga Lagoon Restoration Project
Figure 8
Potential Tidal Waters of the U.S. and State

ESA

SOURCE: ESA, 2023

Topanga Lagoon Restoration Project

Figure 9

Potential Waters of the State

ESA

Path: U:\GIS\GIS\Projects\19xxxx\D191073_Topanga_Lagoon\03_MXDs_Projects\JD_ARDR.aprx, MCScott 9/14/2023

Survey Area Boundary
Potential CDFW Jurisdiction (18.507 ac)

Tuna Canyon Rd
Topanga Canyon Blvd
Clifftop Way
Malibu Vista Dr
Castlerock Rd
Kingsport Dr
Wakecrest Dr
Coastline Dr
D1
D2
D3
D4
D5
D6
D7
D8
Rodeo Ground
Malibu Feed Bin
Pacific Coast Hwy
Topanga County Beach
Topanga Lagoon
Topanga Beach
1

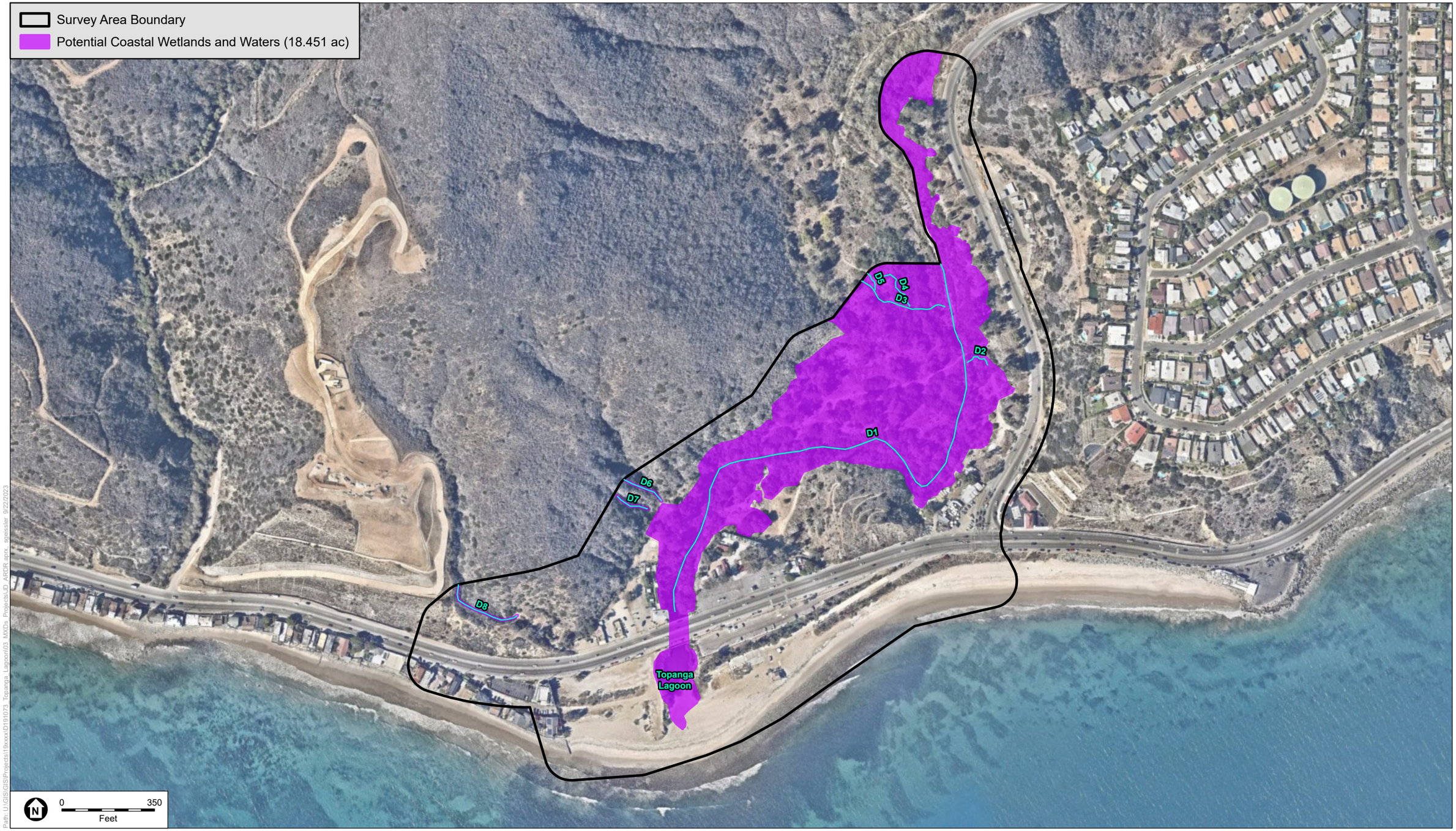
0 350
Feet

Path: U:\GIS\GIS\Projects\19xxxx\D191073_Topanga_Lagoon\03_MXDs_Projects\JD_ARDR.aprx, MCScott 9/14/2023

SOURCE: ESA, 2023

Topanga Lagoon Restoration Project
Figure 10
Rivers, Streams and Lakes

ESA



Path: U:\GIS\GIS\Projects\19xxxx\D191073_Topanga_Lagoon\03_MXDs_Projects\JD_ARDR.aprx, sgeissler 9/22/2023

SOURCE: ESA, 2023

Topanga Lagoon Restoration Project

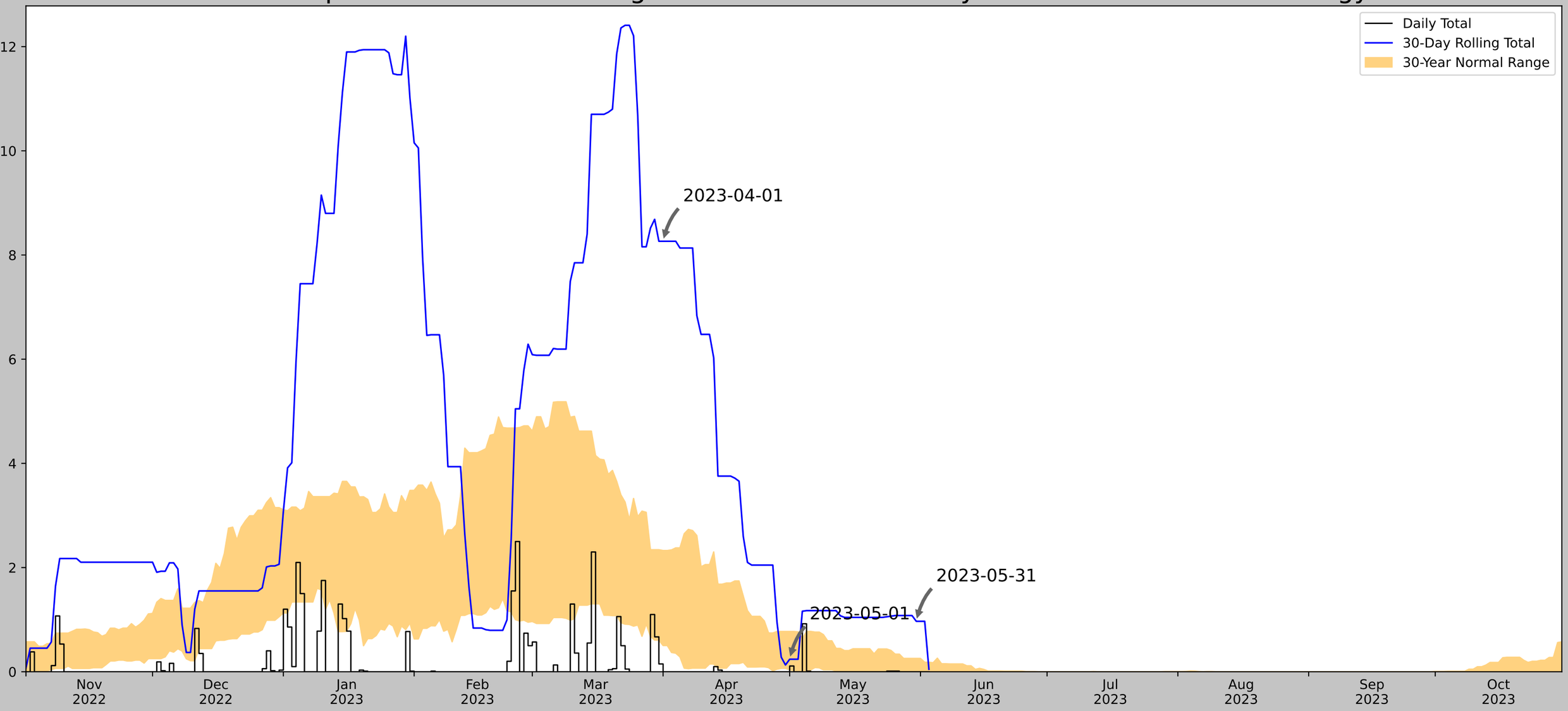
Figure 11

Potential Coastal Wetlands and Waters

ESA

Attachment A
APT Results

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	34.042160, -118.579665
Observation Date	2023-05-31
Elevation (ft)	26.09
Drought Index (PDSI)	Severe wetness (2023-04)

30 Days Ending	30th %ile (in)	70th %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2023-05-31	0.0	0.255906	0.968504	Wet	3	3	9
2023-05-01	0.035827	0.773228	0.240157	Normal	2	2	4
2023-04-01	0.502756	2.327559	8.26378	Wet	3	1	3
Result							Wetter than Normal - 16

Figure and tables made by the
Antecedent Precipitation Tool
Version 1.0

Written by Jason Deters
U.S. Army Corps of Engineers

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days Normal	Days Antecedent
CULVER CITY	34.005, -118.4139	91.864	9.834	65.774	5.072	10690	90
CULVER CITY 1.6 SSW	33.986, -118.409	22.966	1.342	68.898	0.696	20	0
SANTA MONICA MUNI AP	34.0211, -118.4472	174.869	2.208	83.005	1.177	341	0
LOS ANGELES INTL AP	33.9381, -118.3867	97.113	4.878	5.249	2.221	302	0

Attachment B
Photographic Log

Photo 1 (NW). Facing upstream along Drainage 1, within Assessment Area (AA) 1.

Photo 2 (SE). Facing downstream along Drainage 1, immediately southeast of AA 1.

Photo 3 (E). Facing downstream along Drainage 1, within AA 2.

Photo 4 (NE). Facing upstream along Drainage 1, within AA 3.

Photo 5 (W). Facing toward right bank of Drainage 1, within AA 3.

Photo 6 (S). Depicting Wetland 1.

Photo 7. Wetland Data Point 1 (WDP1), collected within Wetland 1.

Photo 8. Upland Data Point 1 (UDP1), collected adjacent to Wetland 1.

Photo 9 (SE). Facing upstream along Drainage 2, within AA 4.

Photo 10 (S). Depicting Wetland 2.

Photo 11. Wetland Data Point 2 (WDP2), collected within Wetland 2.

Photo 12. Upland Data Point 2 (UDP2), collected adjacent to Wetland 2.

Photo 13 (E). Facing downstream along Drainage 3, within AA5.

Photo 14 (W). Topanga County Beach shoreline, depicting high tide line indicators (e.g., debris).

Photo 15 (S). Topanga County Beach shoreline, depicting high tide line indicators (e.g., debris and staining).

Photo 16. Topanga County Beach shoreline, depicting high tide line indicators (e.g., debris and staining).

Photo 17. Topanga County Beach shoreline, depicting high tide line indicators (e.g., debris and staining).

Photo 18 (NW). Facing upstream, along Drainage 6.

Photo 19 (W). Facing upstream, along Drainage 7.

Photo 20. Facing toward the northwest extent of the riparian vegetation (e.g., western sycamore and willow) within the study area. Photo was taken west of Drainage 1 and southwest of Drainage 3.

Photo 21. Facing toward the eastern extent of the riparian vegetation (i.e., giant reed) within the survey area. Photo was taken east of Drainage 1.

Attachment C
Data Sheets

Print Form | Save As | E-mail

U.S. Army Corps of Engineers (USACE)

RAPID ORDINARY HIGH WATER MARK (OHWM) FIELD IDENTIFICATION DATA SHEET

The proponent agency is Headquarters USACE CECW-CO-R.

OMB Control No. 0710-XXXX
Approval Expires:

Project ID #: D20190173 | Site Name: TOPANGA LAGOON | Date and Time: 6/1/23 12:44

Location (lat/long): 34.042436, -118.579697 | Investigator(s): AF, RS

Step 1 Site overview from remote and online resources
Check boxes for online resources used to evaluate site:

- [ ] gage data
- [ ] LiDAR
- [ ] geologic maps
- [x] climatic data
- [x] satellite imagery
- [x] land use maps
- [x] aerial photos
- [x] topographic maps
- [ ] Other: _____

Describe land use and flow conditions from online resources.
Were there any recent extreme events (floods or drought)?
WETTER THAN NORMAL CLIMATIC CONDITIONS, OPEN SPACE LAND USE, TOPO MAPS IDENTIFY CHANNEL AT 40 FT ELEVATION, CHANNEL VISIBLE ON AERIAL IMAGERY

Step 2 Site conditions during field assessment
First look for changes in channel shape, depositional and erosional features, and changes in vegetation and sediment type, size, density, and distribution. Make note of natural or man-made disturbances that would affect flow and channel form, such as bridges, riprap, landslides, rockfalls etc.

APPROX. 30 FT AA IN MAINSTEM (UPSTREAM) **AA-1**

Step 3 Check the boxes next to the indicators used to identify the location of the OHWM.
OHWM is at a transition point, therefore some indicators that are used to determine location may be just below and above the OHWM. From the drop-down menu next to each indicator, select the appropriate location of the indicator by selecting either just below `b', at `x', or just above `a' the OHWM.
OHWM. Go to page 2 to describe overall rationale for location of OHWM, write any additional observations, and to attach a photo log.

Geomorphic indicators

- [x] **Break in slope:** x
  - [x] *on the bank:* a
  - [x] *undercut bank:* x
  - [ ] *valley bottom:*
  - [ ] Other: _____
- [ ] **Shelving:**
  - [ ] *shelf at top of bank:*
  - [ ] *natural levee:*
  - [ ] *man-made berms or levees:*
  - [ ] *other berms:* _____
- [ ] **Channel bar:**
  - [ ] *shelving (berms) on bar:*
  - [ ] *unvegetated:*
  - [ ] *vegetation transition (go to veg. indicators)*
  - [ ] *sediment transition (go to sed. indicators)*
  - [ ] *upper limit of deposition on bar:*
- [x] **Instream bedforms and other bedload transport evidence:**
  - [ ] *deposition bedload indicators (e.g., imbricated clasts, gravel sheets, etc.)*
  - [x] *bedforms (e.g., poofs, riffles, steps, etc.):* b
  - [x] *erosional bedload indicators (e.g., obstacle marks, scour, smoothing, etc.)* b
- [ ] **Secondary channels:**

Sediment indicators

- [ ] **Soil development:**
- [x] **Changes in character of soil:** x
- [ ] **Mudcracks:**
- [x] **Changes in particle-sized distribution:** x
  - [x] *transition from* COBBLE + SAND *to* SILTY SAND
  - [ ] *upper limit of sand-sized particles*
  - [ ] *silt deposits:*

Vegetation Indicators

- [x] **Change in vegetation type and/or density:** b

Check the appropriate boxes and select the general vegetation change *(e.g., graminoids to woody shrubs)*. ***Describe the vegetation transition looking from the middle of the channel, up the banks, and into the floodplain.***

- [x] *vegetation absent to:* forbs
- [ ] *moss to:*
- [x] *forbs to:* woody shrubs
- [ ] *graminoids to:*
- [x] *woody shrubs to:* ~~deciduous trees~~ ~~deciduous absent~~
- [x] *deciduous trees to:* deciduous trees
- [ ] *coniferous trees to:*
- [ ] **Vegetation matted down and/or bent:**
- [x] **Exposed roots below intact soil layer:** b

Ancillary indicators

- [x] **Wracking/presence of organic litter:** a
- [ ] **Presence of large wood:**
- [x] **Leaf litter disturbed or washed away:** b
- [ ] **Water staining:**
- [ ] **Weathered clasts or bedrock:**

Other observed indicators?

Describe:
RIPARIAN VEG OVERHANGS OHWM ON LB, UPLAND VEG ABUT OHWM ON RB ~~EDHO~~

Step 4 Is additional information needed to support this determination?
- [ ] Yes
- [x] No

If yes, describe and attach information to datasheet:

Print Form | Save As | E-mail

Project ID #: _____

Step 5 Describe rationale for location of OHWM

BREAK IN SLOPE AT THE OHWM, ~~FLAT~~ ABOVE THE BANK ON THE LEFT BANK AND AT THE BANK ON THE RIGHT BANK. RIFFLES PRESENT ALONG THE EDGES OF THE CHANNEL AND SCOURING BELOW THE OHWM. SOIL CHARACTER CHANGES FROM COBBLE AND SAND IN THE CHANNEL TO SILTY SAND ABOVE THE OHWM. VEGETATION IS ABSENT WITHIN THE CHANNEL AND FORBS BEGIN JUST BELOW THE OHWM WITH WOODY SHRUBS APPEARING ABOVE THE OHWM. EXPOSED ROOTS APPEARED ALONG THE RIGHT BANK OF THE CHANNEL. WRACKING WAS OBSERVED ABOVE THE OHWM AND LEAF LITTER WAS ABSENT BELOW THE OHWM.

Additional observations or notes

Attach a photo log of the site. Use the table below, or attach separately.

Photo log attached? [X] Yes [ ] No If no, explain why not: _____

List photographs and include descriptions in the table below.

Number photographs in the order that they are taken. Attach photographs and include annotations of features.

Photo Number	Photograph description

Print Form | Save As | E-mail

U.S. Army Corps of Engineers (USACE)

RAPID ORDINARY HIGH WATER MARK (OHWM) FIELD IDENTIFICATION DATA SHEET

The proponent agency is Headquarters USACE CECW-CO-R.

OMB Control No. 0710-XXXX
Approval Expires:

Project ID #: D20190 1073 | Site Name: TOPANGA LAGOON | Date and Time: 6/2/23 09:39

Location (lat/long): 34.040693, -118.58974 | Investigator(s): AF, RS

Step 1 Site overview from remote and online resources
Check boxes for online resources used to evaluate site:

- [ ] gage data
- [ ] LiDAR
- [ ] geologic maps
- [x] climatic data
- [x] satellite imagery
- [x] land use maps
- [x] aerial photos
- [x] topographic maps
- [ ] Other: _____

Describe land use and flow conditions from online resources.
Were there any recent extreme events (floods or drought)?
WETTER THAN NORMAL CLIMATE CONDITIONS, OPENSPACE LANDUSE, TOPO MAPS IDENTIFY CHANNEL AT 20 FT ELEVATION; CHANNEL VISIBLE ON AERIAL IMAGERY

Step 2 Site conditions during field assessment
First look for changes in channel shape, depositional and erosional features, and changes in vegetation and sediment type, size, density, and distribution. Make note of natural or man-made disturbances that would affect flow and channel form, such as bridges, riprap, landslides, rockfalls etc.

APPROX. 30 FT AA ALONG MAINSTEM (MID) **AA-2**

Step 3 Check the boxes next to the indicators used to identify the location of the OHWM.
OHWM is at a transition point, therefore some indicators that are used to determine location may be just below and above the OHWM. From the drop-down menu next to each indicator, select the appropriate location of the indicator by selecting either just below `b', at `x', or just above `a' the OHWM.
OHWM. Go to page 2 to describe overall rationale for location of OHWM, write any additional observations, and to attach a photo log.

Geomorphic indicators

- [x] **Break in slope:** A
  - [x] *on the bank:* A
  - [ ] *undercut bank:*
  - [ ] *valley bottom:*
  - [ ] Other: _____
- [ ] **Shelving:**
  - [ ] *shelf at top of bank:*
  - [ ] *natural levee:*
  - [ ] *man-made berms or levees:*
  - [ ] *other berms:* _____
- [x] **Channel bar:** b
  - [ ] *shelving (berms) on bar:*
  - [x] *unvegetated:* b
  - [ ] *vegetation transition (go to veg. indicators)*
  - [ ] *sediment transition (go to sed. indicators)*
  - [ ] *upper limit of deposition on bar:*
- [x] **Instream bedforms and other bedload transport evidence:**
  - [x] *deposition bedload indicators (e.g., imbricated clasts, gravel sheets, etc.)* b
  - [ ] *bedforms (e.g., poofs, riffles, steps, etc.):*
  - [ ] *erosional bedload indicators (e.g., obstacle marks, scour, smoothing, etc.)*
- [x] **Secondary channels:** b

Sediment indicators

- [ ] **Soil development:**
- [ ] **Changes in character of soil:**
- [ ] **Mudcracks:**
- [x] **Changes in particle-sized distribution:** x
  - [x] *transition from* GRAVEL/COBBLE *to* SAND
  - [ ] *upper limit of sand-sized particles*
  - [ ] *silt deposits:*

Vegetation Indicators

- [x] **Change in vegetation type and/or density:**
  Check the appropriate boxes and select the general vegetation change *(e.g., graminoids to woody shrubs).* ***Describe the vegetation transition looking from the middle of the channel, up the banks, and into the floodplain.***
  - [x] *vegetation absent to:* ~~forbs~~ graminoids
  - [x] *moss to:* graminoids
  - [x] *forbs to:* ~~graminoids~~ woody shrubs
  - [x] *graminoids to:* woody shrubs
  - [x] *woody shrubs to:* deciduous trees
  - [x] *deciduous trees to:* deciduous trees
  - [ ] *coniferous trees to:*
- [ ] **Vegetation matted down and/or bent:**
- [ ] **Exposed roots below intact soil layer:**

Ancillary indicators

- [x] **Wracking/presence of organic litter:** a
- [x] **Presence of large wood:** b
- [x] **Leaf litter disturbed or washed away:** b
- [x] **Water staining:** x
- [ ] **Weathered clasts or bedrock:**

Other observed indicators?

Describe:

Step 4 Is additional information needed to support this determination?
- [ ] Yes
- [x] No

If yes, describe and attach information to datasheet:

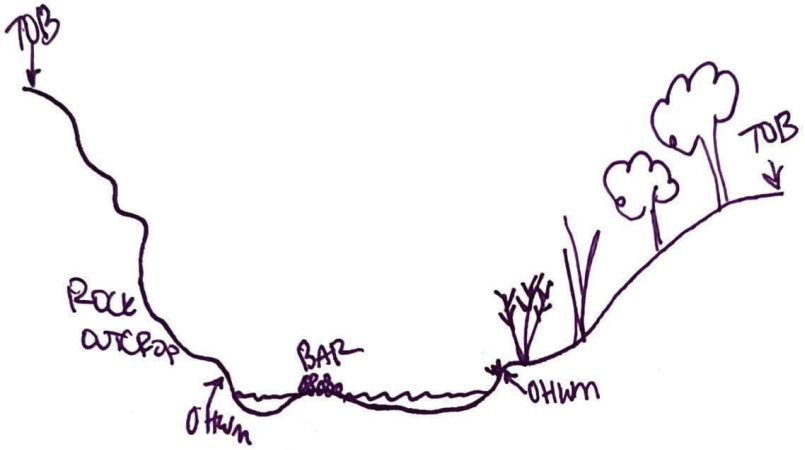
Print Form | Save As | E-mail

Project ID #: _____

Step 5 Describe rationale for location of OHWM

BREAK IN SLOPE ON THE BANK IS ABOVE THE OHWM AND A CHANNEL BAR IS PRESENT BELOW THE OHWM DUE TO DEPOSITION. THE CHANNEL BAR FORMS A SECONDARY CHANNEL ALONG THE LEFT BANK. GRAVEL + COBBLE IS PRESENT BELOW THE OHWM AND TRANSITIONS TO SAND ABOVE THE OHWM. THE CHANNEL IS UNVEGETATED UNTIL GRAMINOIDS BEGIN GROWING ALONG THE BANKS. WRACK IS PRESENT ABOVE THE OHWM WHILE LWD AND ABSENCE OF LEAF LITTER IS PRESENT BELOW.

Additional observations or notes



Attach a photo log of the site. Use the table below, or attach separately.

Photo log attached? ☒ Yes ☐ No If no, explain why not: _____

List photographs and include descriptions in the table below.

Number photographs in the order that they are taken. Attach photographs and include annotations of features.

Photo Number	Photograph description

Print Form | Save As | E-mail

U.S. Army Corps of Engineers (USACE)

RAPID ORDINARY HIGH WATER MARK (OHWM) FIELD IDENTIFICATION DATA SHEET

The proponent agency is Headquarters USACE CECW-CO-R.

OMB Control No. 0710-XXXX
Approval Expires:

Project ID #: D20190107 3 | Site Name: TOPANGA LAGOON | Date and Time: 6/2/23 1000

Location (lat/long): 34.039971, -118.583920 | Investigator(s): AF, RS

Step 1 Site overview from remote and online resources
Check boxes for online resources used to evaluate site:

- [ ] gage data
- [ ] LiDAR
- [ ] geologic maps
- [x] climatic data
- [x] satellite imagery
- [x] land use maps
- [x] aerial photos
- [x] topographic maps
- [ ] Other: _____

Describe land use and flow conditions from online resources.
Were there any recent extreme events (floods or drought)?
WETTER THAN NORMAL CLIMATIC CONDITIONS, OPEN SPACE LAND USE, TOPO MAPS IDENTIFY CHANNEL AT 10 FT ELEVATION & CHANNEL VISIBLE ON AERIAL IMAGERY

Step 2 Site conditions during field assessment

First look for changes in channel shape, depositional and erosional features, and changes in vegetation and sediment type, size, density, and distribution. Make note of natural or man-made disturbances that would affect flow and channel form, such as bridges, riprap, landslides, rockfalls etc.

APPROX. 30 FT AA ALONG MAINSTEM (DOWNSTREAM) **AA-3**

Step 3 Check the boxes next to the indicators used to identify the location of the OHWM.

OHWM is at a transition point, therefore some indicators that are used to determine location may be just below and above the OHWM. From the drop-down menu next to each indicator, select the appropriate location of the indicator by selecting either just below `b', at `x', or just above `a' the OHWM.

OHWM. Go to page 2 to describe overall rationale for location of OHWM, write any additional observations, and to attach a photo log.

Geomorphic indicators

- [x] **Break in slope:** a
  - [x] *on the bank:* a
  - [ ] *undercut bank:*
  - [ ] *valley bottom:*
  - [ ] Other: _____
- [ ] **Shelving:**
  - [ ] *shelf at top of bank:*
  - [ ] *natural levee:*
  - [ ] *man-made berms or levees:*
  - [ ] *other berms:* _____
- [ ] **Channel bar:**
  - [ ] *shelving (berms) on bar:*
  - [ ] *unvegetated:*
  - [ ] *vegetation transition (go to veg. indicators)*
  - [ ] *sediment transition (go to sed. indicators)*
  - [ ] *upper limit of deposition on bar:*
- [ ] **Instream bedforms and other bedload transport evidence:**
  - [ ] *deposition bedload indicators (e.g., imbricated clasts, gravel sheets, etc.)*
  - [ ] *bedforms (e.g., poofs, riffles, steps, etc.):*
  - [ ] *erosional bedload indicators (e.g., obstacle marks, scour, smoothing, etc.)*
- [ ] **Secondary channels:**

Sediment indicators

- [ ] **Soil development:**
- [ ] **Changes in character of soil:**
- [ ] **Mudcracks:**
- [x] **Changes in particle-sized distribution:**
  - [x] *transition from* GRAVEL/COBBLE *to* SILT/CLAY
  - [ ] *upper limit of sand-sized particles*
  - [ ] *silt deposits:*

Vegetation Indicators

- [x] **Change in vegetation type and/or density:**

Check the appropriate boxes and select the general vegetation change *(e.g., graminoids to woody shrubs).* ***Describe the vegetation transition looking from the middle of the channel, up the banks, and into the floodplain.***

- [x] *vegetation absent to:* MOSS
- [x] *moss to:* WOODY SHRUBS
- [ ] *forbs to:*
- [ ] *graminoids to:*
- [x] *woody shrubs to:* DECIDUOUS TREES
- [x] *deciduous trees to:* DECIDUOUS TREES
- [ ] *coniferous trees to:*

- [x] **Vegetation matted down and/or bent:** b
- [x] **Exposed roots below intact soil layer:** b

Ancillary indicators

- [x] **Wracking/presence of organic litter:** a
- [ ] **Presence of large wood:**
- [ ] **Leaf litter disturbed or washed away:**
- [ ] **Water staining:**
- [ ] **Weathered clasts or bedrock:**

Other observed indicators?

Describe:

Step 4 Is additional information needed to support this determination?

- [ ] Yes
- [x] No

If yes, describe and attach information to datasheet:

Print Form | Save As | E-mail

Project ID #: _____

Step 5 Describe rationale for location of OHWM

BREAK IN SLOPE ON THE BANK IS ABOVE THE OHWM. SEDIMENT PARTICLE SIZE CHANGES FROM GRAVEL/COBBLE IN THE CHANNEL TO SILT/LOAM ON THE BANKS. THE CHANNEL IS UNVEGETATED UNTIL MOSS FORMS FROM THE BANKS ~~[illegible]~~ WOODY SHRUBS AND DECIDUOUS TREES THEN GROW ALONG THE BANKS ABOVE THE OHWM. WRACK IS PRESENT ABOVE THE OHWM.

Additional observations or notes

Attach a photo log of the site. Use the table below, or attach separately.

Photo log attached? [X] Yes [ ] No If no, explain why not: _____

List photographs and include descriptions in the table below.

Number photographs in the order that they are taken. Attach photographs and include annotations of features.

Photo Number	Photograph description

Print Form | Save As | E-mail

U.S. Army Corps of Engineers (USACE)

RAPID ORDINARY HIGH WATER MARK (OHWM) FIELD IDENTIFICATION DATA SHEET

The proponent agency is Headquarters USACE CECW-CO-R.

OMB Control No. 0710-XXXX
Approval Expires:

Project ID #: D20190107B | Site Name: TOPANGA LAGOON | Date and Time: 6/1/23 11:45

Location (lat/long): 34.042882, -118.580783 | Investigator(s): AF, RS

Step 1 Site overview from remote and online resources
Check boxes for online resources used to evaluate site:

- [ ] gage data
- [ ] LiDAR
- [ ] geologic maps
- [x] climatic data
- [x] satellite imagery
- [x] land use maps
- [x] aerial photos
- [x] topographic maps
- [ ] Other: _____

Describe land use and flow conditions from online resources. Were there any recent extreme events (floods or drought)?
WETTER THAN NORMAL CLIMATIC CONDITIONS, OPEN SPACE LAND USE, 0% SLOPES WITHIN FLOODPLAIN, CHANNEL VISIBLE ON ~~SATELLITE~~ AERIAL IMAGERY

Step 2 Site conditions during field assessment
First look for changes in channel shape, depositional and erosional features, and changes in vegetation and sediment type, size, density, and distribution. Make note of natural or man-made disturbances that would affect flow and channel form, such as bridges, riprap, landslides, rockfalls etc.
APPROX. 30 FT AA IN TRIBUTARY TO MAINSTEM **AA-4**

Step 3 Check the boxes next to the indicators used to identify the location of the OHWM.
OHWM is at a transition point, therefore some indicators that are used to determine location may be just below and above the OHWM. From the drop-down menu next to each indicator, select the appropriate location of the indicator by selecting either just below `b', at `x', or just above `a' the OHWM.
OHWM. Go to page 2 to describe overall rationale for location of OHWM, write any additional observations, and to attach a photo log.

Geomorphic indicators

- [x] **Break in slope:** x
  - [x] *on the bank:* x
  - [ ] *undercut bank:*
  - [ ] *valley bottom:*
  - [ ] Other: _____
- [ ] **Shelving:**
  - [ ] *shelf at top of bank:*
  - [ ] *natural levee:*
  - [ ] *man-made berms or levees:*
  - [ ] *other berms:* _____
- [ ] **Channel bar:**
  - [ ] *shelving (berms) on bar:*
  - [ ] *unvegetated:*
  - [ ] *vegetation transition (go to veg. indicators)*
  - [ ] *sediment transition (go to sed. indicators)*
  - [ ] *upper limit of deposition on bar:*
- [x] **Instream bedforms and other bedload transport evidence:**
  - [ ] *deposition bedload indicators (e.g., imbricated clasts, gravel sheets, etc.)*
  - [ ] *bedforms (e.g., poofs, riffles, steps, etc.):*
  - [x] *erosional bedload indicators (e.g., obstacle marks, scour, smoothing, etc.)* b
- [ ] **Secondary channels:**

Sediment indicators

- [ ] **Soil development:**
- [ ] **Changes in character of soil:**
- [ ] **Mudcracks:**
- [x] **Changes in particle-sized distribution:** x
  - [x] *transition from* SAND *to* SILTY SAND
  - [ ] *upper limit of sand-sized particles*
  - [ ] *silt deposits:*

Vegetation Indicators

- [x] **Change in vegetation type and/or density:** ~~b~~ b

Check the appropriate boxes and select the general vegetation change *(e.g., graminoids to woody shrubs).* ***Describe the vegetation transition looking from the middle of the channel, up the banks, and into the floodplain.***

- [x] *vegetation absent to:* forbs
- [ ] *moss to:*
- [x] *forbs to:* woody shrubs
- [x] *graminoids to:* woody shrubs
- [x] *woody shrubs to:* deciduous trees
- [x] *deciduous trees to:* woody shrubs
- [ ] *coniferous trees to:*

- [x] **Vegetation matted down and/or bent:** b
- [ ] **Exposed roots below intact soil layer:**

Ancillary indicators

- [x] **Wracking/presence of organic litter:** a
- [x] **Presence of large wood:** b
- [x] **Leaf litter disturbed or washed away:** b
- [ ] **Water staining:**
- [ ] **Weathered clasts or bedrock:**

Other observed indicators?

Describe: N/A

Step 4 Is additional information needed to support this determination?

- [ ] Yes
- [x] No

If yes, describe and attach information to datasheet:

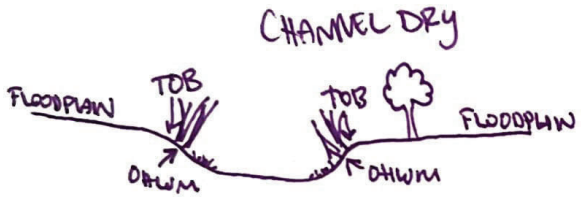
Print Form | Save As | E-mail

Project ID #: _____

Step 5 Describe rationale for location of OHWM

BREAK IN SLOPE IS OBSERVED AT THE OHWM ON THE BANK ALONG WITH A TRANSITION IN SEDIMENT PARTICLE SIZE FROM SAND WITH THE CHANNEL TO SILTY SAND. CHANGE IN VEGETATION TYPE AND DENSITY IS OBSERVED BELOW THE OHWM. ~~OUTSIDE~~ THE CHANNEL IS UNVEGETATED UNTIL FORBS AND GRAMINOIDS APPEAR ALONG THE EDGES OF THE CHANNEL. WOODY SHRUBS APPEAR ALONG THE BANKS OF THE BANKS. VEGETATION WAS MATTED DOWN, LARGE WOODY DEBRIS WAS PRESENT, AND LEAF LITTER WAS WASHED AWAY BELOW THE OHWM.

Additional observations or notes



Attach a photo log of the site. Use the table below, or attach separately.

Photo log attached? [X] Yes [ ] No If no, explain why not: _____

List photographs and include descriptions in the table below.

Number photographs in the order that they are taken. Attach photographs and include annotations of features.

Photo Number	Photograph description

Print Form | Save As | E-mail

U.S. Army Corps of Engineers (USACE)

RAPID ORDINARY HIGH WATER MARK (OHWM) FIELD IDENTIFICATION DATA SHEET

The proponent agency is Headquarters USACE CECW-CO-R.

OMB Control No. 0710-XXXX

Approval Expires:

Project ID #: D20190107 3 | Site Name: TOPANGA LAGOON | Date and Time: 6/2/23 09:00

Location (lat/long): 34.042013, -118.579477 | Investigator(s): AF, RS

Step 1 Site overview from remote and online resources

Check boxes for online resources used to evaluate site:

- [ ] gage data
- [ ] LiDAR
- [ ] geologic maps
- [x] climatic data
- [x] satellite imagery
- [x] land use maps
- [x] aerial photos
- [x] topographic maps
- [ ] Other: _____

Describe land use and flow conditions from online resources. Were there any recent extreme events (floods or drought)?

WETTER THAN NORMAL CLIMATIC CONDITIONS, OPEN SPACE LAND USE, 20% SLOPE FROM ORIGINATION TO TOPANGA CREEK.

Step 2 Site conditions during field assessment

First look for changes in channel shape, depositional and erosional features, and changes in vegetation and sediment type, size, density, and distribution. Make note of natural or man-made disturbances that would affect flow and channel form, such as bridges, riprap, landslides, rockfalls etc.

APPROX. 10 FT AA ALONG SEEP TRIB. TO MAINSTEM **AA-5**

Step 3 Check the boxes next to the indicators used to identify the location of the OHWM.

OHWM is at a transition point, therefore some indicators that are used to determine location may be just below and above the OHWM. From the drop-down menu next to each indicator, select the appropriate location of the indicator by selecting either just below `b', at `x', or just above `a' the OHWM.

OHWM. Go to page 2 to describe overall rationale for location of OHWM, write any additional observations, and to attach a photo log.

Geomorphic indicators

- [x] **Break in slope:** x
  - [x] *on the bank:* x
  - [ ] *undercut bank:*
  - [ ] *valley bottom:*
  - [ ] Other: _____
- [ ] **Shelving:**
  - [ ] *shelf at top of bank:*
  - [ ] *natural levee:*
  - [ ] *man-made berms or levees:*
  - [ ] *other berms:* _____
- [ ] **Channel bar:**
  - [ ] *shelving (berms) on bar:*
  - [ ] *unvegetated:*
  - [ ] *vegetation transition (go to veg. indicators)*
  - [ ] *sediment transition (go to sed. indicators)*
  - [ ] *upper limit of deposition on bar:*
- [x] **Instream bedforms and other bedload transport evidence:**
  - [ ] *deposition bedload indicators (e.g., imbricated clasts, gravel sheets, etc.)*
  - [ ] *bedforms (e.g., poofs, riffles, steps, etc.):*
  - [x] *erosional bedload indicators (e.g., obstacle marks, scour, smoothing, etc.)* b
- [ ] **Secondary channels:**

Sediment indicators

- [ ] **Soil development:**
- [ ] **Changes in character of soil:**
- [ ] **Mudcracks:**
- [x] **Changes in particle-sized distribution:**
  - [x] *transition from* GRAVELLY SCL *to* SCL
  - [ ] *upper limit of sand-sized particles*
  - [ ] *silt deposits:*

Vegetation Indicators

- [x] **Change in vegetation type and/or density:** b

Check the appropriate boxes and select the general vegetation change *(e.g., graminoids to woody shrubs).* ***Describe the vegetation transition looking from the middle of the channel, up the banks, and into the floodplain.***

- [x] *vegetation absent to:* forbs
- [x] *moss to:* forbs
- [x] *forbs to:* woody shrubs
- [x] *graminoids to:* woody shrubs
- [x] *woody shrubs to:* deciduous trees
- [x] *deciduous trees to:* deciduous trees
- [ ] *coniferous trees to:*
- [ ] **Vegetation matted down and/or bent:**
- [ ] **Exposed roots below intact soil layer:**

Ancillary indicators

- [ ] **Wracking/presence of organic litter:**
- [ ] **Presence of large wood:**
- [ ] **Leaf litter disturbed or washed away:**
- [ ] **Water staining:**
- [ ] **Weathered clasts or bedrock:**

Other observed indicators?

Describe:

Step 4 Is additional information needed to support this determination?

- [ ] Yes
- [x] No

If yes, describe and attach information to datasheet:

Print Form | Save As | E-mail

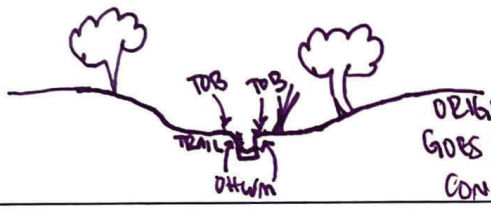
Project ID #: _____

Step 5 Describe rationale for location of OHWM

BREAK IN SLOPE ON THE BANK AT THE OHWM, SCOURING PRESENT BELOW THE OHWM PRESENTING GRAVELLY SANDY CLAY LOAM WITHIN THE CHANNEL. MOSS, FORBS, AND GRASSES ARE PRESENT BELOW THE OHWM ALONG THE BANKS. WOODY SHRUBS AND DECIDUOUS TREES BELOW ABOVE THE OHWM.

Additional observations or notes

A TRAIL IS PRESENT ALONG THE FEATURE.



ORIGINATES AT SEEP WETLAND. GOES SUBSURFACE JUST BEFORE CONNECTION TO TOPANGA CREEK.

Attach a photo log of the site. Use the table below, or attach separately.

Photo log attached? [X] Yes [ ] No If no, explain why not: _____

List photographs and include descriptions in the table below.

Number photographs in the order that they are taken. Attach photographs and include annotations of features.

Photo Number	Photograph description

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: TORRANZA (LADWP) City/County: LOS ANGELES COUNTY Sampling Date: 6/1/23
Applicant/Owner: RCA State: CA Sampling Point: LADP-P
Investigator(s): A. FRENCH, R. SWEET Section, Township, Range: S00, T1S, R16W
Landform (hillslope, terrace, etc.): SLOPE Local relief (concave, convex, none): CONCAVE Slope (%): 2
Subregion (LRR): C - MEDITERRANEAN CA Lat: 34.041896 Long: -118.579226 Datum: WGS84
Soil Map Unit Name: GLOBE FINE SANDY LOAM, COASTAL, 0-2% SLOPES NWI classification: NONE
Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)
Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____
Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes X No _____	

Remarks: WETTER THAN NORMAL CONDITIONS

VEGETATION

Tree Stratum (Use scientific names.) 10m	Absolute % Cover	Dominant Species?	Indicator Status
1. SALIX LASIOLEPIS	70	Y	FACW
2. EUCALYPTUS GLOBULUS	5	N	UPL
3. MALOSMA LAURINA (OVERHANGING)	25	Y	UPL
4.			
Total Cover:	100		
Sapling/Shrub Stratum 5 m			
1. ROSA CALIFORNICA	1	Y	FAC
2.			
3.			
4.			
5.			
Total Cover:	1		
Herb Stratum 2m			
1. ARUNDO DONAX	20	Y	OBL
2. TYPHA LATIFOLIA	25	Y	OBL
3. AGAVE SP. (ORNAMENTAL)	5	N	UPL
4.			
5.			
6.			
7.			
8.			
Total Cover:	50		
Woody Vine Stratum			
1.			
2.			
Total Cover:			

% Bare Ground in Herb Stratum 30 % Cover of Biotic Crust Ø

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)
Total Number of Dominant Species Across All Strata: 5 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 80% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:
X Dominance Test is >50%
___ Prevalence Index is ≤3.0[1]
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes X No _____

Remarks:

SOIL

Sampling Point: WDP-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-7	5Y 2.5/1	100	—	—	—	—	Clay Loam	HIGH CONC. OF ROOTS + ORG. MAT.
7-16	10Y 2.5/1	100	—	—	—	—	Sandy Clay Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- X Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- X Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: —

Depth (inches): —

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 2

Water Table Present? Yes X No ___ Depth (inches): 0

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): SURFACE

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: TOPANGA LAGOON City/County: LOS ANGELES COUNTY Sampling Date: 6/1/23
Applicant/Owner: RCA State: CA Sampling Point: UDP-2
Investigator(s): A. FRENCH, R. SWEET Section, Township, Range: S 00, T 1S, R 16W
Landform (hillslope, terrace, etc.): HILLSLOPE Local relief (concave, convex, none): CONVEX Slope (%): 2
Subregion (LRR): C Lat: 34.041933 Long: -118.579195 Datum: WGS 84
Soil Map Unit Name: ELDER FINE SANDY LOAM, COASTAL, 0-2% SLOPES NWI classification: NONE
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ____ No X
Hydric Soil Present? Yes ____ No X
Wetland Hydrology Present? Yes ____ No X
Is the Sampled Area within a Wetland? Yes ____ No X

Remarks: WETTER THAN NORMAL CONDITIONS

VEGETATION

Tree Stratum (Use scientific names.) 10m	Absolute % Cover	Dominant Species?	Indicator Status
1. SALIX LASIOLEPIS	30	Y	FACW
2. MALOSMA LAURINA	25	Y	UPL
3. PITTOSPORUM UNDULATUM	20	Y	UPL
4.			
Total Cover:	75		
Sapling/Shrub Stratum 5m			
1. ROSA CALIFORNICA	1	Y	FAC
2.			
3.			
4.			
5.			
Total Cover:	1		
Herb Stratum 2m			
1. ARTEMISIA DOUGLASIANA	2	N	FAC
2. ARUNDO DONAX	1	N	FACW
3. AGAVE SP. (ORNAMENTAL)	40	Y	UPL
4. CRASSULA SP. (ORNAMENTAL JADE)	1	N	UPL
5.			
6.			
7.			
8.			
Total Cover:	44		
Woody Vine Stratum			
1.			
2.			
Total Cover:			

% Bare Ground in Herb Stratum 30 % Cover of Biotic Crust ____

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 5 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 40% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	–	x 1 =	–
FACW species	31	x 2 =	62
FAC species	3	x 3 =	9
FACU species	–	x 4 =	–
UPL species	86	x 5 =	430
Column Totals:	120 (A)		501 (B)

Prevalence Index = B/A = 4.18

Hydrophytic Vegetation Indicators:
___ Dominance Test is >50%
___ Prevalence Index is ≤3.0[1]
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:

SOIL

Sampling Point: UDP-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-7	10YR 2/2	100	–	–	–	–	Loam	
7-16	10YR 4/3	100	–	–	–	–	Sandy Clay Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: –

Depth (inches): –

Hydric Soil Present? Yes ____ No X

Remarks: NO INDICATORS

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____

Water Table Present? Yes ____ No X Depth (inches): ____

Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: NO INDICATORS

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: TOPANGA LAGOON City/County: LOS ANGELES COUNTY Sampling Date: 6/2/23

Applicant/Owner: RCA State: CA Sampling Point: WDP-1

Investigator(s): A. FRENCH, R. SWEET Section, Township, Range: S08 T1S R16W

Landform (hillslope, terrace, etc.): Local relief (concave, convex, none): CONCAVE Slope (%): 0

Subregion (LRR): C Lat: 34.038877 Long: -118.582957 Datum: WGS 84

Soil Map Unit Name: ABAFT-BEACHES COMPLEX 0-5% SLOPES NWI classification: ESTUARINE (E1UBL)

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes X No _____	

Remarks: WETTER THAN NORMAL CONDITIONS

VEGETATION

Tree Stratum (Use scientific names.) 10m	Absolute % Cover	Dominant Species?	Indicator Status
1. SALIX LASIOLEPIS	15	Y	FACW
2. MYOPORUM LAETUM	5	Y	FACU
3.			
4.			
Total Cover:	20		
Sapling/Shrub Stratum 5m			
1. ARTEMISIA CALIFORNICA	1	Y	UPL
2. ERIOGONUM CINEREUM	1	Y	UPL
3.			
4.			
5.			
Total Cover:	2		
Herb Stratum 2m			
1. SCHEDONORUS CALIFORNICUS	60	Y	OBL
2. CARPOBROTUS EDULIS	2	N	UPL
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	62		
Woody Vine Stratum			
1.			
2.			
Total Cover:			

% Bare Ground in Herb Stratum 0 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 60% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes X No _____

Remarks:

Sampling Point: WDP-1

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	2.5Y 2.5/1	98	10YR 5/6	1	C	PL	SANDY CLAY LOAM	HIGH ORGANICS
			N 2.5/	1	D	M	L	THROUGHOUT

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- X Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: —

Depth (inches): —

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes X No ___ Depth (inches): 5

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): SURFACE

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: TOPANGA LAGOON City/County: LOS ANGELES COUNTY Sampling Date: 6/2/23

Applicant/Owner: RCA State: CA Sampling Point: VDP-1

Investigator(s): A. FRENCH, R. SWEET Section, Township, Range: S22 T1S R16W

Landform (hillslope, terrace, etc.): SLOPE Local relief (concave, convex, none): CONVEX Slope (%): 5

Subregion (LRR): C Lat: 34.038846 Long: -118.582943 Datum: WGS 84

Soil Map Unit Name: ARBAIT-BEACHES COMPLEX, 0-5% SLOPES NWI classification: ESTUARINE

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks: WETTER THAN NORMAL CLIMACTIC CONDITIONS

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10m)	Absolute % Cover	Dominant Species?	Indicator Status
1. SALIX LASIOLEPIS	40	Y	FACW
2. MYOPORUM LAETUM	10	Y	FACU
3.			
4.			
	50	= Total Cover	
Sapling/Shrub Stratum (Plot size: 5m)			
1. ARTEMISIA CALIFORNICA	1	Y	UPL
2.			
3.			
4.			
5.			
	1	= Total Cover	
Herb Stratum (Plot size: 2m)			
1. SCHOENOPLECTUS CALIFORNICUS	15	Y	OBL
2. CARPOBROTUS EDULIS	45	Y	UPL
3.			
4.			
5.			
6.			
7.			
8.			
	60	= Total Cover	
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
		= Total Cover	

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 40% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	15	x 1 =	15
FACW species	40	x 2 =	80
FAC species	–	x 3 =	–
FACU species	10	x 4 =	40
UPL species	46	x 5 =	230
Column Totals:	111 (A)		365 (B)

Prevalence Index = B/A = 3.29

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:

SOIL

Sampling Point: UDP-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 3/2	98	5YR 4/6	2	C	M	Sandy Clay Loam	NOT ENOUGH REDOX FOR F6

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: COBBLE

Depth (inches): 10

Hydric Soil Present? Yes ____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No ____ Depth (inches): ____

Water Table Present? Yes ____ No ____ Depth (inches): ____

Saturation Present? (includes capillary fringe) Yes ____ No ____ Depth (inches): ____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: NO INDICATORS

Attachment D
Floral Compendium

Family	Scientific Name	Common Name	Nativity	Wetland Indicator Status[1]
ANGIOSPERMS				
DICOTS				
Aizoaceae – Stone Plant Family				
	Carpobrotus edulis	sea fig	non-native	UPL
Anacardiaceae – Sumac or Cashew Family				
	Malosma laurina	laurel sumac	native	UPL
Asteraceae – Sunflower Family				
	Artemisia californica	California sagebrush	native	UPL
	Artemisia douglasiana	California mugwort	native	FAC
Crassulaceae – Stonecrop Family				
	Crassula ovata	jade plant	ornamental	UPL
Myrtaceae– Myrtle Family				
	Eucalyptus globulus	bluegum	non-native	UPL
Pittosporaceae –Pittosporum Family				
	Pittosporum ndulatum	Australian cheesewood	non-native	UPL
Polygonceae – Buckwheat Family				
	Eriogonum cinereum	ashy buckwheat	native	UPL
Rosaceae – Rose Family				
	Rosa californica	California rose	native	FAC
Salicaceae – Willow Family				
	Populus fremontii	Fremont cottonwood	native	
	Salix lasiolepis	arroyo willow	native	FACW
Scrophulariaceae – Figwort Family				
	Myoporum laetum	Ngaio tree	naturalized	FACU
MONOCOTS				
Agavaceae – Yucca Family				
	Agave sp.	agave	ornamental	UPL
Cyperaceae – Sedge Family				
	Schoenoplectus californicus	California bulrush	native	OBL
Poaceae – Grass Family				
	Arundo donax	giant reed	non-native	FACW
Typhaceae – Bulrush Family				
	Typha latifolia	cattail	native	OBL

[1] U.S. Army Corps of Engineers (USACE). 2020. National Wetlands Plant List, version 3.5 Arid West Region. Engineer Research and Development Center Cold Regions Research and Engineering Laboratory, Hanover, NH.

JURISDICTIONAL DELINEATION REPORT

TOPANGA LAGOON RESTORATION PROJECT

TOPANGA, LOS ANGELES COUNTY, CALIFORNIA

Prepared for:

Resource Conservation District of the Santa Monica Mountains
540 S. Topanga Canyon Blvd.
Topanga, CA 90290

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WRA #29335
AUGUST 2020

ENVIRONMENTAL CONSULTANTS

TABLE OF CONTENTS

1.0 INTRODUCTION 1
2.0 REGULATORY BACKGROUND 2
2.1 Section 404 of the Clean Water Act 2
2.1.1 Wetland Waters of the U.S. 3
2.1.2 Non-Wetland Waters of the U.S. 3
2.2 Section 10 of the Rivers and Harbors Act 4
2.3 Porter-Cologne Water Quality Control Act 4
2.4 Coastal Zone Management Act 5
2.5 California Fish and Game Code Section 1602 5
3.0 ASSESSMENT METHODS 7
3.1 Potential U.S Army Corps Engineers Jurisdiction (CWA Section 404) 7
3.1.1 Wetlands 7
3.1.2 Difficult Wetland Situations 11
3.1.3 Non-wetland Waters of the U.S. 11
3.2 Potential Regional Water Quality Control Board Jurisdiction (CWA Section 401 and Porter-Cologne Act) 12
3.3 Potential California Coastal Commission Jurisdiction 12
3.3.1 CCC Wetlands 12
3.3.2 CCC Environmentally Sensitive Habitat Areas 13
3.3.3 Coastal Act Wetlands 13
3.4 Potential CDFW Jurisdiction (CDFG 1602) 14
4.0 STUDY AREA DESCRIPTION 15
4.1 Study Area Description 15
4.2 Land Use 15
4.3 Vegetation 15
4.3.1 Topanga Lagoon 15
4.3.2 Topanga Creek and Surrounding Upland Areas 16
4.4 Hydrology 16
4.5 Soils 16
5.0 POTENTIAL JURISDICTIONAL AREAS 19
5.1 Waters of the United States Determination 20
5.1.1 Wetland Determination 20
5.1.2 Non-wetland Waters Determination 20
5.2 Waters of the State 20

5.3 California Department of Fish and Wildlife 21
5.4 California Coastal Commission 21
5.4.1 CCC Wetlands 21
5.4.2 CCC Environmentally Sensitive Habitat Areas 21
6.0 CONCLUSION 22
7.0 REFERENCES 23

LIST OF TABLES

Table 1. Arid West and Intermittent Streams OHWM data form GPS locations within the Study Area 8
Table 2. Summary of Potential CWA Section 404/401 Jurisdictional Areas within the Study Area 19
Table 3. Summary of Potential CDFW and CCC Jurisdictional Areas within the Study Area 19

LIST OF APPENDICES

Appendix A. Figures
Figure 1. Study Area Regional Location Map
Figure 2. Study Area Aerial Photograph
Figure 3. Biological Communities in the Study Area
Figure 4. Study Area Soils Map
Figure 5. Delineation of Federal Waters of the U.S.
Figure 6. CDFW and CCC Wetlands
Figure 7. CCC Sensitive Environmental Resource Areas
Appendix B. Wetland Determination Data Forms
Appendix C. OHWM data Forms
Appendix D. Study Area Photographs
Appendix E. Plant Species Observed within the Study Area

LIST OF ACRONYMS

CCA	California Coastal Act
CCC	California Coastal Commission
CCR	California Code of Regulations
CDFW	California Department of Fish and Wildlife
CFR	Code of Federal Regulations
Corps	U.S. Army Corps of Engineers
CSRL	California Soil Resource Lab
CWA	Clean Water Act
EPA	Federal Environmental Protection Agency
FAC	Facultative Plant
FACU	Facultative Upland Plant
FACW	Facultative Wetland Plant
HTL	High Tide Line
MHW	Mean High Water
NAVD88	North American Vertical Datum of 1988
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
NWI	National Wetland Inventory
NWPL	National Wetland Plant List
OBL	Obligate Wetland Plant
OHWM	Ordinary High Water Mark
PCH	Pacific Coast Highway
RCDSMM	Resource Conservation District of the Santa Monica Mountains
RWQCB	Regional Water Quality Control Board
RHA	Rivers and Harbors Act
UPL	Upland Plant
USGS	U.S. Geological Survey
WRA	WRA, Inc.

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1.0 INTRODUCTION

This report describes the methods and results of a delineation of aquatic resources within the boundaries of the proposed Topanga Lagoon Restoration Project (Study Area) located in unincorporated Los Angeles County, California (Appendix A, Figure 1). The Study Area consists of approximately 59.86 acres of land within the Santa Monica Mountains (Appendix A, Figure 2) and includes the following parcels: APN 4448-001-900, 4448-002-900, and 4448-002-900. The Study Area lies within Section 32 located in Township 1 North and Range 16 West.

On January 16, 2020, WRA, Inc. (WRA) conducted a delineation within the Study Area to identify wetlands and non-wetland waters potentially subject to jurisdiction by the U.S. Army Corps of Engineers (Corps) under Section 404 of the Clean Water Act (CWA) and/or Section 10 of the Rivers and Harbors Act (RHA). In addition, this report identifies wetlands and other features potentially subject to the jurisdiction of the California State Water Resources Control Board (CSWRCB) under the Porter-Cologne Water Quality Control Act. The following sections describe the regulatory background and methods used to guide the delineation and provide a summary of wetlands and non-wetland waters within the Study Area. This delineation is considered "potential" subject to the approval of the Corps and CSWRCB. The following sections describe the regulatory background and methods used to guide the delineation and provide a summary of potentially jurisdictional wetlands and non-wetland waters within the Study Area.

At the time of writing this report, the Environmental Protection Agency (EPA) and the Corps have announced that they will be issuing a final rule establishing a revised definition of "waters of the U.S." in early 2020. This rule is likely to contain significant changes to the 1986 definition.

WRA believes that the features identified in this report also meet the wetland definition adopted by the CSWRCB in April 2019 (SWRCB 2019a). The report utilizes the methodologies adopted by the Board to delineate wetlands as "Waters of the State."

2.0 REGULATORY BACKGROUND

2.1 Section 404 of the Clean Water Act

Section 404 of the CWA gives the EPA and the Corps regulatory and permitting authority regarding the discharge of dredged or fill material into "navigable waters of the United States." Section 502(7) of the CWA defines "navigable waters" as "waters of the United States, including territorial seas." By Final Rule, effective December 23, 2019, the Corps amended regulations to restore the 1986 definition of waters of the U.S. and restored the prior existing agency guidance documents consistent with Supreme Court decisions (Federal Register, 2019). Section 328 of Chapter 33 in the Code of Federal Regulations (CFR) defines the term "waters of the United States" as it applies to the jurisdictional limits of the authority of the Corps under the CWA. The definition of "waters of the United States" in 33 CFR 328.3 (a) as restored in 2019 is

> (1) All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
>
> (2) All interstate waters including interstate wetlands;
>
> (3) All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters: (i) which are or could be used by interstate or foreign travelers for recreational or other purposes; or (ii) from which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or (iii) which are used or could be used for industrial purpose by industries in interstate commerce;
>
> (4) All impoundments of waters otherwise defined as waters of the United States under the definition;
>
> (5) Tributaries of waters identified in paragraphs (a) (1)—(4) of this section:
>
> (6) The territorial seas;
>
> (7) Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (a) (1)—(6) of this section.

Areas not considered to be "waters of the United States" as currently defined in 33 CFR 328.3 (a)(8) include prior converted cropland and waste treatment systems. In addition, the preamble to the 1986 Rule clarifies that the following are generally not considered waters of the U.S. subject to a case by case determination,

> (a) Non-tidal drainage and irrigation ditches excavated on dry land.
>
> (b) Artificially irrigated areas that would revert to upland if the irrigation ceased.

(c) Artificial lakes or ponds created by excavating and/or diking dry land to collect and retain water and which are used exclusively for such purposes as stock watering, irrigation, settling basins, or rice growing,

(d) Artificial reflecting or swimming pools or other small ornamental bodies of water created by excavating and/or diking dry land to retain water for primarily aesthetic reasons.

(e) Water-filled depressions created in dry land incidental to construction activity and pits excavated in dry land for the purpose of obtaining fill, sand, or gravel unless and until the construction or excavation operation is abandoned and the resulting body of water meets the definition of waters of the United States (see 33 CFR 328.3(a)).

2.1.1 Wetland Waters of the U.S.

Wetlands are defined in 33 CFR 328.3 (b) as:

> *…those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.*

The basis for determining whether a given area is a wetland for the purposes of Section 404 of the CWA is outlined in the Corps *Wetlands Delineation Manual* (Environmental Laboratory 1987) and the *Regional Supplement to the Corps of Engineers* Delineation Manual for the respective region. As defined in 33 CFR 328.4 (c), the extent of federal jurisdiction within wetlands is defined as extending to the limit of the wetland as determined using the methods outlined in the manuals.

2.1.2 Non-Wetland Waters of the U.S.

The limit of federal jurisdiction in tidal non-wetland waters extends to the High Tide Line (HTL) which is defined in 33 CFR 328.3 (d) as:

> *...the line of intersection of the land with the water's surface at the maximum height reached by a rising tide. The high tide line may be determined, in the absence of actual data, by a line of oil or scum along shore objects, a more or less continuous deposit of fine shell or debris on the foreshore or berm, other physical markings or characteristics, vegetation lines, tidal gages, or other suitable means that delineate the general height reached by a rising tide. The line encompasses spring high tides and other high tides that occur with periodic frequency but does not include storm surges in which there is a departure from the normal or predicted reach of the tide due to the piling up of water against a coast by strong winds such as those accompanying a hurricane or other intense storm.*

The limit of federal jurisdiction in non-tidal non-wetland waters extends to the Ordinary High Water Mark (OHWM) which is defined in 33 CFR 328.3 (e) as:

> *...that line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impresses on the bank, shelving, changes in the characteristics of the soil, destruction of terrestrial vegetation, the*

presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.

2.2 Section 10 of the Rivers and Harbors Act

The Corps also has jurisdiction over "navigable waters" under Section 10 of the RHA of 1899. Section 10 of this Act applies to tidal areas below mean high water (MHW) and includes tidal areas currently subject to tidal influence, as well as historic tidal areas behind levees that both historically and presently reside at or below MHW. "Navigable waters of the U.S.", as defined in 33 CFR 329.4, are "those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or maybe susceptible for use to transport interstate or foreign commerce."

The act prohibits any unauthorized action that obstructs navigable capacity. These actions can include building the structures; excavation, fill; and alterations and modifications to navigable waters (33 USC 403). A determination of navigability, once made, applies laterally over the entire surface of the waterbody, and is not extinguished by later actions or events which impede or destroy navigable capacity. The upper limit of navigable water is at the point along its length where the character of the river changes from navigable to non-navigable, such as at a major fall or rapids. Since the upper limit of navigability of waterways under Section 10 is sometimes difficult to discern, determinations of navigability under Section 10 are often made by the Corps and kept on file, independent of submitted permit applications or delineations.

2.3 Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act gives the State Water Resources Control Board authorized to regulate the discharge of dredged or fill material that may affect the quality of waters of the state. In April 2019 the Water Board adopted the State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Waters of the State (State Wetland Definition and Procedures)(State Water Resources Control Board 2019b). Waters of the state include some, but not all, features that are defined as wetlands, as well as other features, including the ocean, lakes, and rivers. The state wetland definition that will be effective May 28, 2020, is similar to but slightly different from that used by the Corps:

> *An area is a wetland if, under normal circumstances, (1) the area has continuous or recurrent saturation of the upper substrate caused by groundwater, or shallow surface water, or both; (2) the duration of such saturation is sufficient to cause anaerobic conditions in the upper substrate; and (3) the area's vegetation is dominated by hydrophytes or the area lacks vegetation.*

The State Wetland Definition and Procedures utilize existing Corps delineation guidance (Environmental Laboratory 1987, Corps 2008a, 2010) and consider any waters of the U.S. identified in an aquatic resource report verified by the Corps to meet the state definition. Any area not verified by the Corps is required to be delineated using Corps methods for consideration as a state wetland with the exception that areas that lack vegetation are not precluded from meeting the state definition of a wetland. In this report, all wetland features also possessed vegetation. Therefore, for the purposes of identification of any wetlands that are subject to the State Policy, this report will suffice. Some of the features, however, may be determined by the Water Board to be exempt under the State Policy.

2.4 Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) defines the coastal zone as:

> *The coastal waters (including the lands therein and thereunder) and the adjacent shorelines (including the waters therein and thereunder), strongly influenced by each other and in proximity to the shorelines of the several coastal states, and includes islands, transitional and intertidal areas, salt marshes, wetlands, and beaches.*
>
> 16 U.S.C. § 1453. Definitions (Section 304)

The California Coastal Commission (CCC) utilizes the Cowardin Wetland Classification System, which was developed for the U.S. Fish and Wildlife Service (USFWS) in order to create the National Inventory of Wetlands. Under this hierarchical system, classification is based on hydrologic regime, vegetative community, and to a lesser extent on water chemistry and soils. The classification includes both wetlands and deepwater habitats. The CCC accepts the USFWS's definition and uses it as a guide in identifying wetlands and in implementing their wetland policies. The Coastal Act (PRC Section 30121) defines "wetlands" as "lands within the Coastal Zone which may be covered periodically or permanently with shallow water and include saltwater marshes, freshwater marshes, open or closed brackish water marshes, swamps, mudflats, and fens." In addition, the Coastal Act (PRC Section 30107.5) defines environmentally sensitive areas in a manner that would include rivers, streams or other aquatic habitats.

The CCC wetlands (i.e., coastal streams and wetlands) are determined based on the "one-parameter" definition which only requires evidence of a single parameter to establish wetland conditions: "Wetland shall be defined as land where the water table is at, near, or above the land surface long enough to promote the formation of hydric soils or to support the growth of hydrophytes, and shall also include those types of wetlands where vegetation is lacking and soil is poorly developed or absent as a result of frequent and drastic fluctuations of surface water levels, wave action, water flow, turbidity or high concentrations of salts or other substances in the substrate."

2.5 California Fish and Game Code Section 1602

The California Department of Fish and Wildlife (CDFW) regulates activities within its regulatory authority under California Fish and Game Code Section 1602(a):

> *1602 (a) An entity may not substantially divert or obstruct the natural flow of, or substantially change or use any material from the bed, channel, or bank of, any river, stream, or lake, or deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake, unless all of the following occur*

Section 1602(a) is based on Title 14, Section 720 of the California Code of Regulations (CCR):

> *For the purpose of implementing Sections 1601 and 1603 of the Fish and Game Code which requires submission to the department of general plans sufficient to indicate the nature of a project for construction by or on behalf of any person, governmental agency, state or local, and any public utility, of any project which will divert, obstruct or change the natural flow or bed of any river, stream or lake designated by the department, or will use material from the streambeds designated by the department,*

> *all rivers, streams, lakes, and streambeds in the State of California, including all rivers, streams, and streambeds which may have intermittent flows of water, are hereby designated for such purpose.*

The term stream, which includes creeks and rivers, is defined in 14 CCR 1.72 as follows:

> *A body of water that flows at least periodically or intermittently through a bed or channel having banks and supports fish or other aquatic life. This includes watercourses having a surface or subsurface flow that supports or has supported riparian vegetation.*

Based on these definitions, the CDFW considers its regulatory authority to include ephemeral streams, dry washes, watercourses with subsurface flows, canals, aqueducts, irrigation ditches, and other means of water conveyance if they support aquatic life, riparian vegetation, or stream-dependent terrestrial wildlife. Typically, CDFW regulatory authority extends to the top of bank or the outer edge of riparian vegetation, whichever distance is greater; however, in some cases, CDFW regulatory authority may extend to adjacent floodplain areas.

3.0 ASSESSMENT METHODS

WRA biologists performed a delineation of aquatic resources within the Study Area on January 16, 2020. Prior to conducting the evaluation, WRA reviewed a range of background materials including the *Soil Survey of Los Angles (LA) County* (USDA 1916), the California Soil Resource Lab's (CSRL) online soil viewer (CSRL 2020), the National Wetland Inventory (NWI; USFWS 2020) the California Aquatic Resource Inventory (SFEI 2020) and the U.S. Geological Survey (USGS) Topanga 7.5-minute quadrangle map (USGS 1916, 2015). WRA also reviewed historic aerial imagery from Google Earth (1990-2020).

During the on-site evaluation, WRA followed the methods outlined in *U.S. Army Corps of Engineers Wetlands Delineation Manual* (Corps Manual; Environmental Laboratory 1987), the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (Arid West Supplement; Corps 2008), and *A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States* (OHWM Guide; Lichvar and McColley 2008). The jurisdictional wetlands were identified and their boundaries mapped using the Routine Method described in the Corps Manual. The jurisdictional limits of non-wetland waters under Section 404 of the CWA were mapped based on a combination of field indicators described in the OHWM Guide and the use of tidal elevation data from nearby tide stations. The jurisdictional limits of non-wetland waters under Section 10 of the RHA were based on MHW elevation, using the North American Vertical Datum of 1988 (NAVD 88) as a baseline datum.

A general description of the Study Area, including plant communities present, topography, and land use was also generated during the delineation visit. The methods for evaluating the presence of wetlands and other "waters of the U.S." employed during the site visit are described in detail below. (add sampling

3.1 Potential U.S Army Corps Engineers Jurisdiction (CWA Section 404)

3.1.1 Wetlands

WRA followed the Routine Method to evaluate the Study Area for the presence or absence of indicators of the three wetland parameters described in the Corps Manual (Environmental Laboratory 1987) and Arid West Supplement (Corps 2008).

Section 328.3 of the Federal Code of Regulations defines wetlands as:

> *Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.*
>
> EPA, 40 CFR 230.3 and CE, 33 CFR 328.3 (b)

Wetland boundaries were identified using a combination of indicators observed on the ground, most often minor shifts in topography and changes in the dominant vegetation, in addition to other indicators. The three parameters used to delineate wetlands are the presence of (1) hydrophytic vegetation, (2) wetland hydrology, and (3) hydric soils. According to the Corps Manual, for areas not considered "problem areas" or "atypical situations":

… [E]vidence of a minimum of one positive wetland indicator from each parameter (hydrology, soil, and vegetation) must be found in order to make a positive wetland determination.

Data on vegetation, hydrology, and soils collected at sample points during the delineation site visit was reported on Arid West Supplement data forms (Appendix B & C). Sample points were recorded using a handheld GPS unit with sub-meter accuracy and mapped on a topographic map. Areas of potential jurisdictional wetlands were measured digitally using ArcGIS software. Indicators described in the Arid West Supplement were used to make wetland determinations at each sample point in the Study Area and are summarized below.

Representative cross sections were selected to capture hydro-geomorphological trends within the study area (Table 1). Cross section one was located near the mouth of the creek to where hydrological constraints would be evident from the bridge abutment to highway one. Cross section two was placed in an area where the floodplain was observed to be expanded due to a large meander. Cross section three was placed near the upstream portion to the study area where the stream course lacked meanders and had a relatively small floodplain.

Table 1. Arid West and Intermittent Streams OHWM data form GPS locations within the Study Area

Cross section	OHWM	Low Flow Channel	Active floodplain	Low Terrace
1	34.040622, -118.582776	34.040657, -118.582872	34.040657, -118.582872	N/A
2	34.040987, -118.581072	34.040987, -118.581072	34.041162, -118.581229	34.041272, -118.581302
3	34.042035, -118.579631	34.042035, -118.579631	34.042033, -118.579653	N/A

Vegetation

Plant species observed in the Study Area were identified using the Jepson eFlora (Jepson Flora Project 2019). Plants were assigned a wetland indicator status according to the National Wetland Plant List (NWPL; Lichvar 2012, as updated in 2018). Where differences in nomenclature occur between the Jepson eFlora and the NWPL, the species name as it occurred in the NWPL is listed in brackets. Other relevant synonyms may also be provided in brackets.

Wetland indicator statuses are based on the expected frequency of occurrence in wetlands as follows:

Classification (Abbreviation)	Definition*	Hydrophytic Species? (Y/N)
Obligate (OBL)	Almost always is a hydrophyte, rarely in uplands	Y
Facultative Wetland (FACW)	Usually is a hydrophyte but occasionally found in uplands	Y

Facultative (FAC)	Commonly occurs as either a hydrophyte or non-hydrophyte	Y
Facultative Upland (FACU)	Occasionally is a hydrophyte but usually occurs in uplands	N
Upland/Not Listed (UPL/NL)	Rarely is a hydrophyte, almost always in uplands	N

**See Lichvar (2012).*

The presence of hydrophytic vegetation was then determined based on indicator tests described in the Arid West Supplement. The Arid West Supplement requires that a three-step process be conducted to determine if hydrophytic vegetation is present. The procedure first requires the delineator to apply the "50/20 rule" (Indicator 1; Dominance Test) described in the manual. To apply the "50/20 rule," dominant species are chosen independently from each stratum of the community. Dominant species are determined for each vegetation stratum from a sampling plot of an appropriate size surrounding the sample point. Dominants are the most abundant species that individually or collectively account for more than 50 percent of the total vegetative cover in the stratum, plus any other species that, by itself, accounts for at least 20 percent of the total vegetative cover. If greater than 50 percent of the dominant species has an OBL, FACW, or FAC status, ignoring + and - qualifiers, the sample point meets the hydrophytic vegetation criterion.

If the sample point fails Indicator 1 and both hydric soils and wetland hydrology are not present, then the sample point does not meet the hydrophytic vegetation criterion, unless the site is a problematic wetland situation. However, if the sample point fails Indicator 1 but hydric soils and wetland hydrology are both present, the delineator must apply Indicator 2.

Indicator 2 is known as the Prevalence Index. The prevalence index is a weighted average of the wetland indicator status for all plant species within the sampling plot. Each indicator status is given a numeric code (OBL = 1, FACW = 2, FAC = 3, FACU = 4, and UPL = 5). Indicator 2 requires the delineator to estimate the percent cover of each species in every stratum of the community and sum the cover estimates for any species that is present in more than one stratum. The delineator must then organize all species into groups according to their wetland indicator status and calculate the Prevalence Index using the following formula, where A equals total percent cover:

$$PI = \frac{A_{OBL} + 2A_{FACW} + 3A_{FAC} + 4A_{FACU} + 5A_{UPL}}{A_{OBL} + A_{FACW} + A_{FAC} + A_{FACU} + A_{UPL}}$$

The Prevalence Index will yield a number between 1 and 5. If the Prevalence Index is equal to or less than 3, the sample point meets the hydrophytic vegetation criterion. However, if the community fails Indicator 2, the delineator must proceed to Indicator 3.

Indicator 3 is known as Morphological Adaptations. If more than 50 percent of the individuals of a FACU species have morphological adaptations for life in wetlands, that species is considered to be a hydrophyte and its indicator status should be reassigned to FAC. If such observations are made, the delineator must recalculate Indicators 1 and 2 using a FAC indicator status for this species. The sample point meets the hydrophytic vegetation criterion if either test is satisfied.

Soils

The Natural Resources Conservation Service (NRCS) defines a hydric soil as follows:

> *A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part.*
>
> Federal Register July 13, 1994,
> U.S. Department of Agriculture ("USDA"), NRCS

Soils formed over long periods of time under wetland (anaerobic) conditions often possess characteristics that indicate they meet the definition of hydric soils. Hydric soils can have a hydrogen sulfide (rotten egg) odor, low chroma matrix color, generally designated 0, 1, or 2, used to identify them as hydric, presence of redox concentrations, gleyed or depleted matrix, or high organic matter content.

Specific indicators that can be used to determine whether a soil is hydric for the purposes of wetland delineation are provided in the NRCS *Field Indicators of Hydric Soils in the U.S.* (USDA 2010). The Arid West Supplement provides a list of 23 of these hydric soil indicators which are known to occur in the Arid West region. Soil samples were collected and described according to the methodology provided in the Arid West Supplement. Soil chroma and values were determined by utilizing a standard Munsell soil color chart (Xrite 2013).

Hydric soils were determined to be present if any of the soil samples met one or more of the 23 hydric soil indicators described in the Arid West Supplement.

Hydrology

The Corps jurisdictional wetland hydrology criterion is satisfied if an area is inundated or saturated for a period sufficient to create anoxic soil conditions during the growing season (a minimum of 14 consecutive days in the Arid West region). Evidence of wetland hydrology can include primary indicators, such as visible inundation or saturation, drift deposits, oxidized root channels, and salt crusts, or secondary indicators such as the FAC-neutral test, presence of a shallow aquitard, or crayfish burrows. The Arid West Supplement contains 16 primary hydrology indicators and 10 secondary hydrology indicators. Only one primary indicator is required to meet the wetland hydrology criterion; however, if secondary indicators are used, at least two secondary indicators must be present to conclude that an area has wetland hydrology.

The presence or absence of the primary or secondary indicators described in the Arid West Supplement was utilized to determine if sample points within the Study Area met the wetland hydrology criterion.

3.1.2 Difficult Wetland Situations

The Arid West Supplement (Corps 2008) includes recommended procedures for completing wetland delineations in areas of "difficult wetland situations" in which wetlands may lack one or more indicators due to natural or anthropogenic factors; these are discussed as atypical or problematic wetland conditions in the Corps Manual (Environmental Laboratory 1987). Although the Corps Manual and Arid West Supplement (Corps 2008) were utilized in the wetland determination, they do not provide exhaustive lists of the difficult situations and problem areas that can arise during delineations in the Arid West. In these situations, the Corps Manual and Regional Supplements stress the importance of using best professional judgment and knowledge of the ecology of the wetlands in the region during the collection and interpretation of data in difficult sites.

3.1.3 Non-wetland Waters of the U.S.

This study also evaluated the presence of "waters of the U.S." other than wetlands potentially subject to Corps jurisdiction under Section 404 of the CWA. Other areas, besides wetlands, subject to Corps jurisdiction include lakes, rivers, and streams (including intermittent streams) in addition to all areas below the HTL in areas subject to tidal influence or to all areas below the OHW in non-tidal areas.

In tidal areas, the elevation of the HTL is defined as:

> *...the line of intersection of the land with the water's surface at the maximum height reached by a rising tide. The high tide line may be determined, in the absence of actual data, by a line of oil or scum along shore objects, a more or less continuous deposit of fine shell or debris on the foreshore or berm, other physical markings or characteristics, vegetation lines, tidal gages, or other suitable means that delineate the general height reached by a rising tide. The line encompasses spring high tides and other high tides that occur with periodic frequency but does not include storm surges in which there is a departure from the normal or predicted reach of the tide due to the piling up of water against a coast by strong winds such as those accompanying a hurricane or other intense storm.*
>
> Federal Register Vol. 51, No. 219,
> Part 328.3 (d). November 13, 1986

High Tide Line

The elevation of HTL was determined based on the highest predicted tide for 2019 based on tide predictions from the National Oceanic and Atmospheric Administration (NOAA), and correlated to North American Vertical Datum of 1988 (NAVD88) using the Summary of Tide Station Data. The Corps' guidance for delineating Section 404 tidal waters states that the upper elevational limit of Section 404 tidal waters is established based on the HTL. NOAA tidal stations do not provide HTL data, so the upper elevational limit of Section 404 waters is based on the maximum predicted annual tide for the given year (i.e., the highest tide predicted for the year). Based on the data reported for the Santa Monica (Station ID # 9410840), the elevation of HTL was determined to be feet 6.66 (NAVD 88). This elevation was mapped based on publically available LiDAR data (U.S. Department of Commerce 2012). In tidal waters, Section

404 other waters extend to the landward extent of vegetation associated with salt or brackish water or the HTL. The HTL applies only to the Ocean side of the Study Area.

The Corps guideline for delineating Section 10 navigable waters states that the upper limit of Section 10 waters is established based on the MHW line. Under Section 10 of the RHA (1899), Corps jurisdiction extends up to the MHW line. With respect to mapping Section 10 Waters (under the RHA of 1899), it is important to understand that the Corps does not regulate wetlands under Section 10, only the aquatic or open waters section of aquatic habitat. Thus, while there is overlap between Section 404 jurisdiction (which in tidal waters extends from the HTL to Ocean side) and Section 10 jurisdiction (which extends from the MHW line Ocean side), the acreage of Section 10 jurisdiction is only reported as "waters of the U.S.," with no separate mapping or acreage.

Ordinary High Water Mark

The non-wetland waters of the U.S. were delineated by using OHWM to identify the extent of Corps jurisdiction under Section 404 of the CWA. The location of the OHWM was determined based on a combination of indicators observed on the ground (e.g., water stains or scour marks). The width between the OHWM on either side of each feature was visually estimated in the field and, when possible, the segments of the centerline or edges were mapped using handheld GPS units with sub-meter accuracy. However, due to dense *Arundo donax* (FAC) along the upland edge of channels and dense, head-high emergent vegetation along the wetted edge of some channels, it was not possible to accurately estimate channel widths or obtain GPS data. In those areas, channels were hand-digitizing in ArcGIS using high-resolution aerial imagery and corresponding elevations in the high-resolution Lidar data. Identification of the OHWM followed the Corps Regulatory Guidance Letter No. 05-05, *Ordinary High Water Mark Identification* (Corps 2005).

3.2 Potential Regional Water Quality Control Board Jurisdiction (CWA Section 401 and Porter-Cologne Act)

The Regional Water Quality Control Board (RWQCB) maintains jurisdiction over all waters of the State; however, the RWQCB has not formalized the methodology for documenting jurisdictional boundaries. As such, the methods used to determine federal jurisdiction (Section 3.1) were also used to determine the extent of RWQCB jurisdiction within the Study Area.

3.3 Potential California Coastal Commission and Los Angeles County Santa Monica Mountain Local Coastal Program Jurisdiction

3.3.1 CCC Wetlands

The CCC wetlands (i.e., coastal streams and wetlands) are determined based on the "one-parameter" definition which only requires evidence of a single parameter to establish wetland conditions. CCC wetlands were mapped as the limits of one-parameter wetlands, consisting of the presence of hydrophytic vegetation, and/or hydric soils, and/or wetland hydrology. Corps standard definitions provided above were used to define each of the three potential wetland indicators used to delineate CCC wetlands. The upper limits of CCC one-parameter wetlands consisted of the greater of either the limits of the OHWM, Section 404 elevations, limits of hydric soils, or the upper limits of hydrophytic vegetation.

3.3.2 CCC Sensitive Environmental Resource Areas

The Los Angeles County Santa Monica Mountains Local Coastal Program (February 2018) defines Sensitive Environmental Resource Areas (SERAs) as areas within the plan that have the highest biological significance, rarity, and sensitivity. These land protection categories were established to reduce disturbance to native species and habitats from development and/or indirect encroachment from anthropogenic uses. SERAs have been divided into three tiers, in order of sensitivity, H1, H2. H3 habitats (though not technically a SERA), have been designated to categories those areas which retain some biological function and value to the plan area

- H1 habitats are the highest tier and include the most sensitive and vulnerable habitat types within the plan area which contain highly threated and/or rare species. Traditional development is restricted within these areas; however, resource dependent uses and publics works projects to protect road infrastructure is allowable. In addition, H1 habitat designated areas are given a 100 foot "quiet zone" buffer from non-resource dependent or allowable uses where feasible.

- H2 habitats consist of large, contiguous areas of habitat areas with high ecological value to the vitality and diversity of the Santa Monica Mountains Mediterranean Ecosystem. These areas include the large areas of coastal sage scrub and chaparral dominated land types in the plan area. In addition, H2 habitats include a sub-tier of "high scrutiny" areas which include CNDDB identified rare natural communities and those that contain at least one of a suite of identified rare and/or sensitive species. Development should avoid H2 habitat where feasible. If H2 habitat cannot be avoided by a project, it must comply with a series of limitations and mitigation requirements. H2 "high scrutiny" habitat must be avoided to the highest extent feasible.

- H3 habitat consists of habitat that would have been designated H2 habitat but native vegetation communities have been significantly disturbed or removed as a part of an approved development. This category includes roadside slopes, fragmented/isolated habitat, fuel modification areas, and isolated stands of native woodland trees. Development within H3 habitat areas warrant development, siting, and design standards for approval.

3.3.3 Coastal Act Wetlands

The Coastal Act defines wetlands as:

> *Wetland means land within the coastal zone which may be covered periodically or permanently with shallow water and include saltwater marshes, freshwater marshes, open or closed brackish water marshes, swamps, mudflats, and fens.*
>
> (Public Resources Code § 30121)

CCC Administrative Regulations (Section 13577 (b)) provide a more explicit definition:

> *Wetlands are lands where the water table is at, near, or above the land surface long enough to promote the formation of hydric soils or to support the growth of hydrophytes, and shall also include those types of wetlands where vegetation is lacking and soil is poorly developed or absent as a result of frequent or drastic fluctuations of surface water levels, wave action, water flow, turbidity or high concentrations of salt or other substance in the substrate. Such wetlands can be recognized by the presence*

of surface water or saturated substrate at some time during each year and their location within, or adjacent to, vegetated wetlands or deepwater habitats.

The Coastal Act defines the upland limit of wetlands as:

> *(1) the boundary between land with predominantly hydrophytic cover and land with predominantly mesophytic or xerophytic cover; (2) the boundary between soil that is predominantly hydric and soil that is predominantly non-hydric; or (3) in the case of wetlands without vegetation or soil, the boundary between land that is flooded or saturated at some time each year and land that is not."*

3.4 Potential CDFW Jurisdiction (CDFG 1602)

The CDFW's jurisdiction applies to all perennial, intermittent, and ephemeral rivers, streams, and lakes in the state. The CDFW's regulatory authority extends to include riparian habitat (including wetlands) supported by a river, stream, or lake regardless of the presence or absence of hydric soils and saturated soil conditions. Generally, the CDFW jurisdiction is mapped to the top of the bank of the stream or to the outer drip line of the adjacent riparian vegetation, whichever is greater. The CDFW jurisdictional habitat includes all riparian shrub or tree canopy that may extend beyond the banks of a stream

4.0 STUDY AREA DESCRIPTION

4.1 Study Area Description

The Study Area is approximately 59.86 acres in size and located in Topanga Canyon of incorporated Los Angeles County, California. The Site is situated in the north of the Topanga beach along the Pacific Coast Highway (PCH), approximately 1 mile east of the City of Malibu. Elevations range from approximately 0 to 180 feet above mean sea level. The Site is located on the USGS 7.5-minute quadrangle map for Topanga (USGS 2015). Topanga Creek enters the Study Area from the east, flows toward west then turns south and empty in the Topanga lagoon just north of the PCH Bridge. Pacific Coast Highway crosses Study Area in the southern part.

4.2 Land Use

The Study Area is located north of PCH between Old Malibu Road and Topanga Canyon Boulevard and is zoned as Open Space Park (O-S-P) by Los Angeles County. Several commercial buildings and rental residences occupy the area north of the bridge. The existing structures include a vacant historic motel with approximately 27 structures; parking, picnic tables, and an access way crossing under PCH to the beach. The surrounding beach area south of PCH is managed by the Los Angeles Department of Beaches and Harbors; a parking lot is located on the south side of the PCH immediately east of the creek. Several of the buildings are currently used for storage by the Department of Beaches and Harbors.

4.3 Vegetation

Vegetation in the Study Area is best described based on the distinct communities present: in the lagoon areas and the upland area along the Topanga creek (Appendix A, Figure 3).

4.3.1 Topanga Lagoon

The lagoon is surrounded by steep fill slopes covered primarily by non-native plants. Eucalyptus (*Eucalyptus* spp., NL), Nagio-tree (*Myoporum laetum*, FACU)) and Aleppo pine (*Pinus halepensis*, NL) are found along the fill edges. The edge of the upper slope is also supported by native species including Phoenix palm (*Phoenix canariensis*, NI), and lemonade berry (*Rhus integrifolia,* NL). The slopes are covered with ice plant (*Mesembryanthemum crystallinum*, FCAU), Invasive exotics including giant reed (*Arundo donax*, FACW), castor bean (*Ricinus communis*, FACU), German ivy (*Delairea odorata*, NL), morning glory (*Ipomoea purpurea*, UPL), and pampas grass (*Cortaderia jubata*, FACU) are all well established. Native vegetation is limited to a cluster of cattail (*Typha latifolia*, OBL) and bulrush (*Schoenoplectus americanus*, OBL) located within the lagoon on the south side of the bridge abutment, and on the east side near the open water creating small stand of emergent marsh vegetation. Saltgrass (*Distichlis spicata*, FAC) is growing monoculturally in the eastern side of the lagoon below the fill slopes. Additionally, a small understory of arroyo willow (*Salix lasiolepis*, FACW) is observed at the edges of the lagoon. This is the only area where federally listed endangered species Tidewater gobies (*Eucyclogobius newberryi*) were found.

Canopy cover is non-existent south of the bridge and covers approximately 50% of the lagoon on the north side. There is no substantial habitat provided by the current vegetative assemblage.

4.3.2 Topanga Creek and Surrounding Upland Areas

The majority of the Study Area (approximately 59.86 acres) consists of flat areas with few steep slopes in the north, covered by coastal sage scrub, mixed chaparral, riverine and southern willow scrub vegetation. In addition to the willow complex [red willow (*Salix laevigata*) FACW and arroyo willow (*Salix lasiolepis*) FACW], several mature native trees, including sycamore (*Platanus racemosa*, FAC), coast live oak (*Quercus agrifolia*, NL), California walnut (*Juglans californica*, FACU), toyon (*Heteromeles arbutifolia*, NL), Mexican elderberry (*Sambucus mexicana*, NL) with non-native exotic landscape and escaped plant species including Vinca (*Vinca major,* NL), lantana (*Lantana camara,* FACU) are also present. Several large stands of giant reed (*Arundo donax*) are also present along the creek. Several species of shrub species including poison oak (*Toxicodendron diversilobum*, FACU), coyote bush (*Baccharis pilularis*, NL), mule fat (*Baccharis salicifolia*, FAC) lemonade berry, and laurel sumac (*Malosma laurina*, NL) are observed growing in the upland area. Umbrella sedge (*Cyperus involucratus,* FACW) and morning glory are growing near the stream channel. The herbaceous vegetation is dominated by non-native fennel (*Foeniculum vulgare*, FACU), wild radish (*Raphanus sativus*, NL), black mustard (*Brassica nigra*, NL) and needlegrass (*Stipa* spp.*,* FAC), with soft chess (*Bromus hordeaceus*, FACU) in the open area.

4.4 Hydrology

Hydrology of the study area is influenced by direct precipitation, surface runoff from adjacent slopes, and moist air from the Pacific Ocean to the immediate west. The Study Area is located at the downstream terminus of the Topanga Creek watershed which drains approximately 12,800 acres and is the third largest creek to empty into the Santa Monica Bay. The watershed is one of a handful of natural coastal watersheds near urban Los Angeles. The main drainage feature, Topanga Creek, is fed by freshwater ground seeps as well as direct precipitation and flows to the Topanga lagoon from the southern reach of the study area. The Topanga Creek, a perennial stream enters the Study Area from the northeastern boundary and passes under the bridge, through the lagoon, and into the ocean at Topanga Beach. The Study Area is surrounded by steep canyon walls that confine the flow of the channel path. Within the Study Area, the majority of the Topanga Creek drainage is largely obscured from view by a dense, impassable thicket of willows and giant reed. Topanga lagoon separates the stream from the beach and causes water to pond prior to discharging to the Pacific Ocean. Hydrology for the lagoon comes from Topanga Creek and Ocean water during the high tide. The seasonal influence of tides is typical of the smaller estuaries in southern California. Winter storm flows from Topanga creek breech and flush out a sand bar deposited during summer, allowing greater direct tidal influence during the rainy season and tidal muting and eventual closer during the summer and fall months.

The creek channel is constrained in the area immediately north of the PCH bridge due to fill materials and by the narrow opening of the bridge. Approximately 400 meters upstream of the PCH bridge the creek is eroding the east bank undermining the fill at the corner of PCH and Topanga Canyon Blvd. A restoration project in 2008 removed a 500 meter long illegal berm that had been installed since the 1960's by previous renters before ownership was transferred to state parks. Much of the lower elevation floodplain has been altered by these actions since the early 1900's.

4.5 Soils

The Soil Survey of LA County (USDA 1916) and the CSRL online soil viewer (CSRL 2020) indicates that the Study Area contains four soil types: Abaft-Beaches complex, 0 to 5 percent slopes; Elder fine sandy loam, coastal, 0 to 2 percent slopes; Chumash-Boades-Malibu association, 30 to 75 percent slopes; and

Mipolomol-Topanga association, 30 to 75 percent slopes. Descriptions of each soil series are provided below. The distribution of these soil types within the Study Area is depicted in Appendix A Figure 4.

Abaft-Beaches complex, 0 to 5 percent slopes:

Abaft series

The Abaft series consists of very deep, excessively drained soils that formed in sands from mixed sources. Abaft soils are on stabilized dunes and beach areas along the coast. Slopes range from 0 to 25 percent. A representative profile for this series consists of a pale brown (10YR 6/3) stratified loamy sand surface layer 5 inches thick. This layer is underlain by pale brown (10YR 6/3) stratified loamy sand and brown (10YR 4/3); 2 percent clay that extends to a depth of 25 inches.

Elder fine sandy loam, coastal, 0 to 2 percent slopes:

Elder series

The Elder series consists of very deep and deep, well-drained soils that formed in alluvial material derived from mixed rock sources. Elder soils are on alluvial fans and in flood plains and have slopes of 0 to 15 percent. A representative profile for this series consists of a dark gray (10YR 4/1) fine sandy loam surface layer 23 inches thick. This layer is underlain by gray (10YR 5/1) sandy loam that extends to a depth of 36 inches and light brownish gray (10YR 6/2) fine sandy loam layer that extends to 72 inches.

Riverwash

Riverwash is a mixture of sand, gravel, and cobblestones that contains little or no silt and clay. It is the loose mass of material that occupies stream channels and is exposed at low water. Riverwash is subject to movement in spring during periods of runoff and during stream flooding

Chumash-Boades-Malibu association, 30 to 75 percent slopes:

Chumash series

The Chumash soils consist of very shallow and shallow to soft bedrock, well-drained soils that formed in residuum and colluvium derived from shale and sandstone. Chumash soils are on hills and mountains. Slopes are 5 to 75 percent. Chumash soils have a yellowish-brown (10YR 5/4) gravelly loam layer on the soil surface from 0 to 23 inches.

Boades series

The Boades series consists of shallow to soft bedrock, well-drained soils that formed in residuum and colluvium derived from bedded shale and sandstone. Boades soils are on hills and mountains. Slopes are 5 to 75 percent. Boades series soils have a brown (10YR 5/3) loam layer on the soil surface up to 14 inches with highly fractured, bedded, weathered shale with fractures 1 to 2 inches apart, and with about 10 to 15 percent soil in fractures with common very fine roots that extends to 60 inches.

Malibu series

The Malibu series consists of moderately deep to soft bedrock, moderately well-drained soils that formed in residuum and colluvium derived from inter-bedded shale and sandstone. Malibu soils are on hills and mountains. Slopes are 4 to 75 percent. A representative profile for this series consists of a brown (10YR 5/3) loam surface layer 19 inches thick. This layer is underlain by reddish-brown (5YR 4/4) clay layer that extends to a depth of 27 inches and highly fractured, bedded, weathered shale and sandstone with about 10 to 15 percent soil in fractures up to 60 inches.

Mipolomol-Topanga association, 30 to 75 percent slopes

Mipolomol series

The Mipolomol series consists of very shallow or shallow to fractured bedrock, well-drained soils that formed in residuum and colluvium derived from bedded shale and sandstone. Mipolomol soils are on hills and mountains. Slopes are 30 to 75 percent. Mipolomol series soils have a brown (10YR 5/3) channery loam layer on the soil surface layer 12 inches thick with highly fractured bedded shale with fractures 1 to 3 inches apart, and with about 5 to 10 percent soil in fractures with few very fine roots that extends to 20 inches.

Topanga series

The Topanga series consists of shallow to fractured bedrock, well-drained soils that formed in residuum and colluvium derived from bedded shale and sandstone. Topanga soils are on hills and mountains. Slopes are 30 to 75 percent. A representative profile for this series consists of a grayish brown (10YR 5/2) gravelly loam surface layer 15 inches thick. This layer is underlain by yellowish-brown (10YR 5/4) gravelly clay loam that extends to 18 inches.

5.0 POTENTIAL JURISDICTIONAL AREAS

This delineation has been prepared for the Resource Conservation District of The Santa Monica Mountains (RCDSMM) in order to delineate the Corps, Regional Board, CDFW, and CCC jurisdictional authority within the Study Area. This report presents WRA's best effort at determining the jurisdictional boundaries using the most up-to-date regulations, written policy, and guidance from the regulatory agencies. However, as with any jurisdictional delineation, only the regulatory agencies can make a final determination of jurisdictional boundaries within a project site or property.

Descriptions of the aquatic resources identified within the Study Area that are potentially subject to federal jurisdiction under Section 404 of the CWA and/or Section 10 of the RHA are provided in the following sections. Additionally, the description also includes potential CDFW and CCC jurisdiction areas within the study area. An overview of aquatic resources mapped within the Study Area is provided in Appendix A, Figures 5 and 6, and the acreage of potential Section 404 and Section 10, CDFW, and CCC jurisdictional areas are summarized in Tables 2 and 3. Wetland Determination Data Forms are provided as Appendix B. OHWM data forms are presented in Appendix C. Photographs of the Study Area are provided as Appendix D. A list of all plant species observed during the delineation site visits is included as Appendix E.

Table 2. Summary of Potential CWA Section 404/401 Jurisdictional Areas within the Study Area

Features	Cowardin Class	Corps/RWQCB	
		Wetland (acres)	Non-Wetland Water acres (linear feet)
Lagoon	Estuarine, subtidal, unconsolidated bottom (sub-tidal pond)	0.59	-
Open Waters	Marine, intertidal, unconsolidated bottom	-	2.79
Streams	Riverine, intermittent, unconsolidated bottom	-	1.25 (2,821)
Total		0.59	4.04

Table 3. Summary of Potential CDFW and Los Angeles County SMM LCP Jurisdictional Areas within the Study Area

Features	Cowardin class	CDFW Streambed (acres)	CCC Wetland (acres)
Lagoon	Estuarine, subtidal, unconsolidated bottom (sub-tidal pond)	0.59	0.59
Riparian Vegetation	Riverine, intermittent, Forested wetland	8.52	8.52
Streams	Riverine, intermittent, unconsolidated bottom	1.25	1.25
Total		10.36	10.36

5.1 Waters of the United States Determination

5.1.1 Wetland Determination

As previously noted, an area must exhibit all three wetland parameters described in the Corps Regional Supplement to be considered a jurisdictional wetland. Based on the results of the site visit, it was determined that the Topanga lagoon area met all three parameters, resulting in 0.59-acres of Corps jurisdictional wetlands within the boundaries of the Study Area (Appendix A, Figure 5).

5.1.2 Non-wetland Waters Determination

Topanga Creek

Topanga Creek is a perennial stream that receives natural precipitation from the watershed and year-round nuisance flows from the surrounding areas. Evidence of an OHWM was noted within and adjacent to the Creek including break-in bank slope, change in sediment texture, and scouring mark. The Creek is a hydrological connection to downstream waters (Pacific Ocean) through Topanga lagoon and is considered Waters of the U.S., which falls within the Corps' jurisdiction. Approximately 1.25-acres (2,821 linear feet) of Corps Section 404/401 Waters of the US occur within the Study Area. Refer to Table 2, Jurisdictional Areas Summary, for a summary of Corps/Regional Board jurisdiction on-site, and Appendix A, Figure 5, Corps/Regional Board Jurisdictional Map, for an illustration of jurisdictional areas in the Study Area.

Ephemeral Stream

Evidence of an OHWM was noted within and adjacent to the Creek including change in sediment texture, and scouring mark, drift deposits and destruction of terrestrial vegetation. Approximately 0.01-acre (404 linear feet) of Corps Section 404/401 non-wetland Waters of the U.S. occurs within the study site. Refer to Table 2, Jurisdictional Areas Summary, for a summary of Corps/Regional Board jurisdiction on-site, and Appendix A, Figure 1 Jurisdictional Map, for an illustration of jurisdictional areas in the Study Area.

Pacific Ocean (Open Water)

Based on the tidal gauge data from the Santa Monica Tidal Gauge Station (adjusted to plot on NAVD 88 datum), the limits of potential Section 404 and Section 10 waters were determined to be +6.66 feet (NAVD 88) and +4.5 feet (NAVD 88), respectively. Within the study area, approximately 2.79 acres of Corps Section 404 Waters of the U.S. and approximately 1.25 acres of Section 10 navigable waters occur within the Study Area.

5.2 Waters of the State

No isolated waters were observed within the boundaries of the Study Area; therefore, the Regional Board follows that of Corps jurisdiction. Within the study area, approximately 4.63 acres of RWQCB Section 401 Waters of the State occur within the Study Areaite. Figure 5, depicts potential Corps and RWQCB jurisdictional areas within the Study Area.

5.3 California Department of Fish and Wildlife

The on-site streams (perennial and ephemeral) features exhibited a bed and bank and qualify as CDFW jurisdictional streambed. Based on the results of the field investigation, approximately 10.36 acres of streams and vegetated streambed occur within the Study Area. Refer to Table 3 for a summary of CDFW jurisdiction on the Study Area, and Appendix A Figure 6, for an illustration of on-site jurisdictional areas.

5.4 California Coastal Commission

5.4.1 CCC Wetlands

The on-site wetland, streams, and riparian vegetation are qualified as a CCC jurisdictional areas. Based on the results of the field investigation, approximately 0.59 acre of CCC jurisdictional wetlands, 1.25 acres (2,821 linear feet) of jurisdictional streams, and 8.52 acres of jurisdictional riparian vegetation occurs within the Study Area. Refer to Table 3 for a summary of the CCC jurisdictional area and Figure 6 CDFW/CCC Jurisdictional Map, for an illustration of on-site jurisdictional areas.

5.4.2 CCC Sensitive Environmental Resource Areas

Given the proximity of sensitive species habitats to potential disturbance, likely CCC SERA within the study area total approximately 23 acres with H1 habitats composed of the mapped wetlands and riparian habitats and H2 habitat composed of Coastal sage scrub mapped on the adjoining hillsides. H3 habitat includes the majority of the remainder of undeveloped land within the study area. within the study area (Appendix A, Figure 7).

6.0 CONCLUSION

The results of this delineation of aquatic resources were based on conditions observed during the time of the assessment and information provided to WRA by the RCDSMM. The delineation uses the federal methodology to determine the potential boundaries of wetlands and non-wetland features and is consistent with the approach used by the RWQCB, CDFW, and CCC to determine wetlands subject to the new State definition of wetlands. Should exemptions from jurisdiction be applicable to some of these features, it may affect the extent of areas subject to permitting. These exemptions may be considered during the permitting process.

7.0 REFERENCES

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APPENDIX A – FIGURES

Path: L:\Acad 2000 Files\29000\29335\GIS\ArcMap\Location20200127.mxd

Sources: National Geographic, WRA | Prepared By: njander, 1/28/2020

Figure 1. Study Area Regional Location Map

Topanga Lagoon Restoration Project
Los Angeles County, California

0 0.25 0.5 Miles

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Sources: USDA NAIP 2016, WRA | Prepared By: njander, 1/28/2020

Figure 2. Study Area Aerial Photograph

0 250 500 Feet

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Topanga Lagoon Restoration Project
Los Angeles County, California

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ENVIRONMENTAL CONSULTANTS

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Sources: DigitalGlobe 2016 Aerial, WRA | Prepared By: njander, 2/10/2020

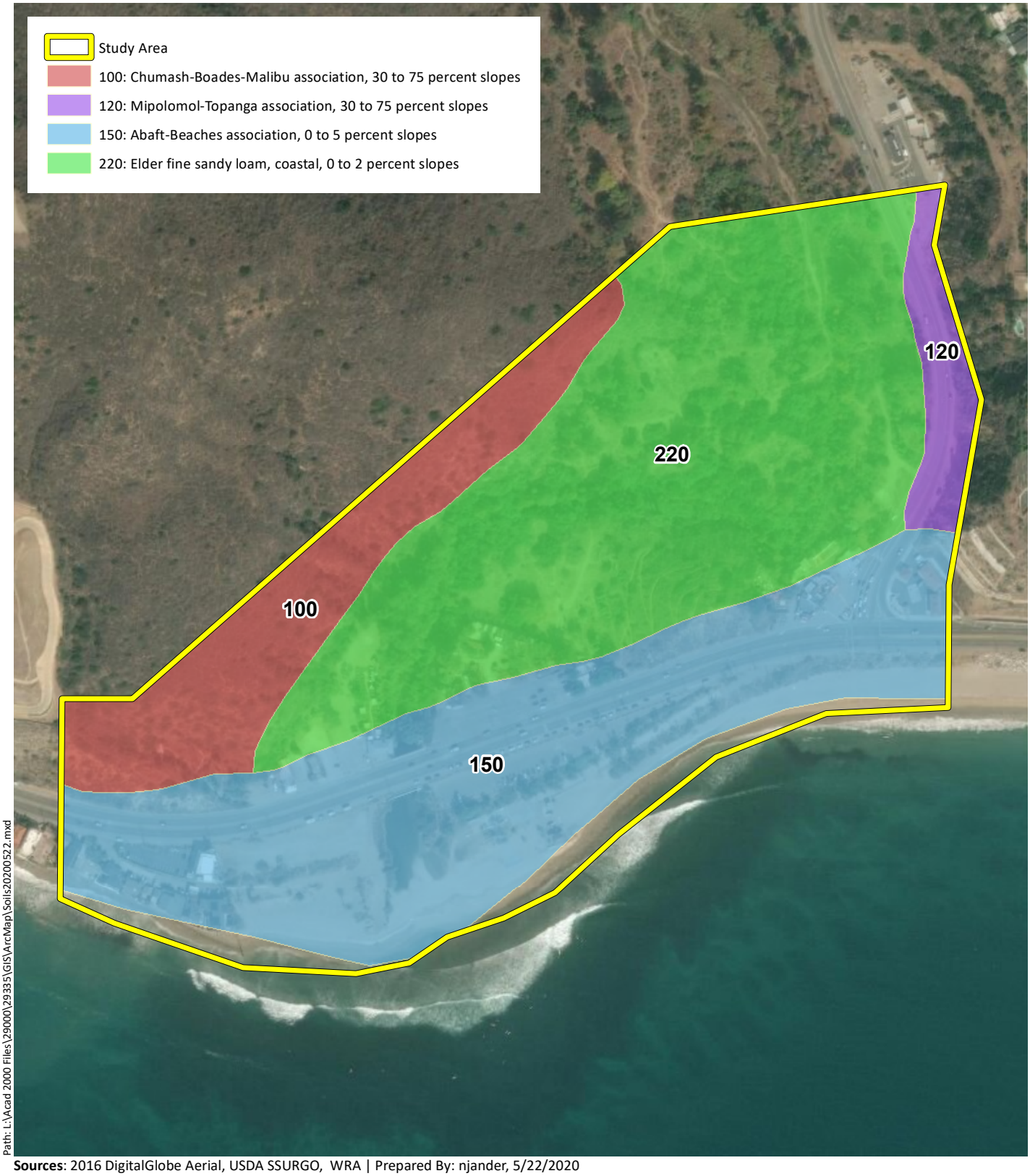
Figure 3. Biological Communities in the Study Area

Topanga Lagoon Restoration Project
Los Angeles County, California

0 200 400 Feet

N

wra ENVIRONMENTAL CONSULTANTS



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Sources: 2016 DigitalGlobe Aerial, USDA SSURGO, WRA | Prepared By: njander, 5/22/2020

Figure 4. Study Area Soils Map

Topanga Lagoon Restoration Project
Los Angeles County, California

0 250 500 Feet

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Sources:USGS West Coast LiDAR 2016, USDA NAIP Imagery 2016, WRA | Prepared By: njander, 2/10/2020

Figure 5. Delineation of Federal Waters of the US

Topanga Lagoon Restoration Project
Los Angeles County, California

0 250 500 Feet

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Path: L:\Acad 2000 Files\29000\29335\GIS\ArcMap\Fig2CDFWCCCJurisdictionalArea20200210.mxd

Sources:USGS West Coast LiDAR 2016, USDA NAIP Imagery 2016, WRA | Prepared By: njander, 2/10/2020

Figure 6. CDFW and CCC Wetlands

Topanga Lagoon Restoration Project
Los Angeles County, California

0 250 500 Feet

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Path: L:\Acad 2000 Files\29000\29335\GIS\ArcMap\CCCEcoArea20200522.mxd

Sources: USDA NAIP 2016, Los Angeles County Dept. of Regional Planning, WRA | Prepared By: njander, 5/22/2020

Figure 7. CCC Sensitive Environmental Resource Areas

Topanga Lagoon Restoration Project
Los Angeles County, California

0 200 400 Feet

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APPENDIX B – WETLAND DETERMINATION DATA FORMS

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Topanga Lagoon Restoration Project City/County: Topanga Sampling Date: 01/16/2020

Applicant/Owner: RCDSMM State: CA Sampling Point: SP1

Investigator(s): P. Acharya, M.Nieto Section, Township, Range:

Landform (hillslope, terrace, etc.): flat Local relief (concave, convex, none): none Slope (%): 1

Subregion (LRR): Lat: Long: Datum:

Soil Map Unit Name: NWI classification: Eustrine

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ✓, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____	**Is the Sampled Area within a Wetland?** Yes ✓ No ____
Hydric Soil Present?	Yes ✓	No ____	
Wetland Hydrology Present?	Yes ✓	No ____	

Remarks:

4 ft south of the open water lagoon

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10 m. radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Pinus halepensis	3	Y	NL
2. Phoenix canariensis	5	Y	NL
3.			
4.			
	8	= Total Cover	
Sapling/Shrub Stratum (Plot size: 5 m. radius)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: 1m radius)			
1. Distichlis spicata	70	Y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	70	= Total Cover	
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
		= Total Cover	

% Bare Ground in Herb Stratum 30 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species 70	x 3 =	210
FACU species	x 4 =	
UPL species 8	x 5 =	40
Column Totals: 78 (A)		250 (B)

Prevalence Index = B/A = 3.2

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

✓ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks:

The area is highly used (disturbed) for the recreational purpose. The entire area is sand filled and planted with non-native species. These managed non-native plant species have changed the abundance of certain plant species, which resulted in shift in dominance species influencing hydrophytic vegetation. Problematic vegetation determined by observing reference site in similar condition.

SOIL

Sampling Point: SP1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR2/2	100					sandy loar	
4-18	Gley1 4/N	100					sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ✓ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No ___

Remarks:

soil is saturate year round. Meets the hydric soil indicator S4.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ✓ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): _____

Water Table Present? Yes ✓ No ___ Depth (inches): 7

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 5

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland hydrology observed.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Topanga Lagoon Restoration Project City/County: Topanga Sampling Date: 01/16/2020

Applicant/Owner: RCDSMM State: CA Sampling Point: SP2

Investigator(s): P. Acharya, M.Nieto Section, Township, Range:

Landform (hillslope, terrace, etc.): flat Local relief (concave, convex, none): none Slope (%): 5

Subregion (LRR): LLRC (Medit CA Lat: Long: Datum:

Soil Map Unit Name: NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation ✓, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation ✓, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks:

4 ft south of the open water lagoon

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10 m. radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Pinus halepensis	5	Y	NL
2. Phoenix canariensis	3	Y	NL
3.			
4.			
	8 = Total Cover		
Sapling/Shrub Stratum (Plot size: 5 m. radius)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 1m radius)			
1. Distichlis spicata	40	Y	FAC
2. Salsola tragus	5	N	FACU
3. Heterotheca grandiflora	1	N	NL
4.			
5.			
6.			
7.			
8.			
	70 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum 30 % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species 40	x 3 =	120
FACU species	x 4 =	
UPL species 14	x 5 =	70
Column Totals: 48 (A)		190 (B)

Prevalence Index = B/A = 3.5

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

✓ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

The area is highly used (disturbed) for the recreational purpose. The entire area is sand filled and planted with non-native species. These managed non-native plant species have changed the abundance of certain plant species, which resulted in shift in dominance species influencing hydrophytic vegetation. Problematic vegetation determined by observing reference site in similar condition.

SOIL

Sampling Point: SP2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 5/3	100					sand	fill sand

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

No hydric soil indicator observed

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No Wetland hydrology observed.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Topanga Lagoon Restoration Project City/County: Topanga Sampling Date: 01/16/2020

Applicant/Owner: RCDSMM State: CA Sampling Point: SP3

Investigator(s): P. Acharya, M.Nieto Section, Township, Range:

Landform (hillslope, terrace, etc.): flat Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR): LLRC (Medit CA Lat: Long: Datum:

Soil Map Unit Name: NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks:

4 ft south of the open water lagoon

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10 m. radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix lasiolepis	25	Y	FACW
2.			
3.			
4.			
	25 = Total Cover		
Sapling/Shrub Stratum (Plot size: 5 m. radius)			
1. Toxicodendron diversilobum	10	Y	FACU
2.			
3.			
4.			
5.			
	10 = Total Cover		
Herb Stratum (Plot size: 1m radius)			
1. Arundo donax	35	Y	FACW
2. Toxicodendron diversilobum	5	N	FACU
3. Stipa miliacea	7	N	NL
4.			
5.			
6.			
7.			
8.			
	47 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 53 % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 67 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

✓ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

The area is highly used (disturbed) for the recreational purpose. The entire area is sand filled and planted with non-native species. These managed non-native plant species have changed the abundance of certain plant species, which resulted in shift in dominance species influencing hydrophytic vegetation. Problematic vegetation determined by observing reference site in similar condition.

SOIL

Sampling Point: SP3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 3/2	100					sandy loar	
3-18	10YR 5/4	100					sandy loar	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

No hydric soil indicator observed

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No Wetland hydrology observed.

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APPENDIX C – OHWM DATA FORMS

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Topanga Lagoon Restoration Project **Date:** 1-16-2020 **Time:** 9:30 Am
Project Number: 24335 **Town:** Unic. LA County **State:** CA
Stream: Topanga Creek **Photo begin file#:** 0013 **Photo end file#:** 0017
Investigator(s): Poorvi Acharya, Michael Nieto

Y ☒ / N ☐ Do normal circumstances exist on the site?

Y ☒ / N ☐ Is the site significantly disturbed?

Location Details:
Cross section 1

Projection: **Datum:**
Coordinates: see GPS

Potential anthropogenic influences on the channel system:
Highway 1 and Bridge abutments constrain hydrology approx 400 ft downstream of x-section 1. Historic and commercial uses have been built on on fill adjacent to Bridge. exotic species prev.

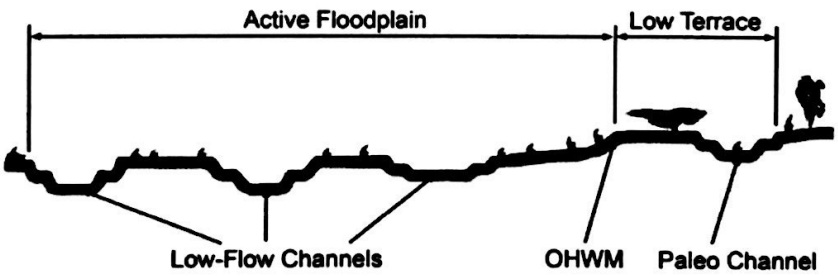
Brief site description:
x-section 1 is a typical intermittent/perennial stream source for the area. Coast live oaks on terraces w/ patches of scalps + arundo closer to Low Flow Channel

Checklist of resources (if available):

- ☒ Aerial photography
  Dates:
- ☒ Topographic maps
- ☐ Geologic maps
- ☒ Vegetation maps
- ☒ Soils maps
- ☐ Rainfall/precipitation maps
- ☐ Existing delineation(s) for site
- ☒ Global positioning system (GPS)
- ☐ Other studies

- ☐ Stream gage data
  Gage number:
  Period of record:
  - ☐ History of recent effective discharges
  - ☐ Results of flood frequency analysis
  - ☐ Most recent shift-adjusted rating
  - ☐ Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units



Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - ☐ Mapping on aerial photograph
   - ☒ GPS
   - ☐ Digitized on computer
   - ☐ Other:

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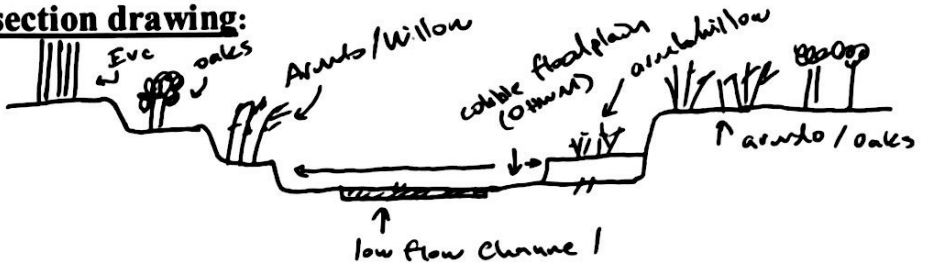
Project ID: 29335 **Cross section ID:** 1 **Date:** 1-16-2020 **Time:** 9:30

Cross section drawing:



OHWM

GPS point: SP cross section 1 (line)

Indicators:

- [x] Change in average sediment texture
- [x] Change in vegetation species
- [x] Change in vegetation cover
- [x] Break in bank slope
- [ ] Other: _____
- [ ] Other: _____

Comments:

Floodplain unit: [x] Low-Flow Channel [x] Active Floodplain [ ] Low Terrace

GPS point: see OHWM

Characteristics of the floodplain unit:

Average sediment texture: cobble / pebble

Total veg cover: 15 % Tree: 0 % Shrub: 5 % Herb: 10 %

Community successional stage:

- [ ] NA
- [x] Early (herbaceous & seedlings)
- [ ] Mid (herbaceous, shrubs, saplings)
- [ ] Late (herbaceous, shrubs, mature trees)

Indicators:

- [ ] Mudcracks
- [ ] Ripples
- [x] Drift and/or debris
- [x] Presence of bed and bank
- [x] Benches
- [ ] Soil development
- [ ] Surface relief
- [ ] Other: _____
- [ ] Other: _____
- [ ] Other: _____

Comments:

low flow channel meanders within cobble floodplain

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Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Topanga Lagoon Restoration Project **Date:** 1-16-2020 **Time:** 11:00 am
Project Number: 29735 **Town:** Unic. LA County **State:** CA
Stream: Topanga Creek **Photo begin file#:** 0018 **Photo end file#:** 0023
Investigator(s): Parshu Acharya, Michael Nieto

Y [X] / N [ ] Do normal circumstances exist on the site?

Y [X] / N [ ] Is the site significantly disturbed?

Location Details: Cross section 2

Projection: **Datum:**
Coordinates: see GPS

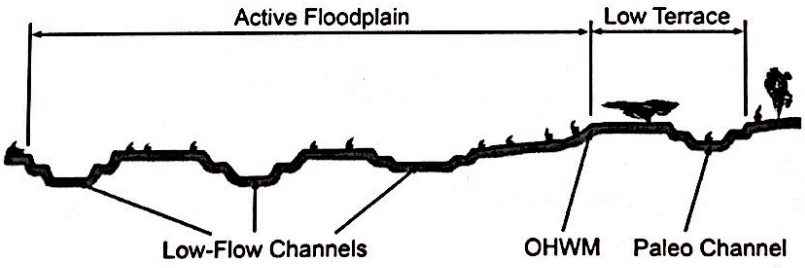
Potential anthropogenic influences on the channel system:
small patches of historic fill in the extent of the floodplain. Invasive weed species dominate some areas.

Brief site description:
Broad floodplain approximately 1,120 feet upstream of Highway 1.

Checklist of resources (if available):

- [X] Aerial photography
  Dates:
- [X] Topographic maps
- [ ] Geologic maps
- [X] Vegetation maps
- [X] Soils maps
- [ ] Rainfall/precipitation maps
- [ ] Existing delineation(s) for site
- [X] Global positioning system (GPS)
- [ ] Other studies
- [ ] Stream gage data
  Gage number:
  Period of record:
  - [ ] History of recent effective discharges
  - [ ] Results of flood frequency analysis
  - [ ] Most recent shift-adjusted rating
  - [ ] Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units



Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - [ ] Mapping on aerial photograph
   - [X] GPS
   - [ ] Digitized on computer
   - [ ] Other:

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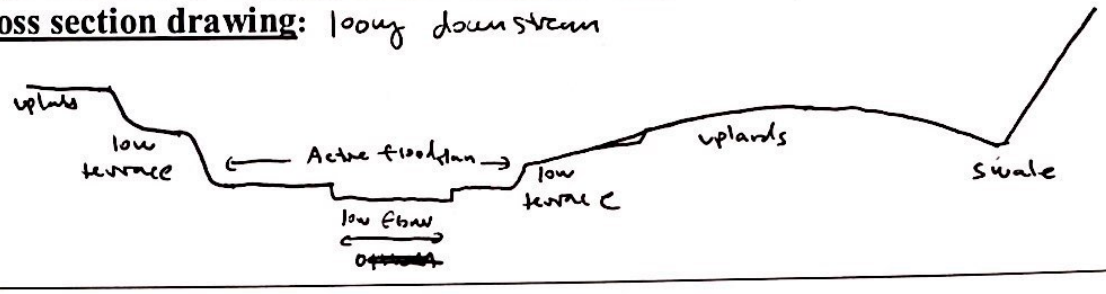
Project ID: 29335 **Cross section ID:** 2 **Date:** 1-16-2020 **Time:** 11:00 am

Cross section drawing: looking downstream



OHWM

GPS point: see GPS

Indicators:

- [x] Change in average sediment texture
- [x] Change in vegetation species
- [x] Change in vegetation cover
- [x] Break in bank slope
- [ ] Other: _____
- [ ] Other: _____

Comments:

Floodplain unit:

- [ ] Low-Flow Channel
- [x] Active Floodplain
- [ ] Low Terrace

GPS point: ~~F~~ cross section 2 (line) - point. see GPS.

Characteristics of the floodplain unit:

Average sediment texture: fine sand

Total veg cover: <5 % Tree: - % Shrub: - % Herb: 5 %

Community successional stage:

- [ ] NA
- [x] Early (herbaceous & seedlings)
- [ ] Mid (herbaceous, shrubs, saplings)
- [ ] Late (herbaceous, shrubs, mature trees)

Indicators:

- [ ] Mudcracks
- [ ] Ripples
- [ ] Drift and/or debris
- [x] Presence of bed and bank
- [ ] Benches
- [ ] Soil development
- [x] Surface relief
- [ ] Other: _____
- [ ] Other: _____
- [ ] Other: _____

Comments:

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Project ID: 24335 **Cross section ID:** 2 **Date:** 1-16-2020 **Time:** 9:30

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☒ Low Terrace

GPS point: gps cross section (line)

Characteristics of the floodplain unit:

Average sediment texture: Medium sand

Total veg cover: 75 % Tree: 60 % Shrub: 10 % Herb: 5 %

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☒ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☒ Benches
- ☒ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

low terrace is vegetated w/ aspen + willows with some evidence of prior benching but no active floodplain indicators were observed. significant

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: _____

Characteristics of the floodplain unit:

Average sediment texture: _____

Total veg cover: _____ % Tree: _____ % Shrub: _____ % Herb: _____ %

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

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Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Topanga Lagoon Restoration Project **Date:** 1-16-2020 **Time:** 12:15 PM
Project Number: 29335 **Town:** Unic. LA County **State:** CA
Stream: Topanga Creek **Photo begin file#:** 0024 **Photo end file#:** 0029
Investigator(s): Parshu Acharya, Michael Nieto

Y [x] / N [ ] Do normal circumstances exist on the site?

Y [x] / N [ ] Is the site significantly disturbed?

Location Details: cross section 3

Projection: **Datum:**
Coordinates: see GPS

Potential anthropogenic influences on the channel system:

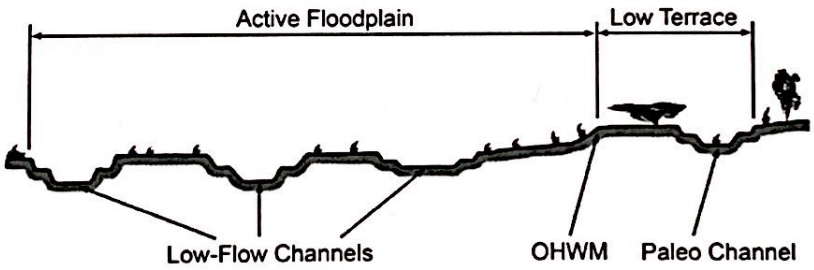
Invasive species in the area. Unpaved stream crossing (trail)

Brief site description:

Checklist of resources (if available):

- [x] Aerial photography
  Dates:
- [x] Topographic maps
- [ ] Geologic maps
- [x] Vegetation maps
- [x] Soils maps
- [ ] Rainfall/precipitation maps
- [ ] Existing delineation(s) for site
- [x] Global positioning system (GPS)
- [ ] Other studies
- [ ] Stream gage data
  Gage number:
  Period of record:
  - [ ] History of recent effective discharges
  - [ ] Results of flood frequency analysis
  - [ ] Most recent shift-adjusted rating
  - [ ] Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units



Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - [ ] Mapping on aerial photograph
   - [ ] Digitized on computer
   - [x] GPS
   - [ ] Other:

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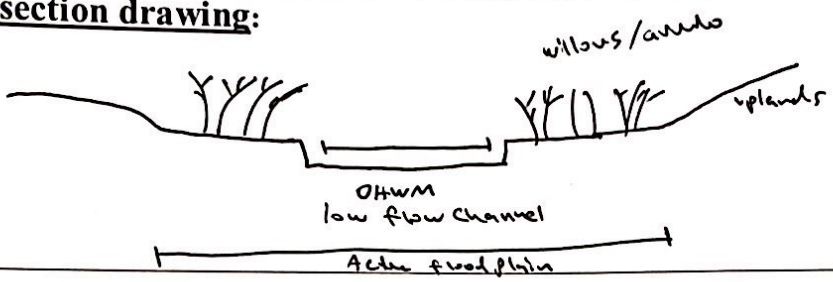
Project ID: 29335 **Cross section ID:** 3 **Date:** 1-16-2020 **Time:** 12:15

Cross section drawing:



OHWM

GPS point: See GPS

Indicators:

- [x] Change in average sediment texture
- [x] Change in vegetation species
- [x] Change in vegetation cover
- [x] Break in bank slope
- [ ] Other: _____
- [ ] Other: _____

Comments:
OHWM + low flow channel overlap

Floodplain unit:

- [x] Low-Flow Channel
- [ ] Active Floodplain
- [ ] Low Terrace

GPS point: see GPS

Characteristics of the floodplain unit:

Average sediment texture: Pebble

Total veg cover: 5 % Tree: ~ % Shrub: ~ % Herb: 5 %

Community successional stage:

- [ ] NA
- [x] Early (herbaceous & seedlings)
- [ ] Mid (herbaceous, shrubs, saplings)
- [ ] Late (herbaceous, shrubs, mature trees)

Indicators:

- [ ] Mudcracks
- [ ] Ripples
- [x] Drift and/or debris
- [x] Presence of bed and bank
- [ ] Benches
- [ ] Soil development
- [ ] Surface relief
- [ ] Other: _____
- [ ] Other: _____
- [ ] Other: _____

Comments:

Scanned with CamScanner

Project ID: 29335 **Cross section ID:** 3 **Date:** 1-16-2020 **Time:** 12:15

Floodplain unit: ☐ Low-Flow Channel ☒ Active Floodplain ☐ Low Terrace

GPS point: See GPS

Characteristics of the floodplain unit:

Average sediment texture: coarse silt

Total veg cover: 70 % Tree: 25 % Shrub: 40 % Herb: 5 %

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☒ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☒ Presence of bed and bank
- ☐ Benches
- ☒ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Flood plain is vegetated by willows + arundo.

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: _____

Characteristics of the floodplain unit:

Average sediment texture: _____

Total veg cover: _____ % Tree: _____ % Shrub: _____ % Herb: _____ %

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Scanned with CamScanner

Project ID: 29335 **Cross section ID:** 3 **Date:** 1-16-2020 **Time:** 11:00 am

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☒ Low Terrace

GPS point: See GPS

Characteristics of the floodplain unit:

Average sediment texture: Medium Sand

Total veg cover: 45 % Tree: 30 % Shrub: 10 % Herb: 5 %

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☒ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☒ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

One large bench with mature trees (oaks, sycamores, arundo)

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: _____

Characteristics of the floodplain unit:

Average sediment texture: _____

Total veg cover: _____ % Tree: _____ % Shrub: _____ % Herb: _____ %

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

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APPENDIX D – SITE AREA PHOTOGRAPHS

Photo 1: Looking toward the eastern slope of Lagoon

Photo 2: Looking southeast at the beach

Photo 3: Wetland sample plot 1 (SP 1): Soil profile

Photo 4: Wetland sample plot 1 (SP 1): Wetland Hydrology

Photo 5: Upland sample plot 2 (SP 2): Soil profile

Photo 6: Upland sample plot 2 (SP 2): Soil pit

Photo 7: Looking Southwest toward lagoon and beach

Photo 8: Looking north toward the HCP bridge and lagoon

Photo 9: Looking south at the lagoon

Photo 10: Looking Southeast at the lagoon outlet

Photo 11: Topanga Creek Cross Section 1: Looking south

Photo 12: Topanga Creek Cross Section1: Looking north

Photo 13: Topanga Creek Cross Section 1: Looking east upstream

Photo 14: Topanga Creek Cross Section1: Looking west down stream

Photo15: Topanga Creek Cross Section 2: Looking south

Photo 16: Topanga Creek Cross Section: Looking north

Photo 17: Topanga Creek Cross Section 2: Looking east - upstream

Photo 18: Topanga Creek Cross Section1: Looking west - down stream

Photo 19: Topanga Creek Cross Section 3: Looking North

Photo 20: Topanga Creek Cross Section 3: Looking south

Photo 21: Topanga Creek Cross Section 3: Looking northeast - upstream

Photo 22: Topanga Creek Cross Section 3: Looking southwest - down stream

Photo 23: Looking south toward the Pacific Ocean from the PCH Bridge

Photo 24: Looking south east toward the lagoon outlet and Pacific

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APPENDIX E – PLANT SPECIES OBSERVED WITHIN THE STUDY AREA

Appendix E: List of Observed Plant Species within the Study Area

Scientific Name	Common Name	Indicator Status
Eucalyptus spp	Eucalyptus	NL
Phoenix canariensis	Phoenix palm	NL
Pinus halepensis	Aleppo pine	NL
Rhus integrifolia	lemonade berry	NL
Brassica nigra	black mustard	NL
Schoenoplectus americanus	bulrush	OBL
Juglans californica	California walnut	FACU
Ricinus communis	castor bean	FACU
Typha latifolia	Broadleaf Cattail	OBL
Quercus agrifolia	coast live oak	NL
Baccharis pilularis	coyote bush	NL
Foeniculum vulgare	funnel	FACU
Delairea odorata	German ivy	NL
Arundo donax	giant reed	FACW
Mesembryanthemum crystallinum	iceplant	FACU
Lantana camara	lantana	NL
Malosma laurina	laurel sumac	NL
Sambucus mexicana	Mexican elderberry	NL
Ipomoea purpurea	morning glory	UPL
Baccharis salicifolia	mule fat	FAC
Myoporum laetum	Nagio-tree	FACU
Cortaderia jubata	pampas grass	FACU
Toxicodendron diversilobum	poison oak	FACU
Salix laevigata	red willow	FACW
Distichlis spicata	Saltgrass	FAC

Scientific Name	Common Name	Indicator Status
Bromus hordeaceus	soft chess	FACU
Stipa spp	Stipa	FAC
Platanus racemosa	sycamore	FAC
Heteromeles arbutifolia	toyon	NL
Cyperus involucratus	Umbrella sedge	FACW
Vinca major	Vinca	NL
Salix lasiolepis	Arroyo willow	FACW
Salicornia pacifica	pickleweed	OBL
Jaumea carnosa	marsh jaumea	OBL
Schoenoplectus americanus	Olney's bulrush	OBL
Grindelia camporum	gumweed	FACW
Isocoma menziesii	Goldenbush	FAC
Salsola tragus	Russian thistle	FACU
Heterotheca grandiflora	telegraph weed	NL
Artemisia californica	California sage	NL
Eriogonum fasciculatum foliolosum	California buckwheat	NL
Umbellularia californica	California bay	FAC

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APPENDIX
B

2 March 2020

Technical Memorandum: 2020 Wetland Condition Assessment for the Topanga Lagoon Restoration Project

Prepared by: Karina Johnston, Chris Enyart, Karina Alvarez, and Nicholas Pilaud, The Bay Foundation
Prepared for: Resource Conservation District of Santa Monica Mountains and California Department of Parks and Recreation
Date: 2 March 2020

Site Background

Over 96% and 98% of the vegetated and unvegetated estuarine wetlands, respectively, have been lost over the past century and a half in the Los Angeles region. This loss is primarily attributed to conversion of wetland habitat to uplands through fill deposition or development (Stein et al. 2014). Historically, Topanga Lagoon covered almost 30 acres at the mouth of Topanga Creek (Fact Sheet 2003). Topanga Creek is important both locally and regionally as the third largest watershed that drains into the Santa Monica Bay, and as a remnant bar-built estuarine system. The Topanga Lagoon Restoration Project was initiated in 2001 when 1,600 acres north of Pacific Coast Highway was obtained by California Department of Parks and Recreation. This was also the first time federally endangered tidewater gobies were documented after being absent since the 1970's, and southern steelhead trout monitoring began as these fish re-colonized Topanga Creek following extirpation in the 1980's (Fact Sheet 2003).

Introduction

California has adopted monitoring and assessment strategies developed by the United States Environmental Protection Agency (US EPA) that provide consistent approaches to the monitoring and assessment of wetlands (CWMW 2010, US EPA 2006, CWMW 2019), including standardized rapid assessment methods to facilitate information transfer between projects, while allowing for a condition-level comparison to reference or more 'natural' wetland sites (Sutula et al. 2006). In California, the California Rapid Assessment Method (CRAM) was developed by the California Wetland Monitoring Workgroup (CWMW) as a field-based diagnostic tool that can be used to cost effectively monitor the condition of streams and wetlands throughout California (CWMW 2013). All CRAM testing, validation, and implementation are coordinated on an ongoing basis by an oversight committee of the CWMW that focuses on the development and implementation of RAMs in California.

CRAM is a standardized field-based diagnostic tool intended to assess the overall condition of wetlands (i.e., functional capacity) (CWMW 2019). CRAM can be used as a measure of general aquatic resource health and produces condition scores that are comparable and repeatable for all wetlands and regions in California. For the purposes of CRAM, *condition* is defined as the state of a wetland assessment area's buffer and landscape context, hydrology, physical and biological structure relative to the best achievable states for the same type of wetland (CWMW 2013). CRAM scores range from 100 (best possible condition) to 25 (worst possible condition).

Methods

CRAM was used to provide an ambient condition assessment of areas within the Topanga Lagoon Restoration Project (Project) study area. "Ambient condition" is defined by the CRAM Technical Bulletin (2019) as: "the condition of one or more wetlands in a specified geographic area. An initial ambient assessment provides a baseline for assessing change in ambient condition over time." Surveys were conducted on 14 and 26 February 2020.

CRAM modules have been developed for various wetland types in direct response to California's assessment and policy needs. Wetland areas within the Project area were classified by wetland type according to the CRAM User Manual and CRAM Field Books as either bar-built estuary (one Assessment Area) or riverine wetland (three Assessment Areas) (Figure 1). Assessment Areas, or AAs, were preliminarily based on delineated wetland areas within the restoration Project study area (WRA 2020). They were then refined using CRAM guidelines and *in situ* field measurements. One bar-built estuary AA filled the maximum area possible within the mouth of the estuary. Three AAs were designated within the riverine habitats of Topanga Creek to maximize survey area and capture results from each portion of the Creek reach. A riverine ecosystem consists of the stream channel and its active floodplain, plus any portions of the adjacent riparian areas that are likely to be strongly linked to the channel or floodplain (CWMW 2019). Wetland types can be compared to one another through CRAM scores (CWMW 2019).

CRAM metrics are organized into four main attributes: landscape and buffer context, hydrology, physical structure, and biotic structure for each wetland type (i.e., riverine and bar-built estuarine wetlands) with multiple metrics and sub-metric assessments (Table 1). Exact metrics vary by wetland type or module. Four individual AA's (one bar-built estuary, and three riverine) were conducted on 14 and 26 February 2020 (Figures 1 and 2). It should be noted that there was an artificial closure of the mouth of the lagoon the week prior to the field survey which may have influenced several individual metric results. For additional specific details on methods, please reference the relevant CRAM scientific literature which can be found at the following website: www.cramwetlands.org.

Table 1. Summary table of CRAM attributes; descriptions modified from the CRAM User Manual (CWMW 2013). Note: exact descriptions and metrics may vary by wetland type or module.

Attribute	Metric	Sub-metric	Description	Assessment Location
Landscape and Buffer Context	Aquatic Area Abundance	---	Spatial association to adjacent areas with aquatic resources	Office
	Buffer	Percent of AA with Buffer	Relationship between the extent of buffer and the functions it provides	Office
		Average Buffer Width	Extent of buffer width assesses area of adjacent functions provided	Office
		Buffer Condition	Assessment of extent and quality of vegetation, soil condition, and human disturbance of adjacent areas	Field
Hydrology	Water Source	---	Water source directly affects the extent, duration, and frequency of hydrological dynamics	Office / Field
	Hydroperiod	---	Characteristic frequency and duration of inundation or saturation	Office / Field
	Hydrologic Connectivity	---	Ability of water to flow into or out of a wetland, or accommodate flood waters	Office / Field
Physical Structure	Structural Patch Richness	---	Number of different obvious physical surfaces or features that may provide habitat for species	Field
	Topographic Complexity	---	Micro- and macro-topographic relief and variety of elevations	Field
Biotic Structure	Plant Community Composition	Number of Plant Layers	Number of vegetation stratum indicated by a discreet canopy at a specific height	Field
Biotic Structure	Plant Community Composition	Number of Co-dominant Species	For each plant layer, the number of species represented by living vegetation	Field
		Percent Invasion	Number of invasive co-dominant species based on Cal-IPC status	Field
	Horizontal Interspersion	---	Variety and interspersion of different plant “zones”: monoculture or multi-species associations arranged along gradients	Field
	Vertical Biotic Structure	---	Interspersion and complexity of plant canopy layers and the space beneath	Field

Results are presented in a summary table and described below. Detailed ArcGIS files and raw quality control checked data for each metric are available upon request. CRAM surveys were conducted by trained practitioners consistent with all quality control measures and field recommendations developed for the CRAM program. Maps were created using ArcGIS Pro 2.4.0.

Figure 1.

Topanga Lagoon Restoration Project
CRAM Survey - Overview

N

0 25 50 100 150
Meters

Figure 2. Representative field photographs from the February 2020 bar-built estuary (top) and riverine (bottom) CRAM surveys.

Results

CRAM condition scores in the Topanga Lagoon Restoration Project area varied by location (Table 2, Figure 3). The lowest CRAM overall score (41) was identified in the lagoon area using the bar-built estuarine CRAM module. Riverine overall scores ranged from a low of 54, at the AA adjacent to the Topanga Bridge, up to a maximum of 87, at the AA furthest upstream from the lagoon. Overall score increased with distance from the bridge (AA2 --> AA4). Riverine hydrology scores remained relatively consistent across all three riverine AAs, with high attribute scores across the three AAs ranging between 83-92. Biotic structure scores across all AAs varied from 28 to 78; similarly, physical structure scores varied from 25 to 88. Figure 3 displays overall CRAM score by AA, including 90% confidence intervals and the CRAM condition tertiles used to define condition classes (CWMW 2019). Appendix A displays GIS maps and representative photographs for each Assessment Area.

Table 2. CRAM results displayed by module and attribute for each Assessment Area.

Module	AA FID	Attribute 1: Buffer and Landscape Context	Attribute 2: Hydrology	Attribute 3: Physical Structure	Attribute 4: Biotic Structure	OVERALL SCORE
Bar-Built	Topanga AA1	**43**	**67**	**25**	**28**	**41**
Riverine	Topanga AA2	**70**	**92**	**25**	**28**	**54**
Riverine	Topanga AA3	**78**	**83**	**63**	**61**	**71**
Riverine	Topanga AA4	**90**	**92**	**88**	**78**	**87**

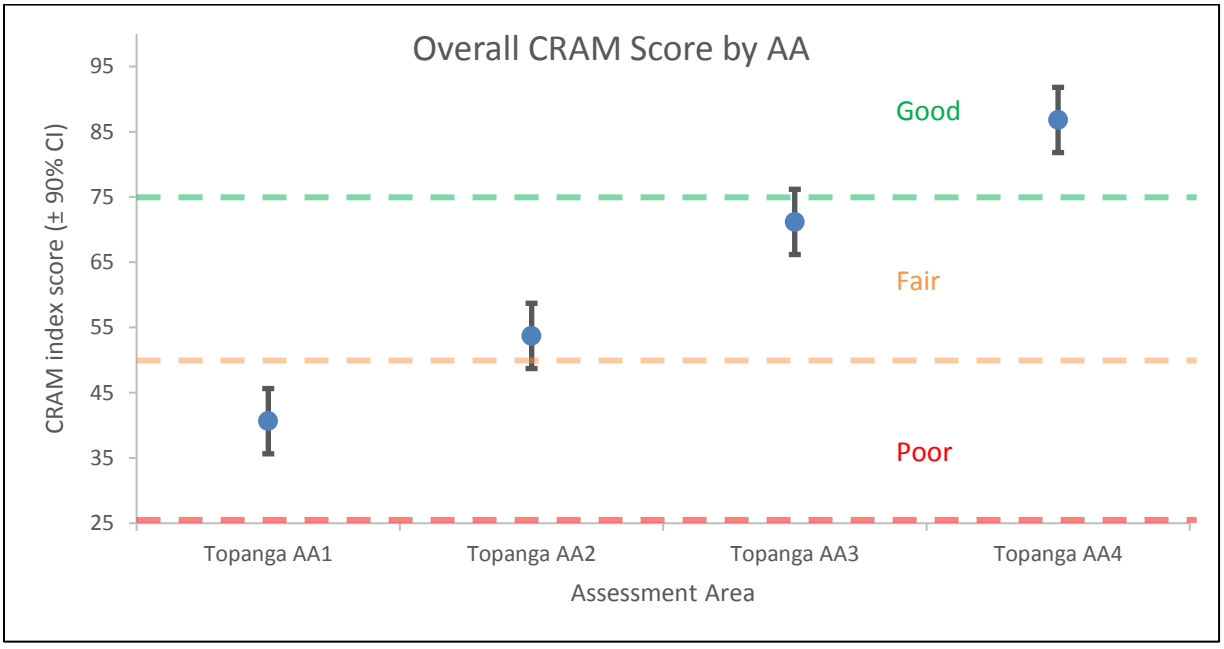

Figure 3. CRAM overall index scores for each Assessment Area (± 90% confidence interval).

Supplemental Information

In addition to the *in situ* field survey assessments, a search of the online CRAM database was performed to identify supplemental site information (CRAMwetlands.org, accessed 24 February 2020). This search yielded two CRAM surveys completed within the Project area since 2005, including one bar-built estuarine CRAM (overall score: 47) and one riverine CRAM (overall score: 69, Table 3). The bar-built estuarine CRAM completed in 2012 yielded similar overall score results to the CRAM conducted by The Bay Foundation in 2020. The riverine CRAM completed in 2011 was most closely located to Topanga AA3 conducted by The Bay Foundation in 2020 and yielded similar overall score results as AA3.

Table 3. CRAM results from web search displayed by module and attribute for each Assessment Area.

Module	Year	Attribute 1: Buffer and Landscape Context	Attribute 2: Hydrology	Attribute 3: Physical Structure	Attribute 4: Biotic Structure	OVERALL SCORE
Bar-Built	2012	**52**	**67**	**25**	**44**	**47**
Riverine	2011	**92**	**67**	**63**	**53**	**69**

Further up the Topanga Canyon Creek watershed, but outside the restoration Project area, overall scores from the online database were identified as the following: 84 (2013), 84 (2010), 83 (2013), 72 (2009), and 77 (2013) (CRAMwetlands.org, accessed 2 March 2020).

Additionally, a reference site search was performed via the online database (CRAMwetlands.org, accessed 24 February 2020). No bar-built estuarine CRAM reference sites with the same wetland type and same ecoregion were identified. Three riverine AAs were identified in upper San Mateo Creek in the Santa Ana Mountains as the nearest similar reference sites. Overall scores for those sites were identified as 93, 93, and 95, and they were completed in 2010 and 2011.

Conclusions

For any given wetland type, lower CRAM scores translate to lower ecological functional capacity (CWMW 2019). For the Topanga Lagoon Restoration Project, the oceanward assessment areas with the lowest scores may benefit the most from restoration actions (i.e., AA1 and AA2). AA4 was close in overall score (within the 7-point 90% confidence interval) to the closest available reference sites and may not require as much restoration activity to achieve reference condition.

Disclaimer: CRAM involves a systematic, detailed examination of wetland structure at various spatial scales and should be used in combination with additional site-intensive assessments. CRAM surveys and scoring were consistent with the CRAM manuals and the most recent Technical Bulletin. Overall CRAM score 90% confidence intervals are ±7 points (CWMW 2019). Interpretation of California Rapid Assessment Method scores should be conducted by trained practitioner scientists.

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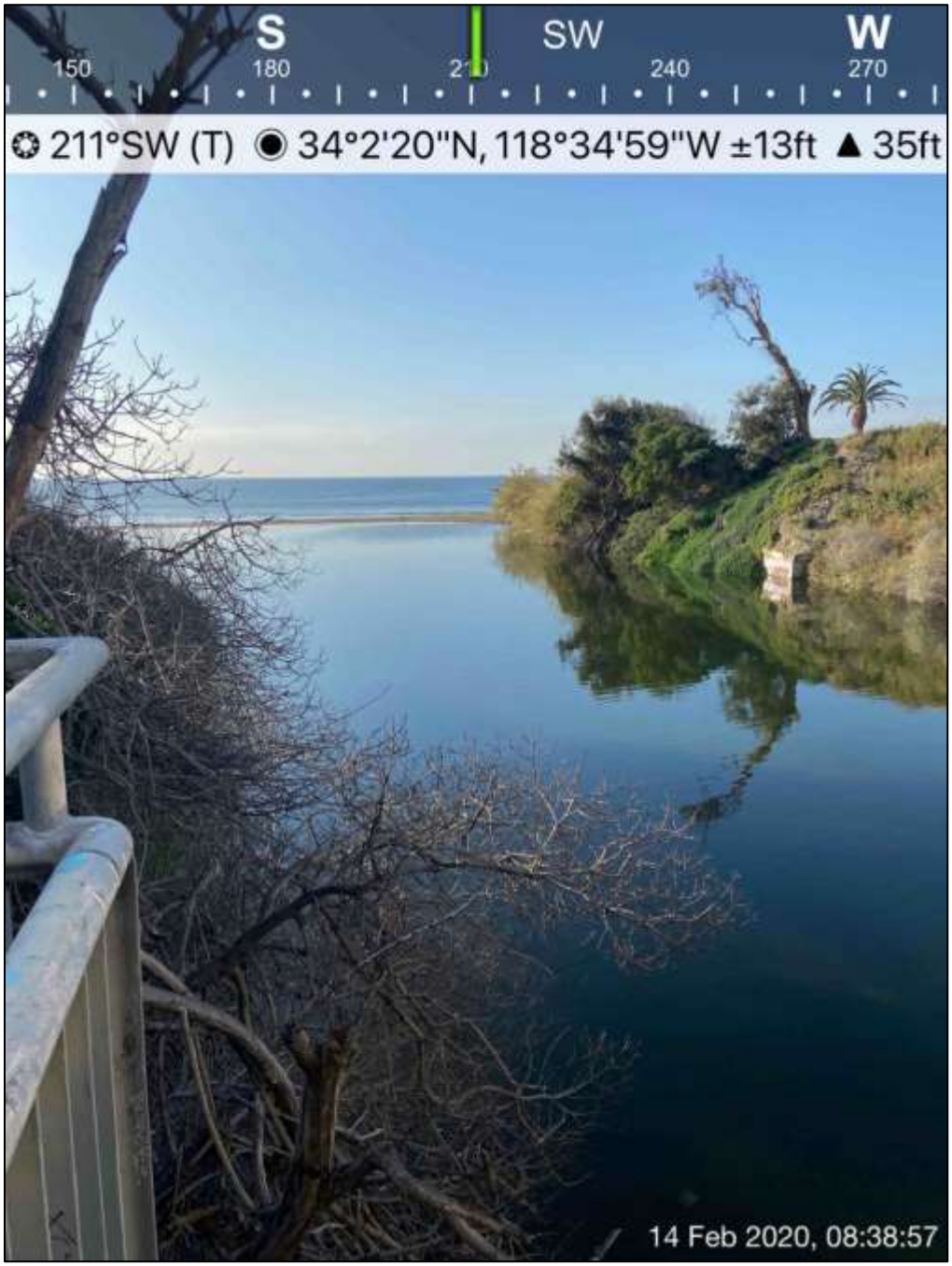
Appendix A

Representative Site Photographs and Maps



THE BAY FOUNDATION

Topanga Lagoon Restoration Project
CRAM Survey - AA1

N

0 25 50
Meters

THE BAY FOUNDATION

Topanga Lagoon Restoration Project
CRAM Survey - AA2

N

0 25 50
Meters

Topanga Assessment Area 1 (Bar-Built Estuarine CRAM)

Topanga Assessment Area 2 (Riverine CRAM)

THE BAY FOUNDATION

Topanga Lagoon Restoration Project
CRAM Survey - AA3

N

0 25 50 Meters

THE BAY FOUNDATION

Topanga Lagoon Restoration Project
CRAM Survey - AA4

N

0 25 50
Meters

Topanga Assessment Area 3 (Riverine CRAM)

Topanga Assessment Area 4 (Riverine CRAM)

APPENDIX
C

NATIVE TREE AND OAK TREE REPORT

TOPANGA LAGOON RESTORATION PLANNING

Topanga, CA 90290

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TABLE OF CONTENTS

CERTIFICATION OF ACCURACY OF REPORT	5
SUMMARY	6
PERMIT REQUEST	6
MITIGATION PROPOSED	9
ASSIGNMENT	11
LIMITS OF THE ASSIGNMENT	12
PURPOSE AND USE OF THE REPORT	12
SITE DESCRIPTION	12
PROJECT DESCRIPTION	13
Alternative 1: No Project/Managed Decline (0 acres restored)	13
Actions Common to All Project Alternatives	18
Topanga Canyon Boulevard Visitor Services	18
Alternative 2: Lagoon Habitat Maximized, Removal of Motel (9.5 wetted acres, as part of 11.7 acres restored)	20
Alternative 3: Least Lagoon Habitat Expansion, Retention of Motel (7.1 wetted acres, as part of 9.8 acres restored)	22
Alternative 4: Maximum Managed Retreat, Partial Motel Retention (7.1 wetted acres, as part of 10.8 acres restored)	24
METHODS FOR TREE INVENTORY	26
Native Trees Summary	27
Native Trees to Remain	28
ALTERNATIVE ANALYSIS	40
Non-Native Trees Summary	41
Coordination with Fuel Modification Plan for each Alternative	42
HERITAGE AND BIOLOGICALLY SIGNIFICANT TREES	45
HISTORIC TREES	45
Mitigation Required	49
Coordination with Habitat Restoration Plan	49
FENCING PLAN	49
INVASIVE BEETLES AND DISEASE MANAGEMENT	
RECOMMENDATIONS	51
REFERENCES CITED	52
Appendix A. Site Plan Showing Tree Locations for Each Alternative	
Appendix B. Field Data Sheets Summarizing Tree Condition Sorted by Native and Non-Native	
Appendix C. Photos of All Tagged Trees by Tag Number	
Appendix D. DRAFT Native Tree Replacement Planting Mitigation, Maintenance and Monitoring Plan	
Appendix E. Assumptions and Limiting Conditions	
Appendix F. Arborist Disclosure Statement	
Appendix G. Resumes	
LIST OF TABLES	
Table 1. Alternative 2 Native Tree Removals Proposed	6

Table 2. Alternative 2 Native Tree Encroachments Proposed	7
Table 3. Alternative 2 Historic and Heritage Non-Native Trees Removed	7
Table 4. Alternative 3 and 4 Native Tree Removals Proposed	8
Table 5. Alternative 3 and 4 Native Tree Encroachments Proposed	8
Table 6. Alternative 3 Historic and Heritage Non-Native Trees Removed	8
Table 7. Alternative 4 Historic and Heritage Non-Native Trees Removed	9
Table 8. Alternative 2 Tree Removals Proposed and Mitigation Requirement	10
Table 9. Alternative 2 Tree Encroachments Proposed and Mitigation Requirement	10
Table 10. Alternative 3 and 4 Tree Removals Proposed and Mitigation Requirement	10
Table 11. Alternative 3 and 4 Tree Encroachments Proposed and Mitigation Requirement	10
Table 12. Metadata for Maps	26
Table 13. Summary of 270 Protected and 15 Undersized Native Trees in the Topanga Lagoon Restoration Planning Area	28
Table 14. Summary of Protected Native Trees on Topanga Canyon Blvd.	28
Table 15. Summary of all Protected Native Trees to Remain in the Topanga Lagoon Restoration Planning Area	29
Table 16. Summary of Potential Impacts to Protected Native Trees in the Topanga Lagoon Restoration Area	40
Table 17. Summary of all Non-native Trees in the Topanga Lagoon Restoration Planning Area	41
Table 18. Summary of Non-native Trees along Topanga Canyon Blvd.	42
Table 19. Summary of Biologically Significant Trees	45
Table 20. Summary of Potentially Historic Trees	48
Table 21. Data on potentially Historic Trees (Heritage Trees in BOLD Red)	49
LIST OF FIGURES	
Figure 1. Topanga Lagoon Restoration Planning Area Parcel Map	13
Figure 2. Existing conditions showing LCP Habitat zones	14
Figure 3. Overall Topanga Lagoon Restoration Project Area Sections	15
Figure 4. Existing Conditions - Northeast	15
Figure 5. Existing Conditions - Northwest	16
Figure 6. Existing Conditions - Topanga Ranch Motel	16
Figure 7. Existing Conditions - Southeast	17
Figure 8. Existing Conditions - Southwest	17
Figure 9. All Trees within the Topanga Canyon Blvd. potential restoration area.	19
Figure 10. All Trees within the Alternative 2 and 200 ft Buffer Zone Using LACO Habitat Overlay	21

Figure 11. All Trees Within the Alternative 2 and 200 ft Buffer Zone Using LACO Habitat Overlay. Showing Ecological Constraints and Jurisdictional Delineation	21
Figure 12. All Trees within the Alternative 3 and 200 ft Buffer Zone Using LACO Habitat Overlay	23
Figure 13. All Trees within the Alternative 3 and 200 ft Buffer Zone Using LACO Habitat Overlay. Showing Ecological Constraints and Jurisdictional Delineation	23
Figure 14. All Trees within the Alternative 4 and 200 ft buffer Buffer Zone Using LACO Habitat Overlay	25
Figure 15. All Trees within the Alternative 4 and 200 ft Buffer Zone Using LACO Habitat Overlay. Showing Ecological Constraints and Jurisdictional Delineation	25
Figure 16. Alternative 1 Fuel Modification Zones with Individual Trees	43
Figure 17. Alternative 2 Preliminary Fuel Modification Zones with Individual Trees	43
Figure 18. Alternative 3 Preliminary Fuel Modification Zones with Individual Trees	44
Figure 19. Alternative 4 Fuel Modification Zones with Individual Trees	44
Figure 20. Aerial Photograph showing the Topanga Ranch Motel in 1940. Note that they were all relatively small trees at that time.	46
Figure 21. Aerial Photograph showing the Topanga Ranch Motel 4/11/1940. Note that they were all relatively small trees at that time. (Photo courtesy of the Spence Collection, UCLA Dept. of Geography)	46
Figure 22. Aerial Photograph showing the Topanga Ranch Motel 1940. Note that they were all relatively small trees at that time. (Photo courtesy of the Spence Collection, UCLA Dept. of Geography)	47
Figure 23. Aerial Photograph showing the Topanga Ranch Motel 8/6/1951. Note that they were all relatively small trees at that time. (Photo courtesy of the Spence Collection, UCLA Dept. of Geography)	47
Figure 24. Alternative 2 DRAFT Fencing Plan	50
Figure 25. Alternative 3 DRAFT Fencing Plan	50
Figure 23. Alternative 4 DRAFT Fencing Plan	51

CERTIFICATION OF ACCURACY OF REPORT

This report provides technical information regarding Native Tree resources to the California Coastal Commission and County of Los Angeles Department of Regional Planning as part of the environmental review of the proposed habitat restoration for Topanga Lagoon Restoration Project Area in Topanga, CA, referred to herein as the "parcel" or "property". The parcel is located in unincorporated Los Angeles County, within the Santa Monica Mountains Local Coastal Zone. The property is owned by CA Department of Parks and Recreation (CDPR) on the north side of PCH (~7 acres in the immediate restoration area), and also includes the Caltrans ROW along PCH including the bridge (~2 acres), and the public beach, parking lot, lifeguard headquarters/restroom and helipad managed by Los Angeles County Department of Beaches and Harbors (DBH) on the south side of PCH (~6 acres).

The potential work area includes the lagoon/ocean interface on the landward side of the bar-built sand berm and extends approximately 450 meters upstream into the creek with potential removal of fill on both the west and east sides. The disturbed potential work area is a subset of the overall project study area (59 acres including the extension along Topanga Canyon Blvd.) that extends upstream along Topanga Canyon Blvd. to include the former Rodeo Grounds floodplain area. The larger project study area is needed because one of the alternatives (Alternative 2) includes removal of the entire historic Topanga Ranch Motel. The potential for relocating parking and overnight accommodations along Topanga Canyon Blvd. required us to extend the potential impact analysis to include that area, although no formal plans are available as yet.

The findings contained herein are based on the following: a review of site plans, etc. provided by the Topanga Lagoon Restoration Planning process; the Santa Monica Mountains Land Use Plan (LUP); and GIS mapping and spatial analysis provided by RCD of the Santa Monica Mountains and Moffatt and Nichols Engineers. The proposed project consists of documenting the extent of Native Tree and Oak associated with each proposed project alternative for CEQA/NEPA and LA County Conditional Use Permit review and proposes appropriate mitigations and Best Management Practices (BMP). The proposed impacted and restoration areas are primarily located within 200 feet of sensitive habitat (H1, H1 buffer zone, H1 quiet zone, H2, or H2 "High Scrutiny") but also extend into designated H3 habitat along Topanga Canyon Blvd.

This Native Tree and Oak Report presents a true and accurate statement of the condition of the natural resources found in the Topanga Lagoon Restoration Planning area, Topanga, Los Angeles County, California on the dates of our site visits between March and November 2021 and complies with the requirements of the Santa Monica Mountains Local Coastal Plan criteria.

Respectfully submitted,

Rosi Dagit, Sr. Conservation Biologist, Certified Arborist ISA WS-1084

SUMMARY

This report provides information needed to evaluate the impacts and benefits associated with the restoration of Topanga Lagoon. At this stage of the planning process, 30% design alternatives provide the limits for assessing loss of native and non-native trees for use with the Coastal Development Permit (CDP) application and CEQA analysis.

A total of 635 trees are located within the project study area at the lagoon and along the graded portion of Topanga Canyon Blvd. (RCB). Of these, 292 native trees of which 277 are of protected size plus 15 undersized that could potentially grow into protected size prior to implementation, and 343 are non-native trees representing 36 species in varying degrees of health with 252 located within the proposed lagoon project area. Once a preferred alternative is identified, it will be possible to further refine the numbers of protected native trees that will be removed or encroached upon, the benefits of removing invasive non-native trees and Arundo, and proposed locations for mitigation restoration plantings.

The overall project goal is to restore native riparian and transitional upland habitat while retaining as many native trees along the existing wetted edges of the creek channel as possible. A fuel modification plan, native tree and habitat restoration plan, mitigation and monitoring plan will also be refined once the preferred alternative is identified. This report documents the condition of the native trees that will be used to develop the additional plan documents required.

PERMIT REQUEST

In accordance with Coastal Development Permit requirements, a summary of trees to be removed and encroached upon are provided by Alternative below. Note that these removal and encroachment numbers are the worse-case scenario and subject to change once the preferred alternative is determined and final surveys are conducted.

Alternative 1 – No Permit needed.

Alternative 2 – If Alternative 2 is selected, it will require permission to remove a maximum of 32 protected native trees listed in Table 1 including:

Table 1. Alternative 2 Native Tree Removals Proposed

Number removed	Common Name	Scientific Name	Tag Numbers
1	Mountain Mahagony	*Cercocarpus* sp.	#537
2	Juniper*	*Juniperus californica*	#354, 438
6	Laurel Sumac	*Malosma laurina*	#302, 303, 357, 436, 445, 501
1	CA Sycamore	*Platanus racemosa*	#97
3	Lemonade Berry	*Rhus integrifolia*	#65. 516, 517
12	Arroyo Willow	*Salix lasiolepsis*	#98, 107, 108, 109, 111, 112, 269, 300, 301, 313, 366, 447
6	Red Willow	*Salix laevigata*	#310, 312, 361, 367, 381, 387
1	Elderberry	*Sambucus nigra*	#64

*All Juniper trees on the site are remnants of past cultivated landscaping and not native to the area

Alternative 2 will also require permission to encroach on an additional 14 native trees listed in Table 2.

Table 2. Alternative 2 Native Tree Encroachments Proposed

Tag Number Encroached	Common Name	Scientific Name	Percent Encroachment
#341	Laurel Sumac	*Malosma laurina*	15
#308	Coast Live Oak	*Quercus agrifolia*	6
#118	Arroyo Willow	*Salix lasiolepsis*	19
#267	Arroyo Willow	*Salix lasiolepsis*	6
#305	Arroyo Willow	*Salix lasiolepsis*	6
#306	Arroyo Willow	*Salix lasiolepsis*	7
#373	Arroyo Willow	*Salix lasiolepsis*	4
#383	Arroyo Willow	*Salix lasiolepsis*	39
#271	Red Willow	*Salix laevigata*	10
#295	Red Willow	*Salix laevigata*	11
#309	Red Willow	*Salix laevigata*	40
#368	Red Willow	*Salix laevigata*	29
#370	Red Willow	*Salix laevigata*	4
#360	Elderberry	*Sambucus nigra*	12

Additionally, Alternative 2 will require the removal of all 14 Historic and Heritage Non-Native Trees in the National Register of Historic Places-eligible Topanga Ranch Motel footprint. All trees dating to the period of significance of the Motel (1933-1952) as determined by photos and aerials are contributing features to the historic property. They are also considered Heritage if they are greater than 36 inches in diameter of one trunk according to the Los Angeles County definition.

Table 3. Alternative 2 Historic and Heritage Non-Native Trees Removed
Trees in **BOLD** are also Heritage size.

Tree Number	Common Name	Scientific Name	DBH Sum	Number of Trunks	Canopy Spread ft	Height (ft)	Latitude	Longitude
393	**Eucalyptus**	**Eucalyptus globulus**	**36.0**	**1**	**40**	**50**	**34.04000184**	**-118.58212257**
394	**Eucalyptus**	**Eucalyptus globulus**	**36.0**	**1**	**35**	**55**	**34.03998678**	**-118.58216799**
395	**Eucalyptus**	**Eucalyptus globulus**	**44.0**	**1**	**50**	**60**	**34.04001897**	**-118.58218178**
396	Aleppo Pine	Pinus halipensis	25.0	1	20	45	34.03965554	-118.58277797
406	**Eucalyptus**	**Eucalyptus globulus**	**46.2**	**1**	**25**	**50**	**34.03967573**	**-118.58267912**
407	**Eucalyptus**	**Eucalyptus globulus**	**61.2**	**5**	**35**	**55**	**34.03970093**	**-118.58256642**
418	Eucalyptus	Eucalyptus globulus	30.0	1	30	45	34.03982089	-118.58218334
419	Eucalyptus	Eucalyptus globulus	30.0	1	40	50	34.03987386	-118.58202028
420	**Eucalyptus**	**Eucalyptus globulus**	**48.0**	**1**	**20**	**25**	**34.03989730**	**-118.58187052**
421	Eucalyptus	Eucalyptus globulus	53.0	1	45	65	34.03991426	-118.58181914
422	Eucalyptus	Eucalyptus globulus	21.7	7	15	10	34.03993023	-118.58177129
423	**Canary Island palm**	**Phoenix canariensis**	**48.0**	**1**	**20**	**25**	**34.03989730**	**-118.58187052**
424	**Eucalyptus**	**Eucalyptus globulus**	**53.0**	**1**	**45**	**65**	**34.03991426**	**-118.58181914**
425	Euphorbia	Euphorbia sp.	21.7	7	15	10	34.03993023	-118.58177129

<u>Alternatives 3 and 4</u>
The proposed native protected tree impacts are the same for both alternatives. If either Alternative 3 or 4 is selected, it will require permission to remove a total of 26 protected native trees including:

Table 4. Alternative 3 and 4 Native Tree Removals Proposed

Number removed	Common Name	Scientific Name	Tag Numbers
2	Juniper*	*Juniperus californica*	#354, 438
6	Laurel Sumac	*Malosma laurina*	#302, 303, 357, 436, 445, 501
1	CA Sycamore	*Platenus racemosa*	#97
3	Lemonade Berry	*Rhus integrifolia*	#65. 516, 517
9	Arroyo Willow	*Salix lasiolepsis*	#98, 108, 109, 269, 300, 301, 313, 366, 447
4	Red Willow	*Salix laevigata*	#361, 367, 381, 387
1	Elderberry	*Sambucus nigra*	#64

*All Juniper trees on the site are remnants of past cultivated landscaping and not native to the area

Alternatives 3 and 4 will also require permission to encroach on an additional 15 native trees.

Table 5. Alternative 3 and 4 Native Tree Encroachments Proposed.

Tag Number Encroached	Common Name	Scientific Name	Percent Encroachment
#341	Laurel Sumac	*Malosma laurina*	15
#308	Coast Live Oak	*Quercus agrifolia*	6
#118	Arroyo Willow	*Salix lasiolepsis*	19
#267	Arroyo Willow	*Salix lasiolepsis*	6
#305	Arroyo Willow	*Salix lasiolepsis*	6
#306	Arroyo Willow	*Salix lasiolepsis*	7
#358	Arroyo Willow	*Salix lasiolepsis*	40
#373	Arroyo Willow	*Salix lasiolepsis*	4
#383	Arroyo Willow	*Salix lasiolepsis*	39
#271	Red Willow	*Salix laevigata*	10
#295	Red Willow	*Salix laevigata*	11
#309	Red Willow	*Salix laevigata*	40
#368	Red Willow	*Salix laevigata*	29
#370	Red Willow	*Salix laevigata*	4
#360	Elderberry	*Sambucus nigra*	12

As shown in Table 6 then in Alternative 3 a total of four trees would be removed (assuming that the underlying fill can be maintained): historic and heritage trees #406 and 407, along with historic trees #418 and 419.

Table 6. Alternative 3 Historic and Heritage Non-Native Tree Removals
Trees in **BOLD** are also Heritage size.

Tree Number	Common Name	Scientific Name	DBH Sum	Number of Trunks	Canopy Spread ft	Height (ft)	Latitude	Longitude
406	**Eucalyptus**	**Eucalyptus globulus**	**46.2**	**1**	**25**	**50**	**34.03967573**	**-118.58267912**
407	**Eucalyptus**	**Eucalyptus globulus**	**61.2**	**5**	**35**	**55**	**34.03970093**	**-118.58256642**
418	Eucalyptus	Eucalyptus globulus	30.0	1	30	45	34.03982089	-118.58218334
419	Eucalyptus	Eucalyptus globulus	30.0	1	40	50	34.03987386	-118.58202028

For Alternative 4, a total of nine Historic Trees would be removed, including six that also qualify as Heritage trees as shown in Table 7. Again, this assumes that the existing fill can be retained.

Table 7. Alternative 3 Historic and Heritage Non-Native Tree Removals
Trees in **BOLD** are also Heritage size.

Tree Number	Common Name	Scientific Name	DBH Sum	Number of Trunks	Canopy Spread ft	Height (ft)	Latitude	Longitude
393	**Eucalyptus**	**Eucalyptus globulus**	**36.0**	**1**	**40**	**50**	**34.04000184**	**-118.58212257**
394	**Eucalyptus**	**Eucalyptus globulus**	**36.0**	**1**	**35**	**55**	**34.03998678**	**-118.58216799**
395	**Eucalyptus**	**Eucalyptus globulus**	**44.0**	**1**	**50**	**60**	**34.04001897**	**-118.58218178**
396	Aleppo Pine	Pinus halipensis	25.0	1	20	45	34.03965554	-118.58277797
406	**Eucalyptus**	**Eucalyptus globulus**	**46.2**	**1**	**25**	**50**	**34.03967573**	**-118.58267912**
407	**Eucalyptus**	**Eucalyptus globulus**	**61.2**	**5**	**35**	**55**	**34.03970093**	**-118.58256642**
418	Eucalyptus	Eucalyptus globulus	30.0	1	30	45	34.03982089	-118.58218334
419	Eucalyptus	Eucalyptus globulus	30.0	1	40	50	34.03987386	-118.58202028
420	**Eucalyptus**	**Eucalyptus globulus**	**48.0**	**1**	**20**	**25**	**34.03989730**	**-118.58187052**

MITIGATION PROPOSED

Mitigation requirements for impacts within the jurisdiction of Los Angeles County Local Coastal Plan (22.44.950, 22.44.1920) include 10:1 replacement for any native tree removed, or that encroaches within 3 ft of the trunk or encroaches into more than 30% of the tree protected zone. A 5:1 replacement is required for encroachment of 10-30% and monitoring only is required for encroachment of less than 10%. Native trees must be monitored with annual reports submitted for 10 years post impact (7 years for oaks). Any mitigation trees that die must be replaced.

At this time a preferred alternative has not been identified, so potential mitigation actions for each Alternative are listed below. Removal of non-native trees (with perhaps some of those deemed historic in the Topanga Ranch Motel) will be completed to meet California Fish and Wildlife requirements for habitat restoration.

To meet CDPR and the LCP requirements for restoration planting material to be sources from within the watershed, we propose that seeds, stakes and cuttings to propagate replacement willows, cottonwood and elderberry are gathered onsite to grow in anticipation of restoration revegetation planting. Upon selection of the preferred alternative, an addendum to this report will be prepared showing locations of any required mitigation planting locations proposed.

Alternative 1 – No mitigation needed. All 270 protected native trees and 343 non-native trees would remain.

Alternative 2 would require a total of 320 native trees (Table 8) planted based on the native tree removal and 50 additional native trees (Table 9) based on the encroachment request. Because the Historic and Heritage Trees are considered a part of the historic landscape of the Topanga Ranch Motel, it is not possible to replace them. A mitigation will be proposed as part of the State Historic Preservation Office consultation which is pending.

Table 8. Alternative 2 Tree Removals Proposed and Mitigation Requirement

Number removed	Common Name	Scientific Name	Number of Replacement Trees Required
1	Mountain Mahagony	*Cercocarpus* sp.	10
2	Juniper*	*Juniperus californica*	20
6	Laurel Sumac	*Malosma laurina*	60
1	CA Sycamore	*Platenus racemosa*	10
3	Lemonade Berry	*Rhus integrifolia*	30
12	Arroyo Willow	*Salix lasiolepsis*	120
6	Red Willow	*Salix laevigata*	60
1	Elderberry	*Sambucus nigra*	10

*All Juniper trees on the site are remnants of past cultivated landscaping and not native to the area

Table 9. Alternative 2 Tree Encroachments Proposed and Mitigation Requirement

Tag Number Encroached	Common Name	Scientific Name	Percent Encroachment	Number of Mitigation Trees Needed
#341	Laurel Sumac	*Malosma laurina*	15	5
#308	Coast Live Oak	*Quercus agrifolia*	6	0
#118	Arroyo Willow	*Salix lasiolepsis*	19	5
#267	Arroyo Willow	*Salix lasiolepsis*	6	0
#305	Arroyo Willow	*Salix lasiolepsis*	6	0
#306	Arroyo Willow	*Salix lasiolepsis*	7	0
#373	Arroyo Willow	*Salix lasiolepsis*	4	0
#383	Arroyo Willow	*Salix lasiolepsis*	39	10
#271	Red Willow	*Salix laevigata*	10	5
#295	Red Willow	*Salix laevigata*	11	5
#309	Red Willow	*Salix laevigata*	40	10
#368	Red Willow	*Salix laevigata*	29	5
#370	Red Willow	*Salix laevigata*	4	0
#360	Elderberry	*Sambucus nigra*	12	5

Alternative 3 and Alternative 4 would require a total of 270 trees (Table 7) planted based on the native tree removal and 60 additional native trees (Table 8) based on the encroachment request.

Alternative 3 proposed removal of only four Historic and Heritage Trees, while Alternative 4 would require removal of nine Historic and Heritage Trees. Mitigation for impacts to the larger historical resource, which may include replanting of similar tree species in an appropriate configuration, will be proposed as part of the State Historic Preservation Office consultation which is pending.

Table 10. Alternative 3 and 4 Tree Removals Proposed and Mitigation Requirement

Number removed	Common Name	Scientific Name	Number of Replacement Trees Required
2	Juniper*	*Juniperus californica*	20
6	Laurel Sumac	*Malosma laurina*	60
1	CA Sycamore	*Platenus racemosa*	10
3	Lemonade Berry	*Rhus integrifolia*	30
9	Arroyo Willow	*Salix lasiolepsis*	90
4	Red Willow	*Salix laevigata*	40

1	Elderberry	*Sambucus nigra*	10

*All Juniper trees on the site are remnants of past cultivated landscaping and not native to the area

Table 11. Alternative 3 and 4 Tree Encroachments Proposed and Mitigation Requirement

Tag Number Encroached	Common Name	Scientific Name	Percent Encroachment	Number of Mitigation Trees Needed
#341	Laurel Sumac	*Malosma laurina*	15	5
#308	Coast Live Oak	*Quercus agrifolia*	6	0
#118	Arroyo Willow	*Salix lasiolepsis*	19	5
#267	Arroyo Willow	*Salix lasiolepsis*	6	0
#305	Arroyo Willow	*Salix lasiolepsis*	6	0
#306	Arroyo Willow	*Salix lasiolepsis*	7	0
#358	Arroyo Willow	*Salix lasiolepsis*	40	10
#373	Arroyo Willow	*Salix lasiolepsis*	4	0
#383	Arroyo Willow	*Salix lasiolepsis*	39	10
#271	Red Willow	*Salix laevigata*	10	5
#295	Red Willow	*Salix laevigata*	11	5
#309	Red Willow	*Salix laevigata*	40	10
#368	Red Willow	*Salix laevigata*	29	5
#370	Red Willow	*Salix laevigata*	4	0
#360	Elderberry	*Sambucus nigra*	12	5

As required by the Los Angeles County Local Coastal Plan, a DRAFT *Native Tree Replacement Planting Mitigation, Maintenance and Monitoring Plan* describing mitigation, monitoring and reporting has been included as APPENDIX D to guide future restoration planting and direct fuel modification protocols according to Local Implementation Plan (LIP) standards (22.44.950) for each proposed alternative. Upon completion of the CEQA process, this document will be updated to provide details associated with the preferred alternative selected. On-site restoration will be utilized at the site to allow for long-term sustainability of the replacement plantings, the potential to expand/connect to riparian and transitional upland habitats.

All replacement trees should be planted on native soil and should be the same species as the removed native trees with appropriate associated native vegetation in the understory.

ASSIGNMENT

After discussing the projects with State Parks, and the Los Angeles Department of Beaches and Harbors, as well as with LA County Department of Regional Planning, County Foresters, and other permitting agencies between June 2020 and November 2021, it was agreed that the assignment was as follows:

1. Tag and assess all native trees over 5-inch Diameter at Standard Height (DSH) within the potential disturbed and restoration area for each proposed alternative. Trees along TCB in the disturbed area only were tagged. (Note this is less than the 6” requirement of the LCP but due to the anticipated time lag between preparing this report and implementation, we erred on the side of including trees that might grow into the protected range during that time.)

2. Tag any native trees under 5 inches DSH that could potentially qualify as a mitigation tree in the restoration area.
3. Confirm that tree locations are properly indicated on the 30% Conceptual Site Plan, and within all four Alternative Designs, potential fuel modification zones and landscape restoration areas.
4. Map canopy dripline limits to scale on the map and reflect current canopy extent and tree protected zones.
5. Identify any historic or heritage trees and provide recommendations on whether to remove or retain, and any associated mitigations.
6. Determine the extent of the impacts and encroachments to individual native trees proposed to remain.
7. Analyze the impacts to protected H1, H1Buffer, H2 and H3 Habitat categories as well as fuel modification zones.
8. Define the Permit Request and potential impacts in accordance with the Los Angeles County Oak Protection Ordinance and the Local Coastal Plan.
9. Identify locations for replacement planting. (To be done once a preferred alternative is selected).
10. Provide recommendations for meeting the Permit requirements for mitigating any impacts or loss of protected native trees and riparian woodlands on the site.

LIMITS OF THE ASSIGNMENT

Due to time and budget constraints, the conditions of the trees are based upon visual assessment only. No root excavations were done. Trees along the banks within the project area along TCB were not tagged as they are outside the limits of proposed disturbance, although they are within the overall project area. A final survey of tree positions will be completed once the preferred alternative is selected.

PURPOSE AND USE OF THE REPORT

The purpose of this report is to provide all information needed to meet the requirements of the California Coastal Commission and Los Angeles County Local Coastal Program related to implementing the proposed restoration and applying for a Conditional Use Permit (CUP). Mitigation recommendations incorporate those required by Los Angeles County, State Parks and other relevant permitting agencies such as CA Department of Fish and Wildlife.

SITE DESCRIPTION

The Topanga Lagoon Restoration Project is located on State Parks parcels APN 4448-002-900 and 4448-002-901on the north side of Pacific Coast Highway (PCH) and west of Topanga Canyon Blvd. Also included is parcel 4448-001-900, which is owned by the Los Angeles County Department of Beaches and Harbors.

Figure 1. Topanga Lagoon Restoration Planning Area Parcel Map

PROJECT DESCRIPTION

The Topanga Lagoon Restoration Project is a coordinated multiagency plan that seeks to expand the existing lagoon footprint, which is less than 1 acre, to 7-10 acres, a significant portion of its former 30-acre extent. The project will address the current causes of resource damage, while proactively building resilience to future environmental challenges. This plan also seeks to improve coastal access and recreation in a way that supports and enhances biological and cultural values.

The range of alternatives allows us to consider the benefits and challenges of the different restoration approaches. This allows a final preferred alternative to be chosen at the end of the environmental review process that best meet the project's needs. Analysis of potential native tree impacts will be factored into that decision.

Alternative 1: No Project/Managed Decline (0 acres restored):

Change in tree condition would occur in response to drought but no other actions.

Under this alternative, the project would not occur. Therefore, there would be no change to the lagoon footprint or habitat quality, and no new bridge would be constructed. Damage to the lifeguard headquarters due to coastal erosion would continue to occur and would likely require future relocation by another project. The Topanga Ranch Motel would continue to deteriorate, and existing non-conforming concessions and septic systems are anticipated to be restricted in the future. No improvements to habitat would occur and non-native trees would remain along with the Arundo patches. Sea level rise

would continue to reduce beach area available and threaten the integrity of the Pacific Coast Highway. Figure 1 provides an overview of the project area showing section boundaries which correspond to detailed maps for each section showing tree locations and tree protected zones (TPZ) which are found in Figures 4-7. CDPR is the landowner for all sections north of PCH, and DBH is the landowner for the sections south of PCH.

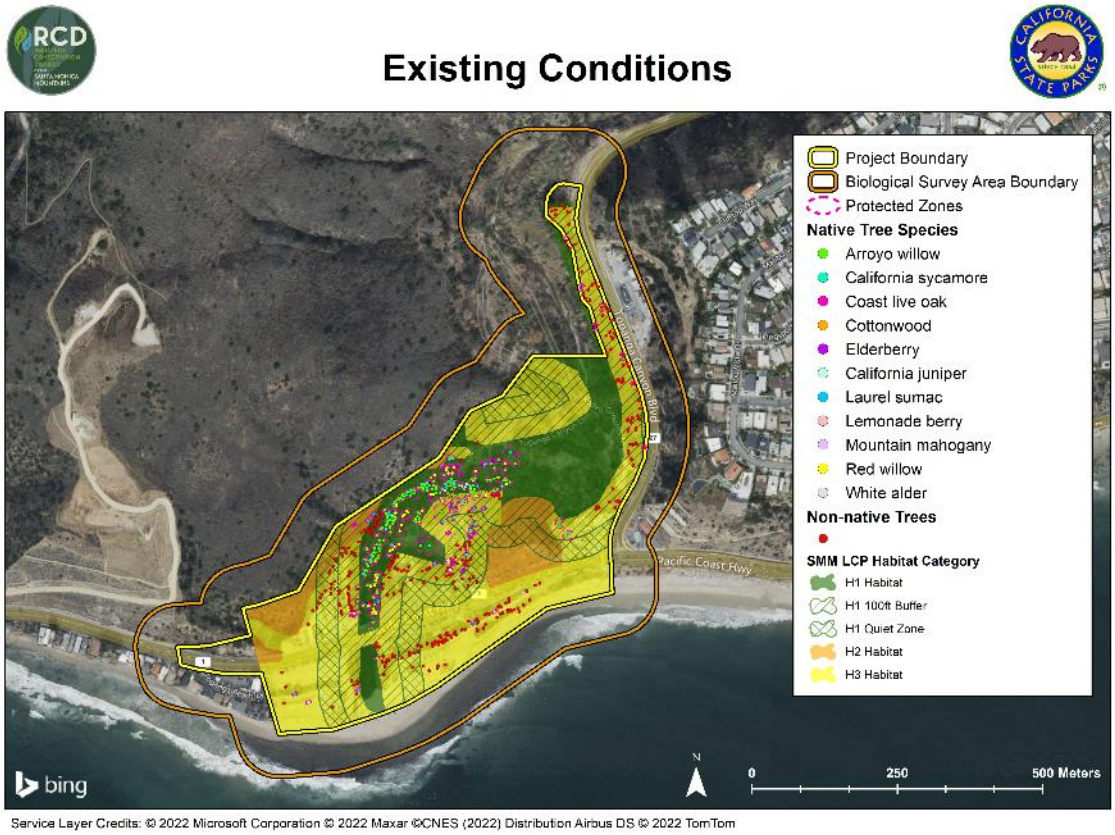

Figure 2. Existing Conditions Showing LCP Habitat Zones

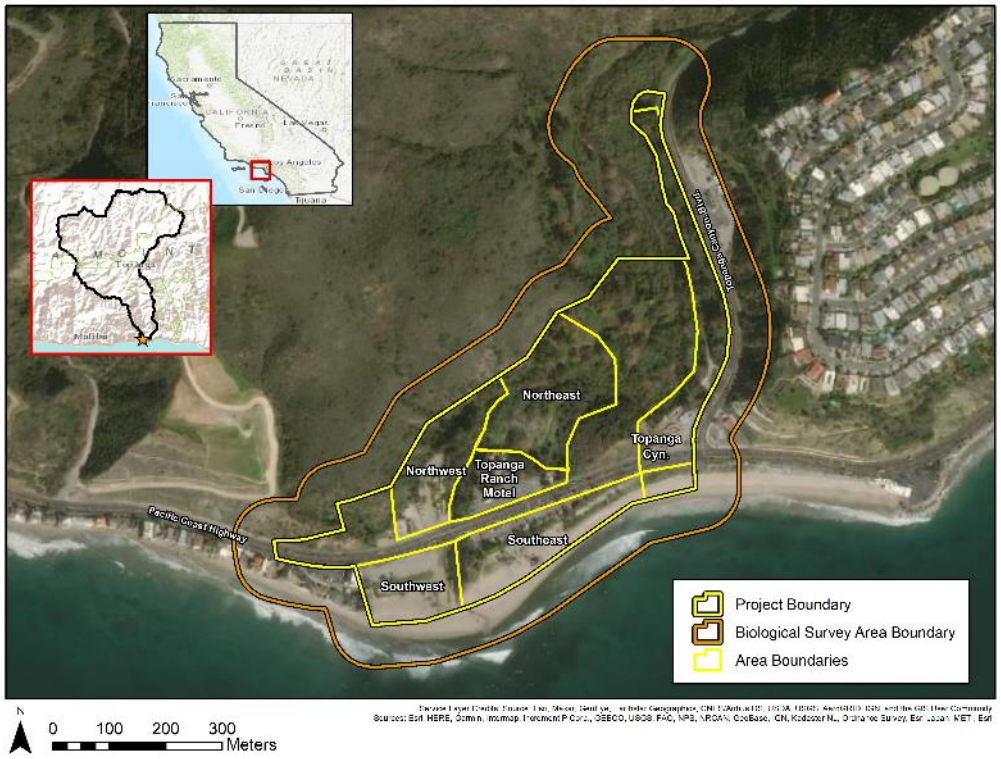

Figure 3. Overall Topanga Lagoon Restoration Project Area Sections

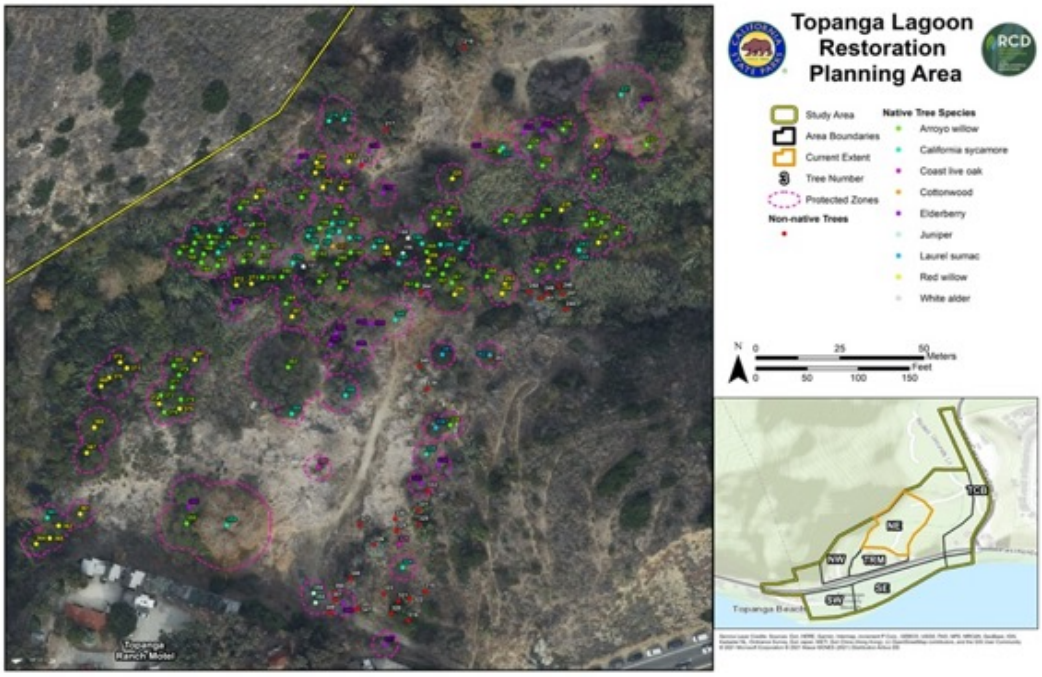

Figure 4. Existing Conditions - Northeast

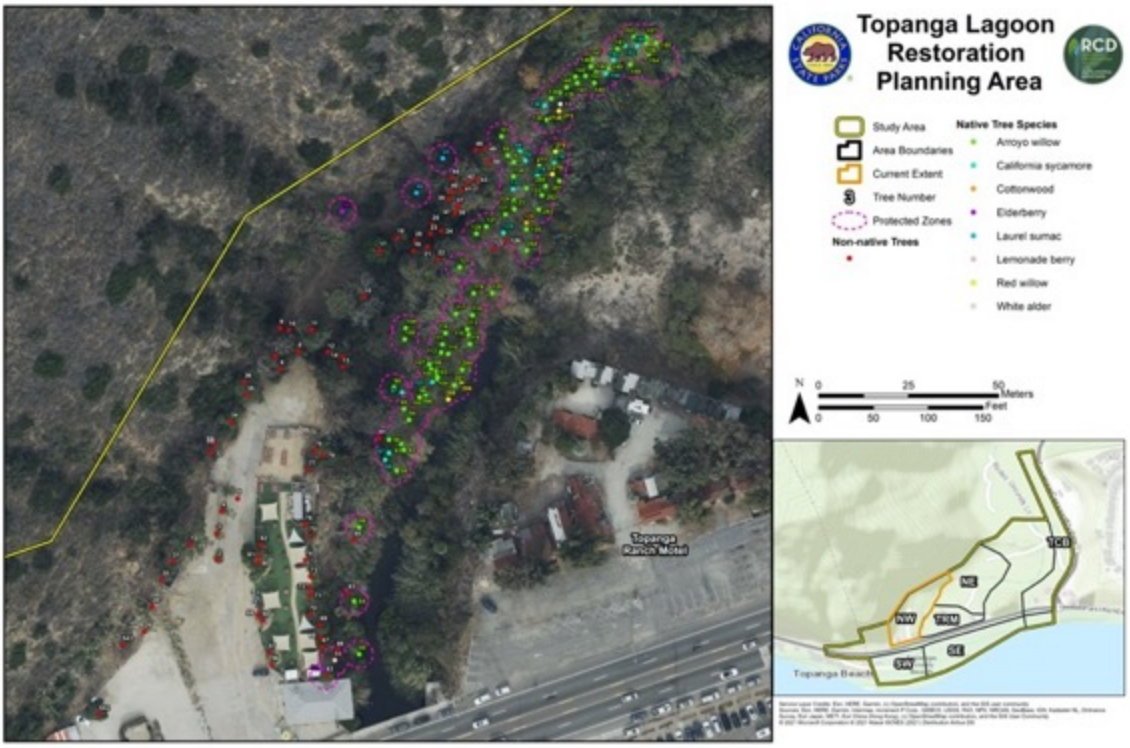

Figure 5. Existing Conditions - Northwest

Figure 6. Existing Conditions - Topanga Ranch Motel

Figure 7. Existing Conditions - Southeast

Figure 8. Existing Conditions - Southwest

Actions Common to All Project Alternatives.
Alternatives 2-4 are the "Project Alternatives". Each of these alternatives provides a different road map to restoring the lagoon, buffering its resources from future sea level rise, and meeting the project goals. However, these Project Alternatives have many things in common.

Under all Project Alternatives the lagoon area would be expanded with wetted areas encompassing 7-10 acres. This would require removing much of the existing artificial fill onsite to create a more natural topography and expanded open space areas. The native trees growing on the wetted banks, as well as others that have been identified as important biological resources will be retained in all alternatives with grading starting inland of the protected zone. Grading will also be avoided within the footprint of the existing wetted lagoon, creek channel, and the beach berm at its mouth.

The project area would be improved by replacing invasive plants with native wetland, riparian and upland vegetation. Relocation of key buildings, structures and infrastructure and undergrounding of associated utilities would occur to facilitate this.

The length of the existing Caltrans bridge would be expanded to accommodate a widened lagoon and would improve fish migration and the quantity/quality of lagoon habitats. The primary bridge span would increase to 200 feet, with secondary/side spans extending 130 ft on either side for a total length of 460 ft.

A plan for determining the final fate of the Topanga Ranch Motel is included in each alternative, as are relocated locations for concessions and parking. Prehistoric cultural sites would be protected in place.

Coastal access and interpretive elements would be included in all alternatives. This includes pedestrian access under PCH on the east and west sides of the lagoon, and several options for emergency vehicle access on the east. The lifeguard tower, beach restrooms and emergency facilities would be relocated further inland from the ocean and existing wetted areas edge to address existing storm damage, and to better protect against future sea level rise and coastal erosion.

It should be noted that some of the options included in a specific alternative could be "mixed and matched" to create the best feasible alternative. This includes: keeping the expanded Caltrans bridge at the same location or shifting inland; full or partial retention of the Topanga Ranch Motel and some onsite concessions; inclusion of more than one wetted lagoon channel; expanding existing beach area through bridge realignment; alternative emergency access routes to the beach; and final placement of relocated beach facilities. The array of alternatives was chosen to show the full range of options available.

Topanga Canyon Boulevard Visitor Services
Depending on the alternative selected, moving some visitor services (concessions, visitor center, parking, etc.) to the upper terraced zone adjacent to the west side of Topanga Canyon Boulevard (TCB) is proposed. The potential for wastewater services, slope

stabilization, etc. are in development. Mapping trees in this area was restricted to the top of slope and does not include trees extending into the 200-foot buffer zone as they are at a different, lower elevation, buffered by large Arundo patches, outside the potential disturbed area, and are not expected be impacted. Several CA walnut trees were noted as native species of special concern found on those slopes and they will be tagged during the final survey once a preferred alternative is selected. Figure 9 provides details of tree locations for this portion of the project area.

Figure 9. All Trees Within the Topanga Canyon Blvd. Potential Restoration Area.

Alternative 2: Lagoon Habitat Maximized, Removal of Motel (9.5 wetted acres, as part of 13.6 acres restored):

Native trees located on the wetted banks will be retained, along with those in the northern floodplain area that have been identified as biologically significant. Most of the non-native trees would be removed, although a few may be retained along the slope south of PCH as well as some of the memorial palms on the beach. Restoration of riparian, transitional and upland vegetation will expand the riparian corridor and allow for the creek to naturally respond to changes in sea level rise.

This alternative provides the maximum increase in lagoon, wetland, riparian and transitional habitats. It includes restoration of more natural side channels on the western side of the lagoon that are based on historic topography and would accommodate changing sea level and storm surge conditions. The historic Topanga Ranch Motel and onsite concessions would be removed from the project area. Replacement of public parking, and visitor services would occur along the west side of TCB in the project area.

The lifeguard headquarters, beach restroom and helipad are currently threatened by coastal erosion. To protect from future damage, they will be demolished and rebuilt closer to the realigned access road.

Figure 10 provides an overview of the LA County habitat zones as they are currently mapped and Figure 11 identifies the ecological constraints and jurisdictional delineation boundaries that are guiding restoration grading. The boundaries may change slightly based on updated mapping conducted for the Biological Report and once a final alternative is selected, any changes to tree position within the H zones will be updated.

Detailed maps showing tree protected zones, habitat zones and fuel modification zones in relation to the current extent of proposed grading for each alternative are found in Appendix A.

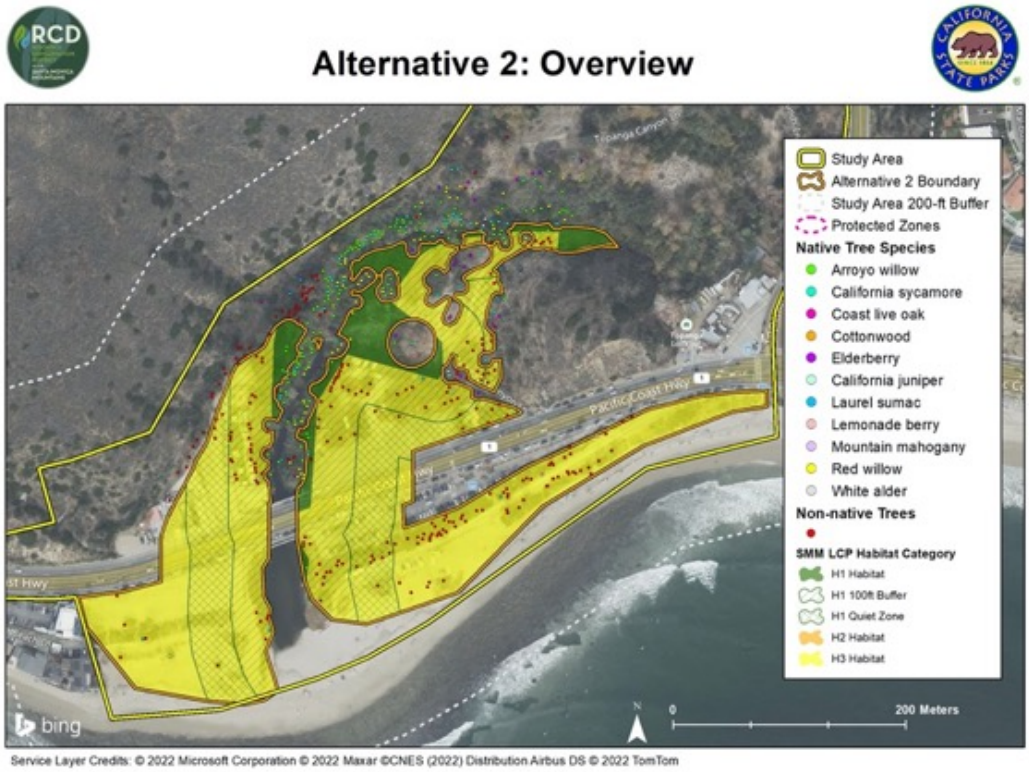

Figure 10. All Trees within the Alternative 2 and 200 ft Buffer Zone Using LACO Habitat Overlay.

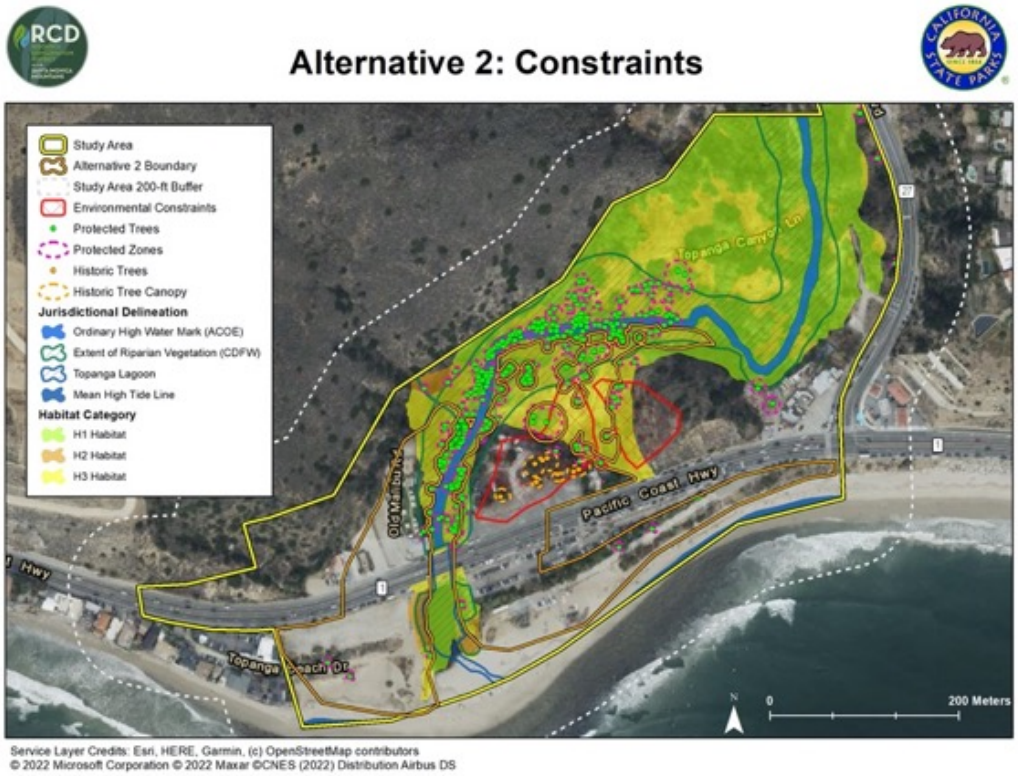

Figure 11. All Trees within the Alternative 2 and 200 ft Buffer Zone Using LACO Habitat Overlay Showing Ecological Constraints and Jurisdictional Delineation.

Alternative 3: Least Lagoon Habitat Expansion, Retention of Motel (7.1 wetted acres, as part of 9.8 acres restored):

Native trees located on the wetted banks will be retained, along with those in the northern floodplain area that have been identified as biologically significant. Most of the non-native trees would be removed, although up to eight of the mature eucalyptus trees (Trees #393, 394, 395, 419, 420, 421, 422, 424), a Canary Island Palm (Tree #423) and mature Euphorbia (Tree #425) deemed historic as part of the Topanga Ranch Motel will be retained within the renovated motel footprint. Restoration of riparian, transitional and upland vegetation will expand the riparian corridor and allow for the creek to naturally respond to changes in sea level rise. On the south side of PCH, most of the non-native trees would be removed and replaced with native species. Memorial palms located on the beach may be retained.

This alternative also provides some expanded lagoon, wetland, riparian and transitional habitat in the western part of the project but allows for only one main channel.

The Topanga Ranch Motel is renovated in its historic configuration. One existing concession (currently the Reel Inn restaurant) would be remodeled and continue to be operated. No other existing concessions would remain along PCH. Replacement of public parking, and visitor services would occur along the west side of TCB in the project area. The lifeguard headquarters would be demolished and rebuilt slightly east, and the helipad is on the same level as PCH and parking lot.

Figure 12 provides an overview of the LA County habitat zones as they are currently mapped and Figure 13 identifies the ecological constraints and jurisdictional delineation boundaries that are guiding restoration grading. The boundaries may change slightly based on updated mapping conducted for the Biological Report and once a final alternative is selected, any changes to tree position within the H zones will be updated.

Detailed maps showing tree protected zones, habitat zones and fuel modification zones in relation to the current extent of proposed grading for each alternative are found in Appendix A.

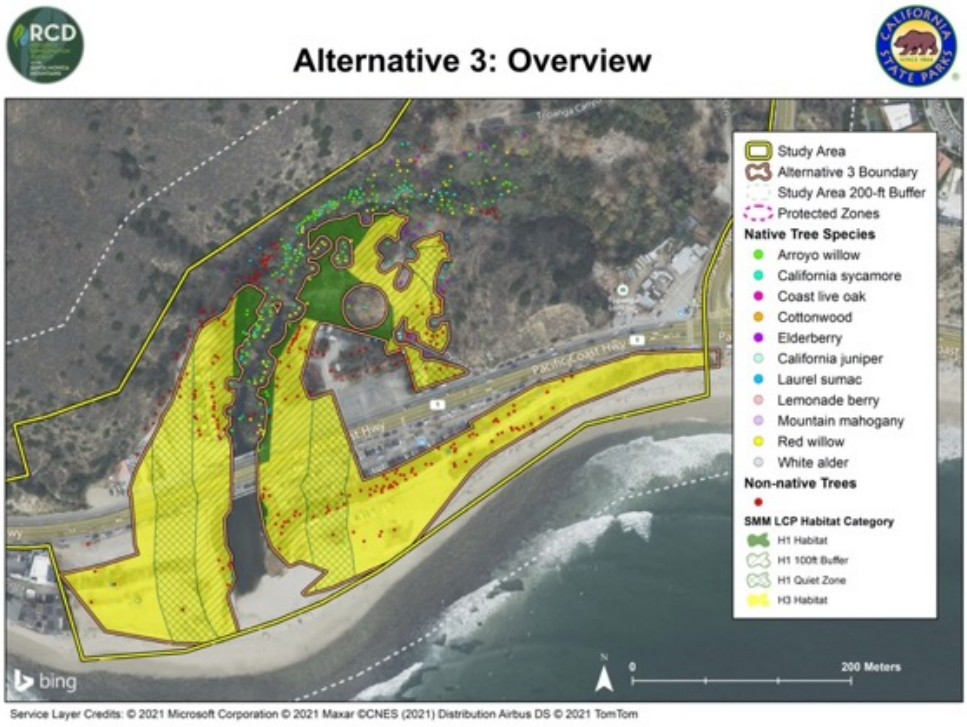

Figure 12. All Trees Within the Alternative 3 and 200 ft Buffer Zone Using LACO Habitat Overlay.

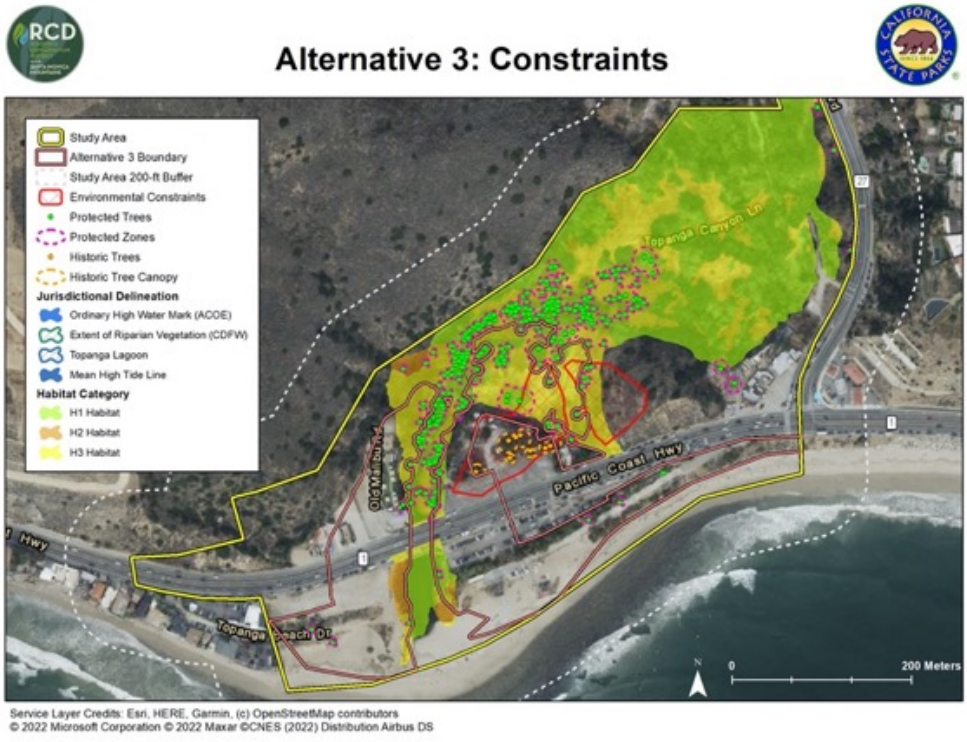

Figure 13. All Trees within the Alternative 3 and 200 ft Buffer Zone Using LACO Habitat Overlay Showing Ecological Constraints and Jurisdictional Delineation.

Alternative 4: Maximum Managed Retreat, Partial Motel Retention (7.1 wetted acres, as part of 10.8 acres restored):

Native trees located on the wetted banks will be retained, along with those in the northern floodplain area that have been identified as biologically significant. Most of the non-native trees would be removed, although up to seven of the mature eucalyptus trees (Trees #394, 395, 419, 420, 421, 422, 424), a Canary Island Palm (Tree #423) and mature Euphorbia (Tree #425) deemed historic as part of the Topanga Ranch Motel could be retained within the renovated motel footprint. Restoration of riparian, transitional and upland vegetation will expand the riparian corridor and allow for the creek to naturally respond to changes in sea level rise. On the south side of PCH, the non-native trees will be removed and replaced with native species. Memorial palms located on the beach may be retained.

The alignment of PCH moves north in this alternative, permitting the maximum amount of beach area and managed retreat. A portion of the historic Topanga Ranch Motel is retained with parking adjusted and allows for a concession, while also providing expanded lagoon, wetland, riparian and transitional habitat mostly on the west. No other concessions remain and parking locations shift. Replacement of public parking, and visitor services would occur along the west side of TCB in the project area. The helipad and lifeguard headquarters are not as closely sited. This alternative maximizes managed retreat and provides the most sea level rise resilience.

Figure 14 provides an overview of the LA County habitat zones as they are currently mapped and Figure 15 identifies the ecological constraints and jurisdictional delineation boundaries that are guiding restoration grading. The boundaries may change slightly based on updated mapping conducted for the Biological Report and once a final alternative is selected, any changes to tree position within the H zones will be updated.

Detailed maps showing tree protected zones, habitat zones and fuel modification zones in relation to the current extent of proposed grading for each alternative are found in Appendix A.

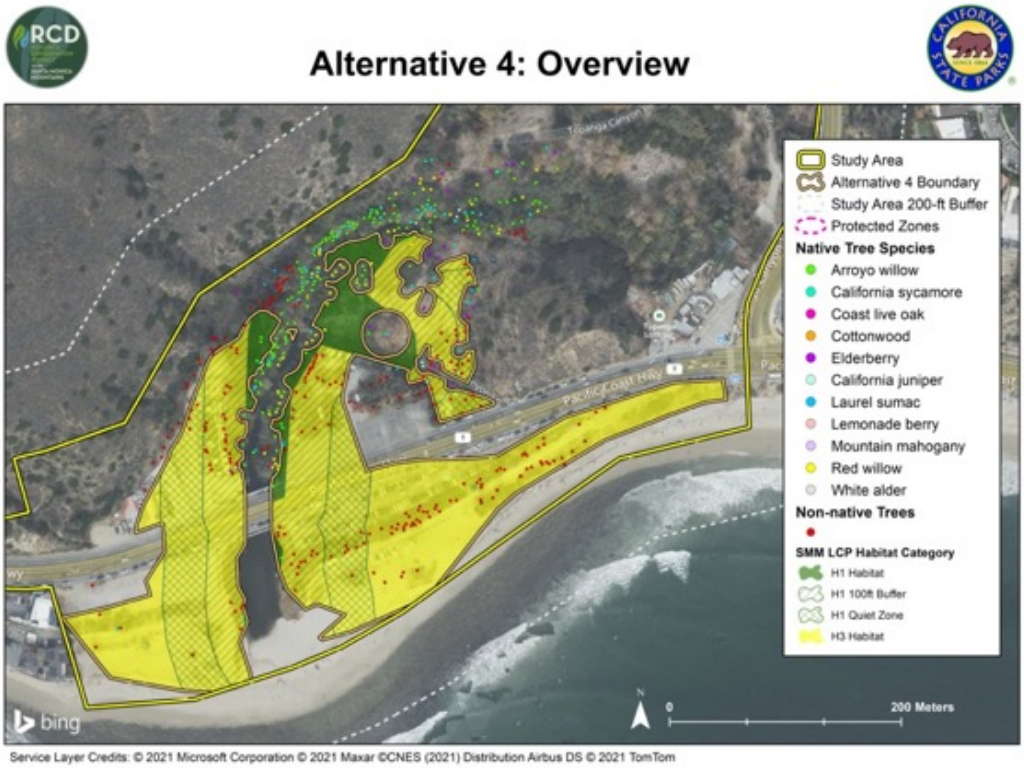

Figure 14. All Trees within the Alternative 4 and 200 ft Buffer Zone Using LACO Habitat Overlay.

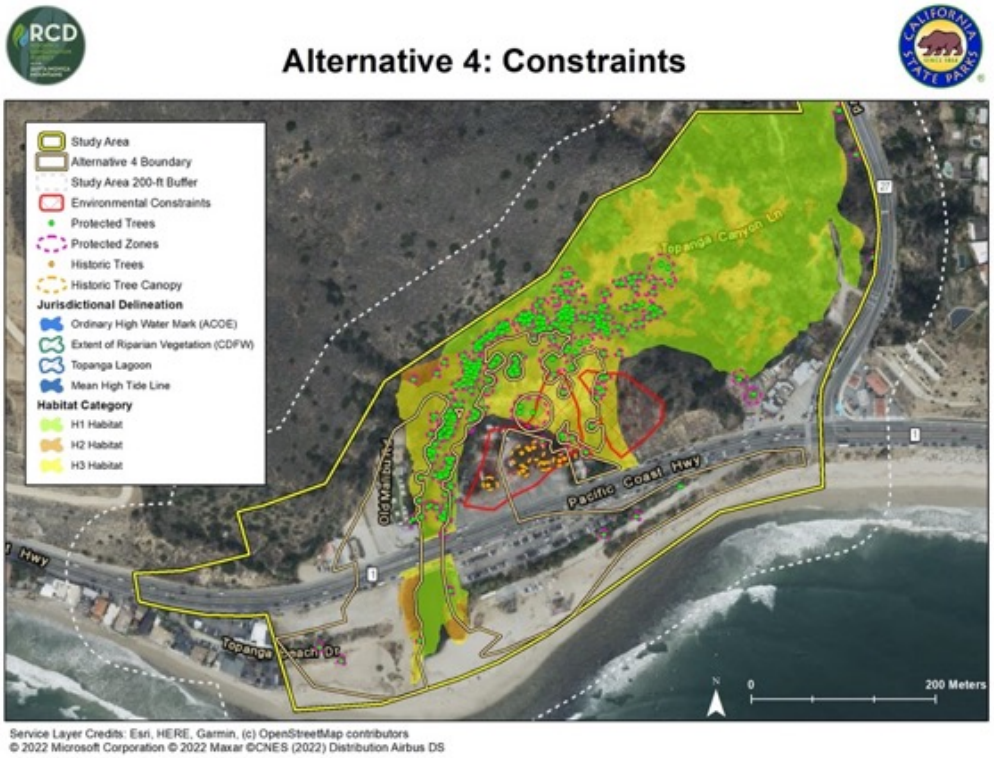

Figure 15. All Trees within the Alternative 4 and 200 ft Buffer Zone Using LACO Habitat Overlay Showing Ecological Constraints and Jurisdictional Delineation.

METHODS FOR TREE INVENTORY

Data for this report was collected between March - November 2021. All trees with a single trunk over five inches in diameter, or having more than two trunks with a combined diameter of over eight inches, were tagged with round, stamped, numbered tags at approximately 54 inches above grade (DSH= diameter at standard height) on the north side of the tree (unless inaccessible). Note that although the county requirement for a protected native tree is 6 inch for a single trunk, due to the time lag between the initial field assessment and implementation, we anticipated potential growth of native trees and identified all potentially protected trees. Non-native trees with one trunk larger than 6 inches or two trunks adding to more than 8 inches were also tagged.

Native trees under 5 inch diameter were also tagged to document demography of the site and identify potential volunteer trees that could be used for mitigation. Tree height was visually estimated, number of trunks and DSH were measured and canopy extent estimated in four cardinal directions. Tree protected zones (TPZ) were mapped based on the outer dripline of the tree canopy plus either 5 ft or 15 ft from a trunk, depending on which is larger.

Tag numbers between 0-642 were used with the exception of 26, 27, 169, 337 and 344 which were lost.

Tree location was mapped using the EOS Positioning Systems Arrow 100. The geographic coordinate system used was WGS 1984, and the projection used was Mercator Auxiliary Sphere. The range of accuracy was 0.30 to 3 meters. Data was collected using ArcGIS Collector, and maps were created using ESRI Arcmap 10.8. Quality Assurance/Quality Control review of the data fields and map locations was conducted. Latitude and longitude coordinates are provided in decimal degrees.

Once a preferred alternative is selected the final tree survey will be conducted to verify locations of all trees within the potentially disturbed area and 200 ft buffer zone in accordance with county standards.

Table 12. Metadata for Maps

File name	File type	Properties (coordinates, etc)	Source/date
LA County H Zones	Shapefile	NAD 1983/GCS1983	LA County, unk date
Vegetation Alliances	Shapefile	NAD 1983/GCS 1983	National Park Service, 2007
Basemap imagery	Basemap	n/a	Maxar/ESRI, 2/2/2020
Impact area	Map layer	NAD 1983/GCS 1983	RCDSMM?
School site boundary	Map layer	NAD 1983/GCS 1983	Courtney M, April 2020
Impact area 200-ft buffer	Map layer	NAD 1983/GCS 1983	Courtney M, April 2020

CA State Parks Boundary	Shapefile	unknown	Noa, April 2020
Updated H Zones	Map layer	NAD 1983/GCS 1983	Courtney M, April 2020
Updated vegetation alliances	Map layer	NAD 1983/GCS 1983	Courtney M, April 2020

Trees were assigned a health and vigor rating based on a summary of the condition of roots, trunk, scaffold branches, small branches and twigs, and foliage according to the standards of the *International Society of Arboriculture Guide to Judging Plant Condition*. Each factor was given a point score according to the guidelines (5 being the highest score, 1 the worst). The total value was divided by 25 (the maximum number of points possible) and multiplied by 100 to obtain a percent rating. Notes on pests, disease, mechanical injury, constrained roots or other potential impacts were also documented.

Excellent (90-100%) - A healthy and vigorous tree characteristic of its species and reasonably free of any visible signs of stress, disease or pest infestation.

Good (70-89%) - A healthy and vigorous tree characteristic of its species with less than 25% of the tree affected by visible signs of stress, disease or pest infestation.

Fair (50-69%) - A healthy and vigorous tree characteristic of its species with 25-75% of the tree affected by visible signs of stress, disease or pest infestation.

Poor (25-49%) - Greater than 75% of this tree is affected by visible signs of stress, disease or pests and appears to be in a general state of decline.

Very Poor/Dead (0-24%) - The tree exhibits few, if any, signs of life.

A summary of all Protected native trees by species and size class is provided in Table 10, with Table 14 summarizing all the non-native trees found. Full details on each individual tree are found in Appendix B. Photos of each tree are found in Appendix C. Heritage Trees (those natives with a single trunk greater with a diameter of over 36 inches) are in bold in the appendix tables. Historic trees are also noted. A summary of the number of each species of native trees located within each alternative disturbed area are listed in Tables 12 and 13.

Native Tree Summary

There are a total of 292 native trees in the project area of which 270 are of protected size plus 15 undersized natives in the overall project area summarized in Tables 10 and 11. Details on tree identification, scientific and common name, location (latitude and longitude in decimal degrees), recommended action (retain, remove), % encroachment into the protected zone, DSH, condition and comments are found in Appendix B. Photos of all trees are found in Appendix C.

Table 13. Summary of 270 Protected and 15 undersized Native Trees in the Topanga Lagoon Restoration Planning Area

Common Name	Scientific Name	Total Number <5" DSH	Total Number 5-20" DSH	Total Number 20.1-36" DSH	Total Number >36" DSH	Total Number
White Alder	*Alnus rhombifolia*	0	2	0	2	**4**
Mountain mahogany	*Cercocarpus sp.*	0	1	0	0	**1**
Juniper*	*Juniperus californica*	0	2	2	0	**4**
Laurel Sumac	*Malosma laurina*	0	8	4	0	**12**
California Sycamore	*Platanus racemosa*	6	31	4	3	**44**
Cottonwood	*Populus fremontii*	0	2	0	0	**2**
Coast Live Oak	*Quercus agrifolia*	1	2	0	0	**3**
Lemonade Berry	*Rhus integrifolia*	0	3	0	0	**3**
Arroyo Willow	*Salix lasiolepsis*	8	90	28	16	**142**
Red Willow	*Salix laevigata*	0	22	14	14	**50**
Elderberry	*Sambucus nigra*	0	6	7	7	**20**
	TOTAL	**15**	**169**	**59**	**42**	**285**

*Junipers are remnants of past landscaping and not native to the area.

Additionally, there are 7 native trees of protected size representing four species located along Topanga Canyon Blvd. summarized in Table 11.

Table 14. Summary of Seven Protected Native Trees on Topanga Canyon Blvd.

Tree Number	Common Name	Scientific Name	DBH sum	Number of Trunks	Condition Category	Latitude	Longitude
640	CA Sycamore	*Platanus racemosa*	42	1	Good	34.04043047	-118.579964
641	CA Sycamore	*Platanus racemosa*	39	3	Good	34.04054659	-118.5801072
559	Elderberry	*Sambucus nigra*	40	3	Good	34.04361439	-118.5797774
575	Elderberry	*Sambucus nigra*	10	10	Good	34.04307558	-118.5795344
627	Laurel Sumac	*Malosma laurina*	23	8	Good	34.04152361	-118.5787778
555	Toyon	*Heteromeles arbutifolia*	17	3	Good	34.04422193	-118.5799692
596	Toyon	*Heteromeles arbutifolia*	21	10	Fair	34.04236099	-118.5789687

Native Trees to Remain

The goal of the project is habitat restoration, so to that end, all the primarily willow trees lining the wetted banks of the creek will be preserved and protected during grading. Additionally, biologically significant Trees #358-360, 383 and 388-392 will also be retained in all Alternatives and recommendations for protecting these trees during construction are included in the recommendations. Additional details for each of these trees is found in Appendix B.

Table 15. Summary of all Protected Native Trees to Remain in the Topanga Lagoon Restoration Planning Area

Tree Number	Common Name	Scientific Name	DSH Sum	Number trunks	Canopy Spread ft	Condition Category	Latitude	Longitude
16	Elderberry	Sambucus nigra	24.4	4	15	Good	34.0405401	-118.5832700
45	Laurel sumac	Malosma laurina	10.9	11	10	Good	34.0406884	-118.5829889
46	Laurel sumac	Malosma laurina	14.0	5	10	Good	34.0406010	-118.5830670
51	Arroyo Willow	Salix lasiolepsis	70.2	20	30	Good	34.0407458	-118.5828130
52	California sycamore	Platanus racemosa	7.6	1	25	Good	34.0406860	-118.5827406
55	Arroyo Willow	Salix lasiolepsis	18.5	5	25	Good	34.0406983	-118.5827934
64	Elderberry	Sambucus nigra	24.5	3	20	Fair	34.0394314	-118.5833343
65	Lemonade Berry	Rhus integrifolia	8.9	2	25	Excellent	34.0394217	-118.5832907
80	Arroyo Willow	Salix lasiolepsis	24.7	5	15	Excellent	34.0394453	-118.5831765
81	Laurel Sumac	Malosma laurina	22.0	6	15	Fair	34.0395380	-118.5831522
82	Arroyo Willow	Salix lasiolepsis	17.5	4	10	Fair	34.0395225	-118.5831756
84	Arroyo Willow	Salix lasiolepsis	14.3	4	20	Fair	34.0395750	-118.5832354
86	Arroyo Willow	Salix lasiolepsis	20.0	2	10	Good	34.0397602	-118.5832236
87	California sycamore	Platanus racemosa	9.0	2	15	Excellent	34.0399478	-118.5831369
88	Arroyo Willow	Salix lasiolepsis	13.0	5	0	Excellent	34.0399040	-118.5831132
90	Arroyo Willow	Salix lasiolepsis	10.0	4	6	Fair	34.0399811	-118.5831377
92	Arroyo Willow	Salix lasiolepsis	20.9	11	0	Fair	34.0399560	-118.5830932
93	Arroyo Willow	Salix lasiolepsis	12.0	1	40	Good	34.0399712	-118.5831010
94	Arroyo Willow	Salix lasiolepsis	11.0	3	30	Good	34.0400316	-118.5830781
98	Arroyo Willow	Salix lasiolepsis	14.3	2	20	Fair	34.0401123	-118.5831252
99	Arroyo Willow	Salix lasiolepsis	8.7	4	6	Excellent	34.0400963	-118.5830298
100	Arroyo Willow	Salix lasiolepsis	19.0	4	15	Excellent	34.0400799	-118.5830274

101	California sycamore	Platanus racemosa	5.5	1	0	Excellent	34.0401092	-118.5830340
102	California sycamore	Platanus racemosa	8.0	1	20	Excellent	34.0401271	-118.5830097
103	Arroyo Willow	Salix lasiolepsis	7.2	4	20	Excellent	34.0401352	-118.5829956
104	Arroyo Willow	Salix lasiolepsis	12.7	8	10	Good	34.0401420	-118.5829940
105	Arroyo Willow	Salix lasiolepsis	27.4	13	10	Good	34.0401540	-118.5829970
107	Arroyo Willow	Salix lasiolepsis	23.0	7	15	Good	34.0401715	-118.5830194
108	Arroyo Willow	Salix lasiolepsis	11.2	2	15	Good	34.0402336	-118.5830952
109	Arroyo Willow	Salix lasiolepsis	7.4	2	6	Good	34.0402614	-118.5830925
110	Arroyo Willow	Salix lasiolepsis	18.7	7	20	Excellent	34.0401987	-118.5829637
111	Arroyo Willow	Salix lasiolepsis	13.7	5	8	Good	34.0402220	-118.5829810
112	Arroyo Willow	Salix lasiolepsis	26.5	12	20	Good	34.0402018	-118.5829850
113	Arroyo Willow	Salix lasiolepsis	12.2	9	8	Good	34.0402607	-118.5829070
114	Arroyo Willow	Salix lasiolepsis	8.5	2	13	Good	34.0402241	-118.5828989
115	Arroyo Willow	Salix lasiolepsis	11.5	4	8	Good	34.0402472	-118.5829025
116	Arroyo Willow	Salix lasiolepsis	41.1	17	10	Good	34.0402508	-118.5829722
117	Arroyo Willow	Salix lasiolepsis	15.0	3	7	Good	34.0402991	-118.5829419
118	Arroyo Willow	Salix lasiolepsis	12.6	5	13	Good	34.0402964	-118.5828920
119	Arroyo Willow	Salix lasiolepsis	26.5	5	10	Good	34.0403516	-118.5828896
120	Arroyo Willow	Salix lasiolepsis	11.2	3	10	Good	34.0403529	-118.5828337
121	Arroyo Willow	Salix lasiolepsis	24.6	5	0	Fair	34.0404160	-118.5829330
124	Arroyo Willow	Salix lasiolepsis	11.3	11	15	Good	34.0405858	-118.5827718
125	California sycamore	Platanus racemosa	11.5	4	10	Good	34.0405041	-118.5828028
127	Arroyo Willow	Salix lasiolepsis	8.2	5	6	Good	34.0405191	-118.5828549
128	Arroyo Willow	Salix lasiolepsis	10.3	5	10	Good	34.0405006	-118.5828843
129	Cottonwood	Populus fremontii	8.0	5	6	Fair	34.0405302	-118.5827341
130	Arroyo Willow	Salix lasiolepsis	33.2	19	10	Good	34.0405140	-118.5827339
131	Arroyo Willow	Salix lasiolepsis	11.0	6	6	Good	34.0405503	-118.5827979

132	California sycamore	Platanus racemosa	11.2	5	10	Good	34.0406140	-118.5827755
133	Arroyo Willow	Salix lasiolepsis	14.4	10	6	Fair	34.0406166	-118.5827358
134	Arroyo Willow	Salix lasiolepsis	15.8	5	10	Good	34.0406454	-118.5827753
135	Arroyo Willow	Salix lasiolepsis	14.6	5	10	Good	34.0407897	-118.5826773
136	California sycamore	Platanus racemosa	10.0	1	20	Excellent	34.0408249	-118.5826846
137	White Alder	Alnus rhombifolia	7.6	2	10	Good	34.0408292	-118.5826377
138	Arroyo Willow	Salix lasiolepsis	11.7	5	10	Good	34.0408430	-118.5826658
139	Arroyo Willow	Salix lasiolepsis	19.5	8	10	Good	34.0408579	-118.5826405
140	Arroyo Willow	Salix lasiolepsis	30.4	10	10	Good	34.0408718	-118.5826199
141	Arroyo Willow	Salix lasiolepsis	6.1	2	15	Excellent	34.0408829	-118.5825874
142	Arroyo Willow	Salix lasiolepsis	8.3	3	3	Fair	34.0408986	-118.5825931
143	Arroyo Willow	Salix lasiolepsis	14.2	5	0	Fair	34.0409008	-118.5825632
144	Arroyo Willow	Salix lasiolepsis	17.2	9	20	Excellent	34.0409091	-118.5825313
145	Arroyo Willow	Salix lasiolepsis	8.1	6	15	Excellent	34.0408837	-118.5825360
146	Arroyo Willow	Salix lasiolepsis	8.3	5	10	Excellent	34.0409246	-118.5825477
148	California sycamore	Platanus racemosa	9.0	2	30	Excellent	34.0409077	-118.5825021
149	Arroyo Willow	Salix lasiolepsis	6.4	1	6	Good	34.0409208	-118.5824962
150	California sycamore	Platanus racemosa	14.7	1	25	Excellent	34.0409409	-118.5824796
151	Arroyo Willow	Salix lasiolepsis	8.3	1	15	Excellent	34.0409695	-118.5824684
152	California sycamore	Platanus racemosa	30.6	5	20	Excellent	34.0409783	-118.5824444
153	Arroyo Willow	Salix lasiolepsis	62.8	10	30	Excellent	34.0410001	-118.5824191
154	Arroyo Willow	Salix lasiolepsis	9.5	1	30	Excellent	34.0409592	-118.5823737
155	California sycamore	Platanus racemosa	11.6	1	30	Excellent	34.0409780	-118.5824090
156	Arroyo Willow	Salix lasiolepsis	8.0	2	20	Good	34.0409854	-118.5823826
157	Arroyo Willow	Salix lasiolepsis	10.0	1	10	Good	34.0410003	-118.5823815
159	Arroyo Willow	Salix lasiolepsis	14.3	5	13	Excellent	34.0409310	-118.5824286
160	Arroyo Willow	Salix lasiolepsis	17.5	3	10	Excellent	34.0410021	-118.5822224

161	Arroyo Willow	Salix lasiolepsis	16.7	2	10	Excellent	34.0410283	-118.5822933
162	Arroyo Willow	Salix lasiolepsis	16.1	5	15	Excellent	34.0410555	-118.5822448
163	Arroyo Willow	Salix lasiolepsis	25.9	5	20	Good	34.0410570	-118.5821911
164	Arroyo Willow	Salix lasiolepsis	8.5	2	10	Excellent	34.0410561	-118.5821366
165	Arroyo Willow	Salix lasiolepsis	9.0	1	10	Good	34.0409946	-118.5821700
166	Arroyo Willow	Salix lasiolepsis	6.0	1	0	Good	34.0410255	-118.5822154
167	California sycamore	Platanus racemosa	13.4	1	20	Excellent	34.0410304	-118.5821684
168	Arroyo Willow	Salix lasiolepsis	13.8	3	0	Fair	34.0410341	-118.5822537
170	California sycamore	Platanus racemosa	10.0	2	25	Excellent	34.0410778	-118.5822373
171	Arroyo Willow	Salix lasiolepsis	44.5	7	15	Excellent	34.0410740	-118.5821979
172	California sycamore	Platanus racemosa	6.8	1	10	Good	34.0410914	-118.5821626
173	Arroyo Willow	Salix lasiolepsis	11.2	2	15	Good	34.0411088	-118.5820586
175	Arroyo Willow	Salix lasiolepsis	8.5	5	10	Excellent	34.0410570	-118.5820660
176	Arroyo Willow	Salix lasiolepsis	10.6	3	3	Good	34.0410083	-118.5820869
177	Arroyo Willow	Salix lasiolepsis	15.6	5	15	Excellent	34.0410056	-118.5820325
178	Arroyo Willow	Salix lasiolepsis	22.0	4	10	Excellent	34.0410460	-118.5820249
179	California sycamore	Platanus racemosa	13.4	1	25	Excellent	34.0410045	-118.5819280
180	Arroyo Willow	Salix lasiolepsis	9.0	4	6	Excellent	34.0409664	-118.5819629
181	White Alder	Alnus rhombifolia	48.6	6	25	Excellent	34.0409956	-118.5818937
182	Arroyo Willow	Salix lasiolepsis	16.2	2	10	Good	34.0410317	-118.5818621
183	California sycamore	Platanus racemosa	5.2	1	25	Good	34.0410790	-118.5818797
184	California sycamore	Platanus racemosa	15.0	2	20	Excellent	34.0410514	-118.5818508
185	California sycamore	Platanus racemosa	7.9	1	20	Excellent	34.0410804	-118.5818130
186	Arroyo Willow	Salix lasiolepsis	5.4	1	35	Excellent	34.0411014	-118.5818432
187	Cottonwood	Populus fremontii	17.2	1	30	Excellent	34.0410524	-118.5818002
188	California sycamore	Platanus racemosa	7.2	1	20	Excellent	34.0411136	-118.5818036
190	California sycamore	Platanus racemosa	7.4	1	20	Excellent	34.0410761	-118.5817469

191	Arroyo Willow	Salix lasiolepsis	6.5	1	6	Fair	34.0411441	-118.5817939
192	Arroyo Willow	Salix lasiolepsis	9.2	4	3	Excellent	34.0411122	-118.5817421
193	Arroyo Willow	Salix lasiolepsis	13.9	7	8	Excellent	34.0410358	-118.5817421
194	California sycamore	Platanus racemosa	10.2	1	25	Excellent	34.0410525	-118.5816667
195	Red Willow	Salix laevigata	33.5	7	35	Excellent	34.0410514	-118.5816263
196	White Alder	Alnus rhombifolia	6.1	1	30	Excellent	34.0410362	-118.5815736
198	White Alder	Alnus rhombifolia	55.1	6	30	Excellent	34.0410778	-118.5815583
199	California sycamore	Platanus racemosa	6.2	1	20	Excellent	34.0410633	-118.5815129
200	California sycamore	Platanus racemosa	10.1	1	15	Excellent	34.0410614	-118.5814536
201	Red Willow	Salix laevigata	29.6	6	30	Excellent	34.0411167	-118.5814601
202	Arroyo Willow	Salix lasiolepsis	26.0	4	6	Fair	34.0411351	-118.5814775
203	Arroyo Willow	Salix lasiolepsis	17.8	5	8	Good	34.0411477	-118.5814277
204	Arroyo Willow	Salix lasiolepsis	39.0	11	10	Good	34.0411536	-118.5821001
205	Red Willow	Salix laevigata	46.7	7	25	Good	34.0411844	-118.5820492
206	Elderberry	Sambucus nigra	22.9	13	20	Excellent	34.0412816	-118.5819146
207	Arroyo Willow	Salix lasiolepsis	46.8	9	25	Good	34.0411850	-118.5819032
208	Red Willow	Salix laevigata	10.6	3	0	Poor	34.0412528	-118.5818599
209	Red Willow	Salix laevigata	37.6	8	15	Good	34.0412807	-118.5818563
210	Red Willow	Salix laevigata	15.8	5	13	Excellent	34.0412133	-118.5818347
211	Red Willow	Salix laevigata	56.1	16	20	Poor	34.0412116	-118.5817766
213	Red Willow	Salix laevigata	15.6	5	10	Excellent	34.0412849	-118.5817527
214	Elderberry	Sambucus nigra	17.6	16	25	Excellent	34.0413131	-118.5816886
215	California sycamore	Platanus racemosa	10.8	1	35	Excellent	34.0414001	-118.5817700
216	California sycamore	Platanus racemosa	14.3	2	35	Excellent	34.0413945	-118.5818183
219	Elderberry	Sambucus nigra	75.6	15	15	Excellent	34.0411999	-118.5816411
220	Red Willow	Salix laevigata	106.9	19	40	Good	34.0412422	-118.5814187
221	Arroyo Willow	Salix lasiolepsis	18.9	6	10	Good	34.0413199	-118.5812678

222	Elderberry	Sambucus nigra	18.9	12	10	Excellent	34.0413315	-118.5813138
223	California sycamore	Platanus racemosa	25.0	2	40	Excellent	34.0413289	-118.5812579
224	Elderberry	Sambucus nigra	15.0	1	20	Excellent	34.0413709	-118.5811904
225	Elderberry	Sambucus nigra	38.5	4	30	Excellent	34.0413780	-118.5811331
226	Arroyo Willow	Salix lasiolepsis	38.5	8	30	Good	34.0413813	-118.5810644
227	California sycamore	Platanus racemosa	74.5	5	55	Excellent	34.0414788	-118.5808798
228	Elderberry	Sambucus nigra	31.1	7	15	Excellent	34.0414521	-118.5808123
229	Arroyo Willow	Salix lasiolepsis	14.0	5	20	Good	34.0413328	-118.5811705
230	Arroyo Willow	Salix lasiolepsis	36.1	5	15	Good	34.0412817	-118.5811287
231	Arroyo Willow	Salix lasiolepsis	12.0	5	13	Excellent	34.0412543	-118.5809632
232	Red Willow	Salix laevigata	12.0	1	20	Good	34.0413379	-118.5809569
233	Arroyo Willow	Salix lasiolepsis	31.5	5	25	Good	34.0413426	-118.5807957
234	Arroyo Willow	Salix lasiolepsis	20.3	3	25	Excellent	34.0411002	-118.5808857
235	Red Willow	Salix laevigata	7.0	2	20	Excellent	34.0410736	-118.5809452
236	Arroyo Willow	Salix lasiolepsis	23.8	3	20	Excellent	34.0411283	-118.5809368
237	Arroyo Willow	Salix lasiolepsis	24.8	5	15	Excellent	34.0411373	-118.5809644
238	Arroyo Willow	Salix lasiolepsis	14.4	3	20	Excellent	34.0411213	-118.5809863
239	Red Willow	Salix laevigata	41.5	3	40	Excellent	34.0411606	-118.5810661
240	Arroyo Willow	Salix lasiolepsis	5.5	1	10	Fair	34.0411453	-118.5811269
241	Arroyo Willow	Salix lasiolepsis	15.8	3	15	Excellent	34.0411283	-118.5811847
242	Arroyo Willow	Salix lasiolepsis	9.3	2	15	Excellent	34.0411299	-118.5812433
243	California sycamore	Platanus racemosa	6.0	2	18	Excellent	34.0410534	-118.5810077
245	Arroyo Willow	Salix lasiolepsis	25.3	2	15	Excellent	34.0410052	-118.5810736
252	Arroyo Willow	Salix lasiolepsis	11.5	1	10	Good	34.0409937	-118.5811399
253	Red Willow	Salix laevigata	59.4	7	20	Excellent	34.0409550	-118.5812441
254	Red Willow	Salix laevigata	8.5	2	6	Fair	34.0409300	-118.5812526
255	Arroyo Willow	Salix lasiolepsis	17.0	2	20	Good	34.0409756	-118.5813016

256	Red Willow	Salix laevigata	64.5	6	40	Excellent	34.0409253	-118.5814053
257	Arroyo Willow	Salix lasiolepsis	33.8	7	18	Good	34.0409572	-118.5814150
258	California sycamore	Platanus racemosa	6.8	1	20	Excellent	34.0410512	-118.5813892
259	Red Willow	Salix laevigata	9.9	3	10	Good	34.0410152	-118.5814919
260	Arroyo Willow	Salix lasiolepsis	10.6	1	25	Excellent	34.0409790	-118.5814928
261	Arroyo Willow	Salix lasiolepsis	12.5	1	20	Excellent	34.0409807	-118.5814454
262	Arroyo Willow	Salix lasiolepsis	7.9	1	25	Excellent	34.0410057	-118.5814324
263	Arroyo Willow	Salix lasiolepsis	32.0	3	25	Good	34.0409496	-118.5815269
265	Arroyo Willow	Salix lasiolepsis	6.7	1	0	Fair	34.0410406	-118.5814972
266	Arroyo Willow	Salix lasiolepsis	31.0	2	30	Fair	34.0410045	-118.5817843
267	Arroyo Willow	Salix lasiolepsis	40.9	4	40	Good	34.0409553	-118.5818407
268	Arroyo Willow	Salix lasiolepsis	42.0	5	20	Fair	34.0409393	-118.5817757
269	Arroyo Willow	Salix lasiolepsis	19.3	5	25	Fair	34.0408938	-118.5819478
270	Arroyo Willow	Salix lasiolepsis	59.1	18	25	Good	34.0409641	-118.5820251
271	Red Willow	Salix laevigata	15.5	2	35	Good	34.0409468	-118.5820602
272	Red Willow	Salix laevigata	52.8	16	20	Good	34.0409421	-118.5821082
273	Red Willow	Salix laevigata	20.6	5	20	Good	34.0407951	-118.5826415
274	Red Willow	Salix laevigata	16.2	5	20	Good	34.0408118	-118.5826413
275	Red Willow	Salix laevigata	8.3	2	10	Fair	34.0407096	-118.5826496
276	California sycamore	Platanus racemosa	6.1	2	20	Excellent	34.0406810	-118.5826531
277	Red Willow	Salix laevigata	27.6	5	20	Excellent	34.0406721	-118.5826980
278	Red Willow	Salix laevigata	22.2	7	15	Good	34.0406531	-118.5826585
279	California sycamore	Platanus racemosa	6.4	2	6	Good	34.0406484	-118.5827020
280	Arroyo Willow	Salix lasiolepsis	7.1	3	13	Good	34.0406228	-118.5826777
282	Arroyo Willow	Salix lasiolepsis	11.5	2	15	Good	34.0406002	-118.5826889
283	Arroyo Willow	Salix lasiolepsis	12.8	2	20	Good	34.0405643	-118.5826979
284	Arroyo Willow	Salix lasiolepsis	22.5	5	13	Good	34.0404611	-118.5827320

285	Arroyo Willow	Salix lasiolepsis	15.2	6	10	Good	34.0401596	-118.5829203
286	Red Willow	Salix laevigata	12.9	4	10	Fair	34.0401218	-118.5829094
287	Arroyo Willow	Salix lasiolepsis	32.5	5	20	Fair	34.0401124	-118.5829308
288	Red Willow	Salix laevigata	16.7	6	15	Fair	34.0400866	-118.5829310
289	Arroyo Willow	Salix lasiolepsis	25.3	5	20	Good	34.0398986	-118.5829567
290	Red Willow	Salix laevigata	24.2	7	10	Excellent	34.0399147	-118.5829637
291	Arroyo Willow	Salix lasiolepsis	18.3	4	18	Excellent	34.0399118	-118.5829151
292	Red Willow	Salix laevigata	27.4	5	15	Excellent	34.0398822	-118.5829349
293	Red Willow	Salix laevigata	20.1	6	5	Fair	34.0398394	-118.5829508
294	Arroyo Willow	Salix lasiolepsis	12.4	2	20	Good	34.0398023	-118.5829666
295	Red Willow	Salix laevigata	20.6	3	25	Excellent	34.0397810	-118.5829772
296	Arroyo Willow	Salix lasiolepsis	7.3	1	0	Fair	34.0397874	-118.5830317
297	Red Willow	Salix laevigata	22.8	2	6	Fair	34.0397661	-118.5830289
298	Arroyo Willow	Salix lasiolepsis	21.3	2	10	Good	34.0397782	-118.5830824
300	Arroyo Willow	Salix lasiolepsis	33.9	10	20	Good	34.0397063	-118.5829367
301	Arroyo Willow	Salix lasiolepsis	16.8	8	18	Good	34.0396811	-118.5829271
302	Laurel Sumac	Malosma laurina	12.8	5	10	Excellent	34.0395888	-118.5829117
303	Laurel Sumac	Malosma laurina	8.8	5	6	Excellent	34.0395687	-118.5829228
305	Arroyo Willow	Salix lasiolepsis	18.0	3	6	Good	34.0396232	-118.5829847
306	Arroyo Willow	Salix lasiolepsis	36.7	6	30	Good	34.0395339	-118.5829708
307	Red Willow	Salix laevigata	14.0	1	25	Good	34.0394796	-118.5829940
308	Coast Live Oak	Quercus agrifolia	18.0	1	30	Excellent	34.0394425	-118.5830277
309	Red Willow	Salix laevigata	26.9	3	20	Good	34.0394472	-118.5829820
310	Red Willow	Salix laevigata	5.8	1	6	Fair	34.0394377	-118.5829539
311	Red Willow	Salix laevigata	12.3	5	10	Good	34.0394269	-118.5830066
312	Red Willow	Salix laevigata	10.1	3	6	Good	34.0394173	-118.5829625
313	Arroyo Willow	Salix lasiolepsis	34.8	4	15	Good	34.0393069	-118.5830011

314	Red Willow	Salix laevigata	18.0	3	3	Fair	34.0395182	-118.5830662
317	Elderberry	Sambucus nigra	14.3	5	20	Good	34.0400048	-118.5816028
324	California sycamore	Platanus racemosa	7.7	2	10	Excellent	34.0401764	-118.5815582
333	Elderberry	Sambucus nigra	82.5	11	20	Good	34.0404473	-118.5814917
334	Elderberry	Sambucus nigra	50.0	7	15	Good	34.0404976	-118.5814396
335	California sycamore	Platanus racemosa	8.6	5	10	Excellent	34.0405281	-118.5814781
336	Laurel Sumac	Malosma laurina	34.1	9	15	Good	34.0406018	-118.5814488
338	Arroyo Willow	Salix lasiolepsis	41.4	4	20	Fair	34.0406093	-118.5814025
341	Laurel Sumac	Malosma laurina	34.9	12	30	Excellent	34.0408032	-118.5814590
342	Laurel Sumac	Malosma laurina	13.0	7	15	Excellent	34.0407893	-118.5812920
345	California sycamore	Platanus racemosa	70.9	8	40	Excellent	34.0408536	-118.5815947
346	Elderberry	Sambucus nigra	24.4	7	20	Good	34.0400535	-118.5817457
354	Juniper*	Juniperus californica	7.6	2	20	Excellent	34.0399774	-118.5818070
355	Juniper*	Juniperus californica	8.5	1	15	Excellent	34.0400707	-118.5818233
356	Juniper*	Juniperus californica	18.3	5	25	Excellent	34.0400964	-118.5818296
357	Laurel Sumac	Malosma laurina	18.4	12	10	Excellent	34.0400845	-118.5820735
358	Arroyo Willow	Salix Lasiolepsis	51.5	2	35	Excellent	34.0403038	-118.5822054
359	California sycamore	Platanus racemosa	71.5	3	48	Excellent	34.0403032	-118.5821423
360	Elderberry	Sambucus nigra	12.5	3	10	Excellent	34.0403492	-118.5821978
361	Red Willow	Salix laevigata	20.0	2	15	Excellent	34.0403095	-118.5826000
362	Red Willow	Salix laevigata	41.7	3	10	Good	34.0402763	-118.5826684
363	California sycamore	Platanus racemosa	24.4	2	25	Excellent	34.0402977	-118.5827052
364	Arroyo Willow	Salix laevigata	43.0	3	20	Excellent	34.0402258	-118.5827399
365	Red Willow	Salix laevigata	9.5	1	10	Good	34.0402421	-118.5826962
366	Arroyo Willow	Salix Lasiolepsis	9.8	1	0	Good	34.0401614	-118.5827452

367	Red Willow	Salix laevigata	45.8	5	30	Excellent	34.0404765	-118.5825819
368	Red Willow	Salix laevigata	69.5	10	40	Excellent	34.0405467	-118.5825587
369	Red Willow	Salix laevigata	18.5	2	8	Good	34.0406600	-118.5825387
370	Red Willow	Salix laevigata	49.6	11	35	Excellent	34.0406834	-118.5825135
371	Red Willow	Salix laevigata	34.0	4	0	Good	34.0407105	-118.5824568
372	Arroyo Willow	Salix laevigata	25.6	3	30	Excellent	34.0407261	-118.5824786
373	Arroyo Willow	Salix Lasiolepsis	15.3	2	6	Fair	34.0406368	-118.5823473
374	Arroyo Willow	Salix laevigata	11.7	2	6	Good	34.0406138	-118.5823508
375	Arroyo Willow	Salix laevigata	13.7	3	10	Fair	34.0406016	-118.5822849
376	Arroyo Willow	Salix Lasiolepsis	7.6	2	10	Good	34.0405917	-118.5823345
377	Arroyo Willow	Salix Lasiolepsis	8.8	1	10	Excellent	34.0406597	-118.5823092
378	Arroyo Willow	Salix Lasiolepsis	18.0	2	15	Good	34.0406272	-118.5822814
379	Arroyo Willow	Salix Lasiolepsis	36.4	5	10	Good	34.0406934	-118.5822880
380	Arroyo Willow	Salix Lasiolepsis	27.4	5	20	Excellent	34.0407194	-118.5823054
381	Arroyo Willow	Salix laevigata	37.8	5	25	Good	34.0407362	-118.5822386
382	Elderberry	Sambucus nigra	23.9	10	13	Excellent	34.0408808	-118.5821202
383	Arroyo Willow	Salix lasiolepsis	68.7	9	45	Good	34.0407193	-118.5819377
384	California sycamore	Platanus racemosa	11.4	3	30	Excellent	34.0405781	-118.5818957
385	Coast Live Oak	Quercus agrifolia	9.4	5	10	Excellent	34.0404575	-118.5818471
386	California sycamore	Platanus racemosa	25.1	4	35	Excellent	34.0405270	-118.5817410
387	Arroyo Willow	Salix laevigata	35.8	5	5	Good	34.0408583	-118.5819274
388	Elderberry	Sambucus nigra	85.9	13	35	Good	34.0408453	-118.5816727
389	Elderberry	Sambucus nigra	20.5	3	15	Excellent	34.0408433	-118.5816744
390	Elderberry	Sambucus nigra	56.0	5	20	Good	34.0407715	-118.5817177
391	Elderberry	Sambucus nigra	5.1	1	6	Excellent	34.0408135	-118.5817851
392	Elderberry	Sambucus nigra	36.8	5	20	Excellent	34.0407834	-118.5818028
436	Laurel Sumac	Malosma laurina	17.9	6	25	Excellent	34.0383957	-118.5841805

438	Juniper*	Juniperus californica	19.2	2	15	Excellent	34.0382823	-118.5839961
445	Laurel Sumac	Malosma laurina	32.8	14	15	Excellent	34.0384462	-118.5832269
447	Arroyo Willow	Salix lasiolepsis	24.4	6	10	Excellent	34.0388454	-118.5829377
501	Laurel Sumac	Malosma laurina	15.8	6	14	Excellent	34.0392990	-118.5814393
516	Lemonade Berry	Rhus integrifolia	13.5	4	8	Excellent	34.0394350	-118.5811129
517	Lemonade Berry	Rhus integrifolia	7.3	2	5	Excellent	34.0394512	-118.5811222
537	Mountain mahogany	Cercocarpus sp.	10.5	6	8	Excellent	34.0396898	-118.5806932

ALTERNATIVE ANALYSIS

Table 13 summarizes the numbers of each species of native protected tree that would be removed, retained or encroached upon in the lagoon restoration area based on the 30% alternative design level. A final determination and refinement of tree impacts will be prepared as the design evolves further, thus these numbers indicate a "worse case" level of impact for each alternative. Details specific to each individual tree are found in Appendix B by tag number. All trees would remain in Alternative 1 as they are currently.

Table 16. Summary of Potential Impacts to Protected Native Trees in the Topanga Lagoon Restoration Area.

Alternative	Common Name	Scientific Name	Number to Remove	Number Encroached Upon	Number to Remain	undersize
ALTERNATIVE 1	White Alder	*Alnus rhombifolia*	0	0	4	
	Mountain Mahogany	*Cercocarpus sp.*	0	0	1	
	Toyon	*Heteromeles arbutifolia*	0	0	2	
	Juniper*	*Juniperus californica*	0	0	4	
	Laurel Sumac	*Malosma laurina*	0	0	13	
	CA Sycamore	*Platanus racemosa*	0	0	40	6
	Cottonwood	*Populus fremontii*	0	0	2	
	Coast Live Oak	*Quercus agrifolia*	0	0	2	1
	Lemonade Berry	*Rhus integrifolia*	0	0	3	
	Arroyo Willow	*Salix lasiolepsis*	0	0	134	8
	Red Willow	*Salix laevigata*	0	0	50	
	Elderberry	*Sambucus nigra*	0	0	22	
TOTAL ALTERANTIVE 1	**292**		**0**	**0**	**277**	**15**
ALTERNATIVE 2	White Alder	*Alnus rhombifolia*	0	0	4	
	Mountain Mahogany	*Cercocarpus sp.*	1	0	0	
	Toyon	*Heteromeles arbutifolia*	0	0	2	
	Juniper*	*Juniperus californica*	2	0	2	
	Laurel Sumac	*Malosma laurina*	6	1	6	
	CA Sycamore	*Platanus racemosa*	1	0	39	6
	Cottonwood	*Populus fremontii*	0	0	2	
	Coast Live Oak	*Quercus agrifolia*	0	1	1	1
	Lemonade Berry	*Rhus integrifolia*	3	0	0	
	Arroyo Willow	*Salix lasiolepsis*	12	6	116	8
	Red Willow	*Salix laevigata*	6	5	39	
	Elderberry	*Sambucus nigra*	1	1	20	
TOTAL ALTERNATIVE 2	292		**32**	**14**	**231**	**15**
ALTERNATIVE 3	White Alder	*Alnus rhombifolia*	0	0	4	
	Mountain Mahogany	*Cercocarpus sp.*	0	0	1	
	Toyon	*Heteromeles arbutifolia*	0	0	2	
	Juniper*	*Juniperus californica*	2	0	2	
	Laurel Sumac	*Malosma laurina*	6	1	6	
	CA Sycamore	*Platanus racemosa*	1	0	39	6
	Cottonwood	*Populus fremontii*	0	0	2	
	Coast Live Oak	*Quercus agrifolia*	0	1	1	1
	Lemonade Berry	*Rhus integrifolia*	3	0	0	
	Arroyo Willow	*Salix lasiolepsis*	9	7	118	8
	Red Willow	*Salix laevigata*	4	5	41	
	Elderberry	*Sambucus nigra*	1	1	20	
TOTAL ALTERNATIVE 3	292		**26**	**15**	**236**	**15**
ALTERNATIVE 4	White Alder	*Alnus rhombifolia*	0	0	4	
	Mountain Mahogany	*Cercocarpus sp.*	0	0	1	
	Toyon	*Heteromeles arbutifolia*	0	0	2	
	Juniper*	*Juniperus californica*	2	0	2	
	Laurel Sumac	*Malosma laurina*	6	1	6	
	CA Sycamore	*Platanus racemosa*	1	0	39	6
	Cottonwood	*Populus fremontii*	0	0	2	
	Coast Live Oak	*Quercus agrifolia*	0	1	1	1
	Lemonade Berry	*Rhus integrifolia*	3	0	0	
	Arroyo Willow	*Salix lasiolepsis*	9	7	118	8
	Red Willow	*Salix laevigata*	4	5	41	
	Elderberry	*Sambucus nigra*	1	1	20	
TOTAL ALTERNATIVE 4	292		**26**	**15**	**236**	**15**

Non-native Trees Summary

In addition to the native trees, the site also has 343 non-native trees representing 36 species in varying degrees of health with 252 within the proposed lagoon project area as shown in Table 14 and an additional 91 non-native trees located along Topanga Canyon Blvd. shown in Table 15. Full details for these trees are found in Appendix B.

Non-native trees within the project area will be removed with the exception of some of eucalyptus trees (Trees #393, 394, 395, 419, 420, 421, 422, 424), a Canary Island Palm (Tree #423) and mature Euphorbia (Tree #425) within the Topanga Ranch Motel footprint in Alternatives 3 and 4. These trees have been identified as historically significant for the motel and while they would all be removed for Alternative 2, all would remain in Alternative 3 and all but #393 would remain in Alternative 4. Memorial palms located on the beach may also be retained.

Table 17. Summary of all Non-native Trees in the Topanga Lagoon Restoration Planning Area

Common Name	Scientific Name	Total Number <5" DSH	Total Number 5-20" DSH	Total Number 21-36" DSH	Total Number >36" DSH	Total Number
Acacia	*Acacia sp.*	0	1	1	0	2
Aleppo Pine	*Pinus halipensis*	0	2	1	1	4
Banana	*Musa sp.*	0	1	0	0	1
Bird of Paradise	*Strelitzia reginae*	0	1	0	2	3
Black Acacia	*Acacia melanoxylon*	0	0	1	0	1
Blue Gum	*Eucalyptus globulus*	2	20	23	13	58
Brazilian Pepper	*Schinus terebinthifolia*	0	5	5	0	10
California Pepper	*Schinus mole*	0	1	0	1	2
Canary Island Palm	*Phoenix canariensis*	0	0	1	1	2
Canary Island Pine	*Pinus canariensis*	0	4	0	0	4
Chinese Elm	*Ulmus parvifolia*	0	2	0	0	2
Cypress	*Cupressus sempervirens*	0	1	1	0	2
Date Palm	*Phoenix dactylifera*	0	0	1	1	2
Dracaena	*Dracaena draco*	0	1	1	2	4
Dracaena	*Dracaena sp.*	0	13	11	6	30
Elm	*Ulmus sp.*	0	3	0	0	3
Eucalyptus	*Eucalyptus sp.*	0	4	2	0	6
Euphorbia	*Euphorbia sp.*	0	0	1	0	1
Fan Palm	*Washingtonia sp.*	0	51	10	0	61
Ficus	*Ficus benjamina*	0	5	2	0	7
Ficus	*Ficus sp.*	1	8	7	0	16
Lemon	*Citrus aurantiifolia*	0	1	0	0	1
Mexican Fan Palm	*Washingtonia robusta*	0	0	0	1	1
Monetery Pine	*Pinus radiata*	0	2	0	0	2
Monkey Puzzle	*Auaracaura spp.*	0	1	0	0	1
Myoporum	*Myoporum laetum*	0	6	0	0	6
Myoporum	*Myoporum sp*	0	1	1	0	2
Olive	*Olea Europeans*	0	0	0	1	1
Podocarpus	*Podocarpus sp.*	0	1	0	0	1
Red Box	*Eucalyptus polyanthemos*	0	0	1	0	1
Red River Gum	*Eucalyptus camaldulensis*	0	0	1	0	1
Rubber Fig	*Ficus elastica*	0	0	1	1	2
Spineless Yucca	*Yucca gigantea*	0	1	1	0	2
Sweet Pittosporum	*Pittosporum sp.*	0	1	0	0	1
Tamarisk	*Tamarix ramosissima*	0	1	3	3	7
Tree Tobacco	*Nicotiana glauca*	0	2	0	0	2
	TOTAL	**3**	**140**	**76**	**33**	**252**

Because the plans are not yet available, we are not able to identify which 91 non-native trees along TCB will be impacted. Additional data on tree metrics will be collected and available once the preferred alternative and associated impacts are identified.

Table 18. Summary of Non-native Trees along Topanga Canyon Blvd.

Common Name	Scientific Name	Total Number
Brazilian Pepper	*Schinus terebinthifolia*	3
California Pepper	*Schinus molle*	2
Canary Island Palm	*Pinus canariensis*	2
Cherry	*Prunus sp.*	20
Chinese Elm	*Ulmus parvifolia*	1
Cypress	*Cupressus semperivirens*	2
Dracaena	*Dracaena draco*	3
Eucalytpus	*Eucalyptus globulus*	27
Ficus	*Ficus benjamina*	8
Fire Thorn	*Pyracantha sp.*	1
Hibiscus	*Hibiscus sp.*	1
Jacaranda	*Jacaranda mimosifolia*	2
Mexican Fan Palm	*Washingtonia sp.*	3
Monkey Puzzle	*Araucaria sp.*	1
Monterey Pine	*Pinus radiata*	1
Pine	*Pinus sp*	8
Pittosporum	*Pittosporum sp.*	3
Pomegranate	*Pomegranate granatum*	1
Rubber Plant	*Ficus elastica*	1
Velvet Ash	*Fraxinus velutina*	1
TOTAL		**91**

Coordination with Fuel Modification Plans for each Alternative

The fuel modification limits shown in Figures 16-19 below for each alternative are preliminary and a final list of protected native trees that would be potentially impacted within a fuel modification zone will be developed once the preferred alternative is identified.

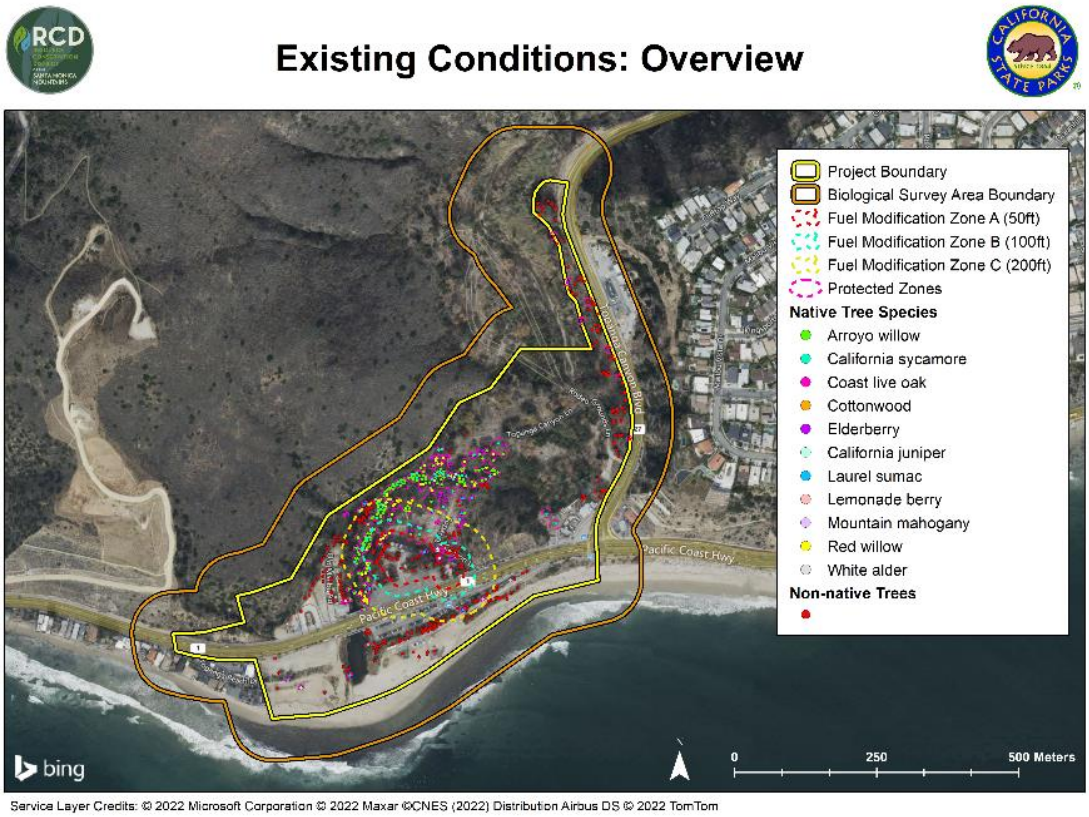

Figure 16. Alternative 1 Fuel Modification Zones with individual trees

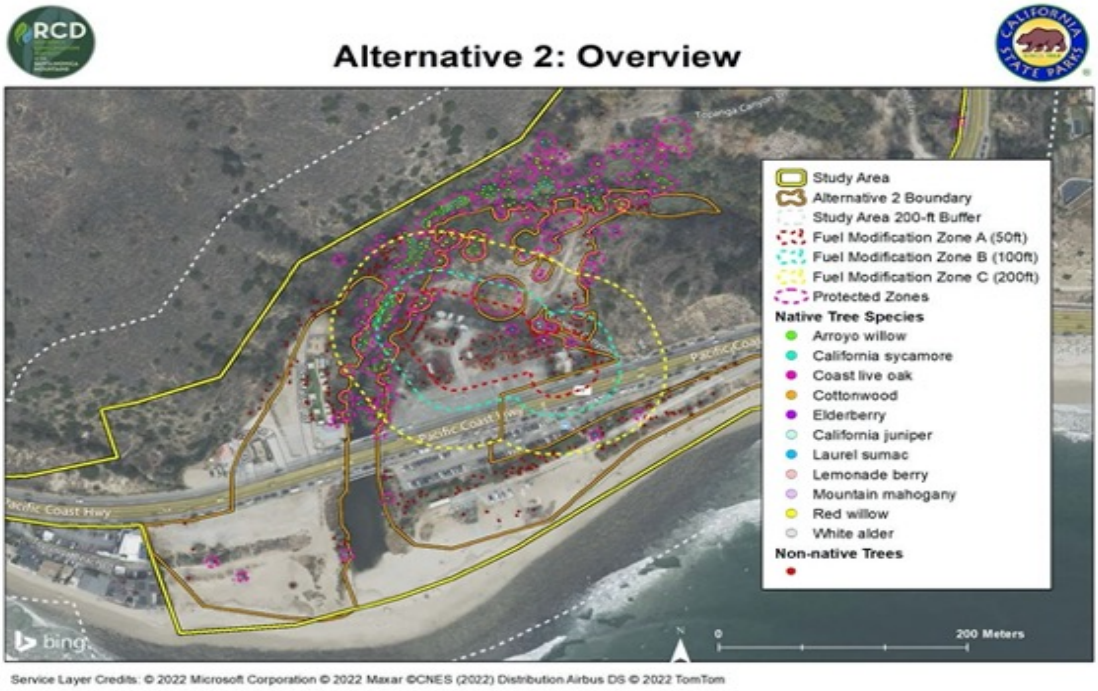

Figure 17. Alternative 2 Preliminary Fuel Modification Zones with individual trees

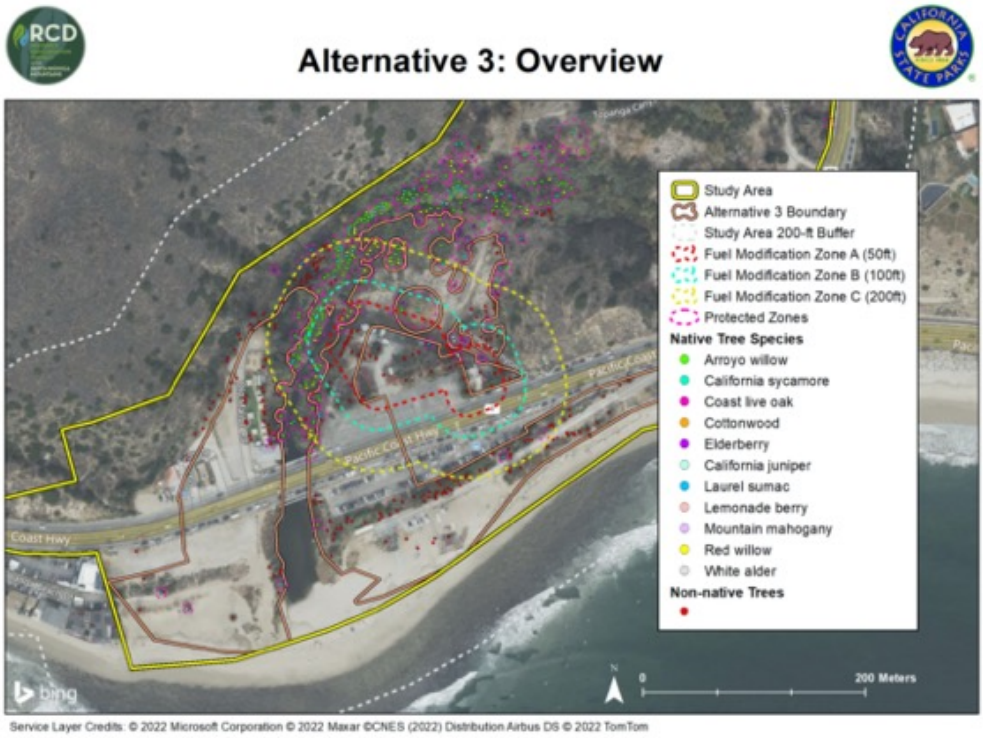

Figure 18. Alternative 3 Preliminary Fuel Modification Zones with individual trees

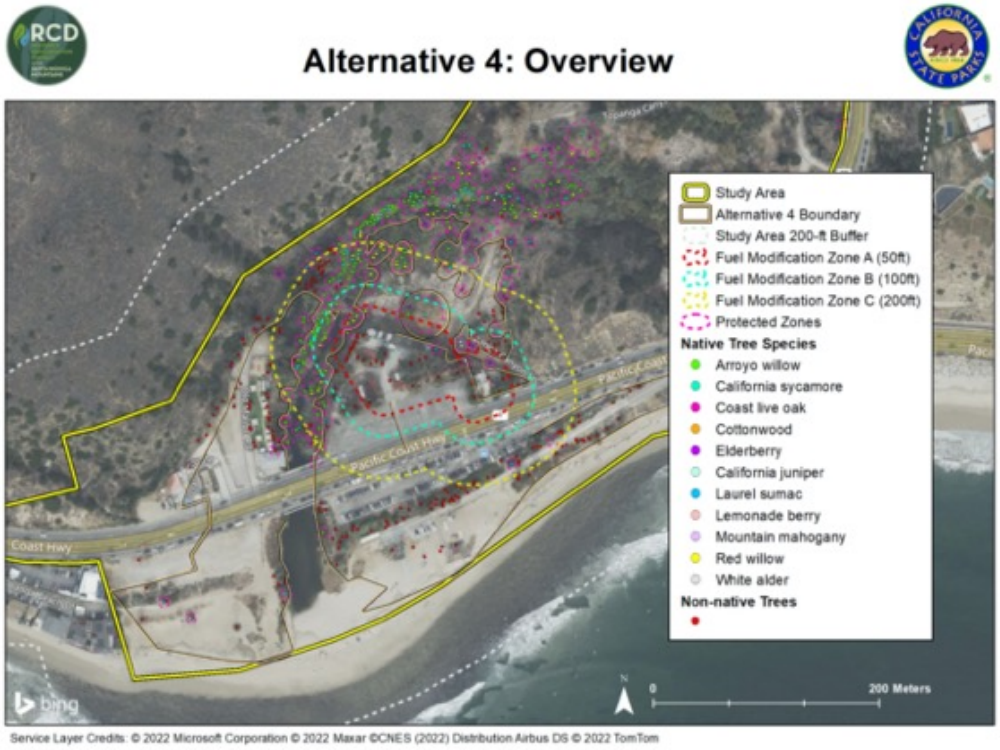

Figure 19. Alternative 4 Fuel Modification Zones with individual trees

HERITAGE AND BIOLOGICALLY SIGNIFICANT TREES

LA County defines heritage trees as having a single trunk greater than 36 inches at DSH or having significant historic or cultural significance. No native trees in the project area meet that definition.

Although there is no formal definition for biologically significant tree, in the case of this project, we avoided impacts to several native tree clusters due to their co-location and size. Trees #358 Arroyo Willow, #359 CA Sycamore and #360 Elderberry are considered a biologically significant cluster and will remain, as will the cluster of elderberry and CA Sycamore (#383, 384, 386, 388, 389, 390, 391, 392). Table 19 provides the details on native trees that meet the County standard OR have been identified by State Parks as biologically significant.

Table 19. Summary of Biologically Significant Trees

Tree Number	Common Name	Scientific Name	DSH Sum	Number trunks	Canopy Spread ft	Condition Category	Latitude	Longitude
358	Arroyo Willow	Salix Lasiolepsis	51.5	2	35	Excellent	34.0403038	-118.5822054
359	CA Sycamore	Platanus racemosa	71.5	3	48	Excellent	34.0403032	-118.5821423
360	Elderberry	Sambucus nigra	12.5	3	10	Excellent	34.0403492	-118.5821978
383	Arroyo Willow	Salix lasiolepsis	68.7	9	45	Good	34.0407193	-118.5819377
384	CA Sycamore	Platanus racemosa	11.4	3	30	Excellent	34.0405781	-118.5818957
386	CA Sycamore	Platanus racemosa	25.1	4	35	Excellent	34.0405270	-118.5817410
388	Elderberry	Sambucus nigra	85.9	13	35	Good	34.0408453	-118.5816727
389	Elderberry	Sambucus nigra	20.5	3	15	Excellent	34.0408433	-118.5816744
390	Elderberry	Sambucus nigra	56.0	5	20	Good	34.0407715	-118.5817177
391	Elderberry	Sambucus nigra	5.1	1	6	Excellent	34.0408135	-118.5817851
392	Elderberry	Sambucus nigra	36.8	5	20	Excellent	34.0407834	-118.5818028

HISTORIC TREES

Analysis of historical aerial photographs from the Spence Collection (used with permission from the UCLA Department of Geography) was done to identify any trees present on the site between 1933 and 1952, which is considered to be the historic period of significance for the Topanga Ranch Motel. The trees surrounding the Topanga Ranch Motel would be considered to be contributors to the historic landscape if they were planted between 1933 and 1952. The historic evaluation conducted by WJE (2019) identified all but #410 Canary Island Palm of the 30 trees within the motor court as contributing to the historical condition.

However, based on analysis of aerial photos show in Figures 20-23, only 14 trees (see Table 20) meet the criteria for historic significance due to presence within the historic time period. Based on the size of the other trees in the courtyard and the fact that they are not present in the aerials, it appears that the majority were planted later than the period of significance and thus would not be deemed historic. A number of small plants and other trees including Cypress, visible in the aerials are no longer on the site.

Because the trees are considered part of the historic context of the Topanga Ranch Motel, removal will be evaluated as part of the State Historic Preservation Office consultation which is pending.

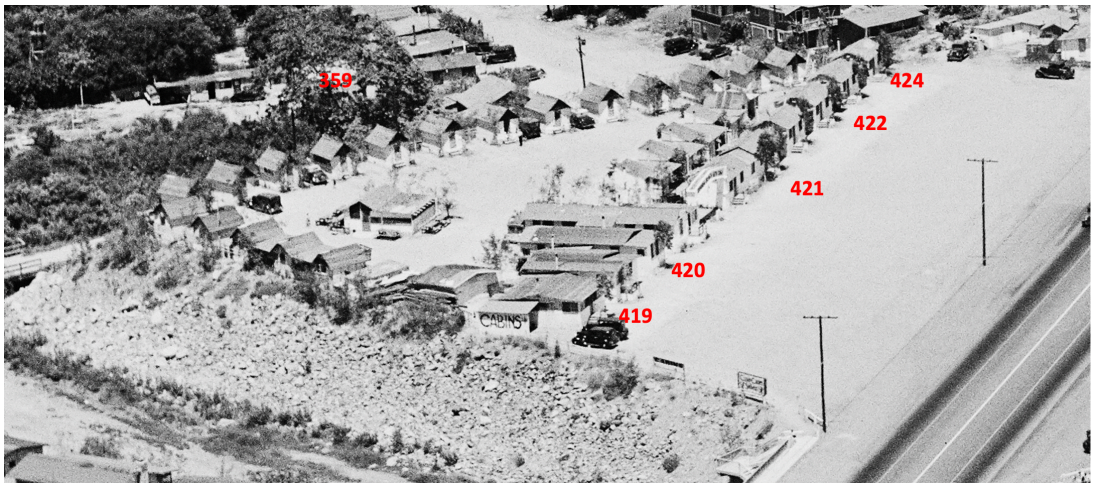

Figure 20. Aerial Photograph showing the Topanga Ranch Motel 7/14/1935. Note that they were all relatively small trees at that time. (Photo courtesy of the Spence Collection, UCLA Dept. of Geography)

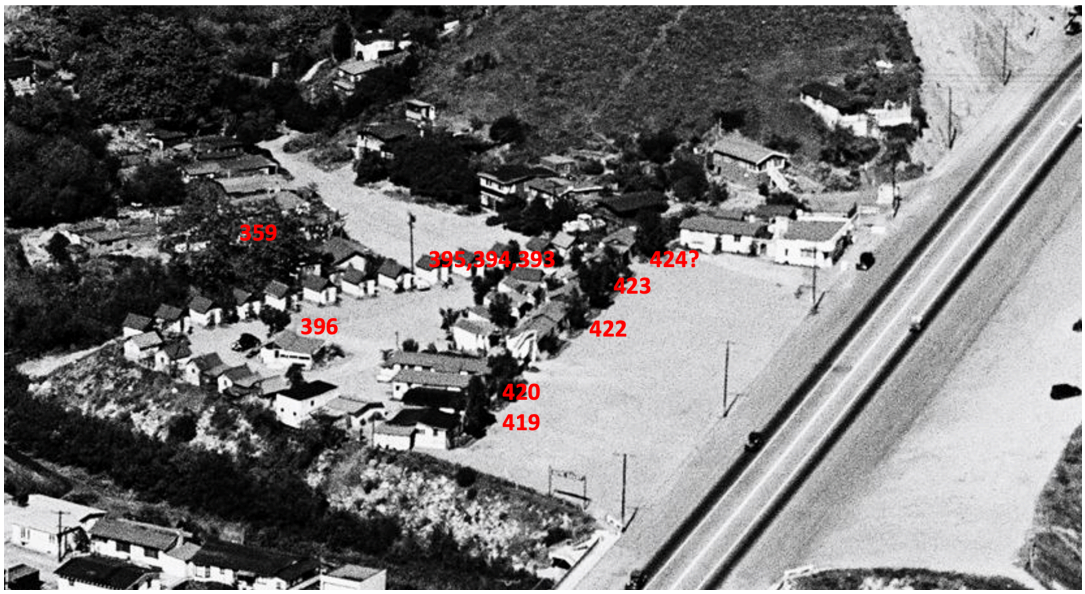

Figure 21. Aerial Photograph showing the Topanga Ranch Motel 4/11/1940. Note that they were all relatively small trees at that time. (Photo courtesy of the Spence Collection, UCLA Dept. of Geography)

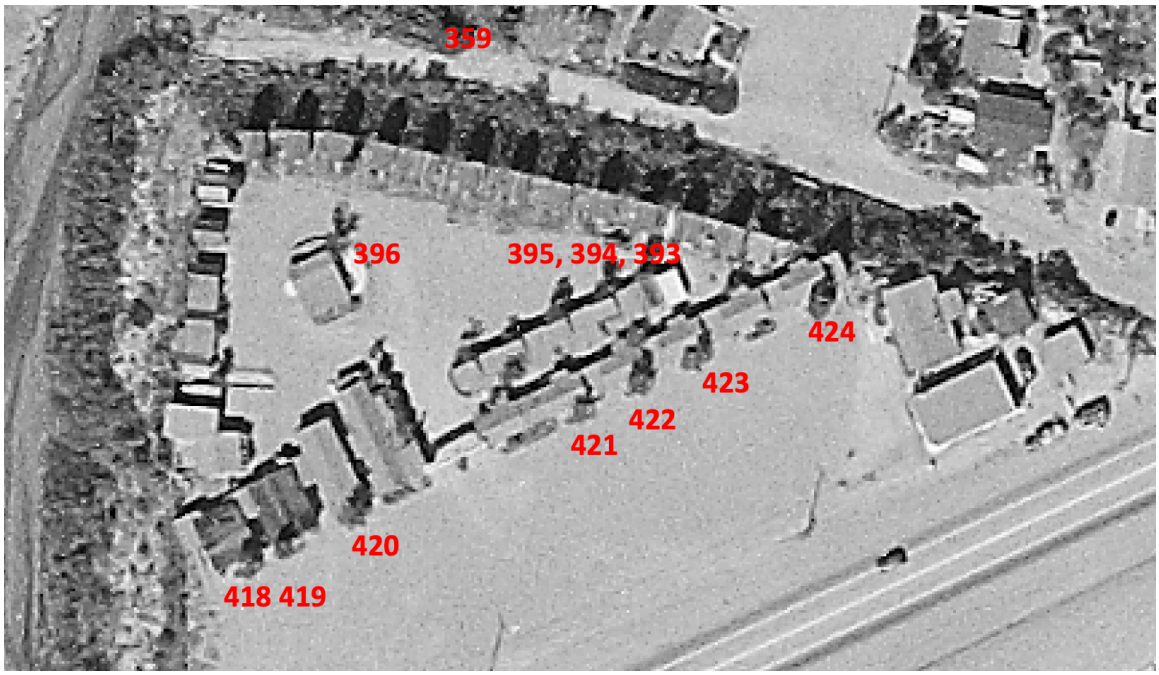

Figure 22. Aerial Photograph showing the Topanga Ranch Motel 1940. Note that they were all relatively small trees at that time. (Photo courtesy of the Spence Collection, UCLA Dept. of Geography)

Figure 23. Aerial Photograph showing the Topanga Ranch Motel 8/6/1951. Note that they were all relatively small trees at that time. (Photo courtesy of the Spence Collection, UCLA Dept. of Geography)

Table 20 provides a summary of all the trees within the Topanga Ranch Motel footprint. Those highlighted in red appear to meet the criteria for historic significance. In Alternative 2, all 30 trees would be removed including all 14 considered potentially historic. For Alternative 3, a total of nine trees would be removed of which four Eucalyptus (#406. 407, 418 and 419) are considered potentially historic. These same four trees, plus #396 and 420 are the potentially historic trees that would be removed in Alternative 4, but a total of 14 trees would be removed overall.

Nine of the 14 potentially Historic trees (shown in bold red in Table 17) also meet the criteria as Heritage trees due to having a single trunk exceeding 36 inch DSH. Data on all 14 trees are provided in Table 18.

Table 20. Summary of Potentially Historic Trees
Heritage Trees are shown in BOLD Red

Tree Number	Common Name	Scientific Name	Historic based on 1935-1951Photos	WJE List 2019	Alternative 2 Removed	Alternative 3 Removed	Alternative 4 Removed
352	Banana	Musa sp.		X	X		
353	Giant Bird of Paradise	Strelitzia reginae		X	X		
354	Juniper	Juniperus californica		X	X		
355	Juniper	Juniperus californica		X	X		
356	Juniper	Juniperus californica		X	X		
357	Laurel Sumac	Malosma laurina		X	X		
353	Giant Bird of Paradise	Strelitzia reginae		X	X		
393	**Eucalyptus**	**Eucalyptus globulus**	**X**	**X**	**X**		
394	**Eucalyptus**	**Eucalyptus globulus**	**X**	**X**	**X**		
395	**Eucalyptus**	**Eucalyptus globulus**	**X**	**X**	**X**		
396	Aleppo Pine	Pinus halipensis	X	X	X		X
397	Aleppo Pine	Pinus halipensis		X	X		X
398	Cypress	Cupressus semperivirens		X	X		X
399	Date palm	Phoenix sp.		X	X		X
400	Ficus	Ficus sp.		X	X	X	X
401	Cypress	Cupressus sempervirens		X	X	X	X
406	**Eucalyptus**	**Eucalyptus globulus**	**X**	**X**	**X**	**X**	**X**
407	**Eucalyptus**	**Eucalyptus globulus**	**X**	**X**	**X**	**X**	**X**
408	Bird of paradise	Strelitzia reginae		X	X	X	X
409	Bird of paradise	Strelitzia reginae		X	X	X	X
410	Canary Island palm	Phoenix canariensis		X	X		
411	Brazilian Pepper	Schinus terebinthifolia		X	X	X	X
418	Eucalyptus	Eucalyptus globulus	X	X	X	X	X
419	Eucalyptus	Eucalyptus globulus	X	X	X	X	X
420	**Eucalyptus**	**Eucalyptus globulus**	**X**	**X**	**X**		**X**
421	**Eucalyptus**	**Eucalyptus globulus**	**X**	**X**	**X**		
422	Eucalyptus	Eucalyptus globulus	X	X	X		
423	**Canary Island palm**	**Phoenix canariensis**	**X**	**X**	**X**		
424	**Eucalyptus**	**Eucalyptus globulus**	**X**	**X**	**X**		
425	Euphorbia	Euphorbia sp.	X	X	X		
		TOTAL	14	30	30	9	14

Table 21. Data on potentially Historic Trees (Heritage Trees in BOLD Red)

Tree Number	Common Name	Scientific Name	DBH Sum	Number of Trunks	Canopy Spread ft	Height (ft)	Latitude	Longitude
393	**Eucalyptus**	**Eucalyptus globulus**	**36.0**	**1**	**40**	**50**	**34.04000184**	**-118.58212257**
394	**Eucalyptus**	**Eucalyptus globulus**	**36.0**	**1**	**35**	**55**	**34.03998678**	**-118.58216799**
395	**Eucalyptus**	**Eucalyptus globulus**	**44.0**	**1**	**50**	**60**	**34.04001897**	**-118.58218178**
396	Aleppo Pine	Pinus halipensis	25.0	1	20	45	34.03965554	-118.58277797
406	**Eucalyptus**	**Eucalyptus globulus**	**46.2**	**1**	**25**	**50**	**34.03967573**	**-118.58267912**
407	**Eucalyptus**	**Eucalyptus globulus**	**61.2**	**5**	**35**	**55**	**34.03970093**	**-118.58256642**
418	Eucalyptus	Eucalyptus globulus	30.0	1	30	45	34.03982089	-118.58218334
419	Eucalyptus	Eucalyptus globulus	30.0	1	40	50	34.03987386	-118.58202028
420	**Eucalyptus**	**Eucalyptus globulus**	**48.0**	**1**	**20**	**25**	**34.03989730**	**-118.58187052**
421	**Eucalyptus**	**Eucalyptus globulus**	**53.0**	**1**	**45**	**65**	**34.03991426**	**-118.58181914**
422	Eucalyptus	Eucalyptus globulus	21.7	7	15	10	34.03993023	-118.58177129
423	**Canary Island palm**	**Phoenix canariensis**	**48.0**	**1**	**20**	**25**	**34.03989730**	**-118.58187052**
424	**Eucalyptus**	**Eucalyptus globulus**	**53.0**	**1**	**45**	**65**	**34.03991426**	**-118.58181914**
425	Euphorbia	Euphorbia sp.	21.7	7	15	10	34.03993023	-118.58177129

Mitigation Required

Removal of historic and heritage trees is considered a potentially significant impact, even though they are all non-native and their current locations are causing impacts to the foundations of the Topanga Ranch Motel buildings. Because the Historic and Heritage Trees are considered a part of the historic landscape of the Topanga Ranch Motel, it is not possible to replace them. A mitigation plan for the loss of historic landscape will be proposed as part of the State Historic Preservation Office consultation, which is pending.

Coordination of Mitigation Planting with Habitat Restoration Plan

Once the preferred alternative is identified, a Habitat Restoration Plan will be developed. At that time the required number of mitigation trees for each species will be incorporated into the planting plan. Location of mitigation trees will be outside any potential areas of disturbance and will be monitored as part of the overall post-construction project monitoring plan.

FENCING PLAN

Protective fencing will be installed to protect remaining trees from construction impacts in accordance with all regulatory requirements. Preliminary fencing plans (Figures 20-22) for Alternatives 2-4 have been developed based on the 30% design. Once the preferred alternative is identified, a final Fencing Plan meeting all regulatory requirements will be prepared to protect all native trees and any historic non-native trees that will be retained.

Figure 24. Alternative 2 DRAFT Fencing Plan

Figure 25. Alternative 3 DRAFT Fencing Plan

Figure 26. Alternative 4 DRAFT Fencing Plan

INVASIVE BEETLES AND DISEASE MANAGEMENT

Recent infestations of non-native insects such as the Invasive Shot Hole Borer, and potential for disease are issues of concern for protecting existing native trees that will remain as well as additional trees that will be planted as part of the restoration.

The Early Detection Rapid Response Plan for Invasive Beetles in Los Angeles County (Dagit and Burnap 2019) has been adopted by Los Angeles County as the protocol for detecting and managing existing and new infestations. Implementation of the recommended visual and trapping protocols should be incorporated into the ongoing maintenance and monitoring plan for the project.

RECOMMENDATIONS

1. Complete final tree survey and mapping including trees within the project area and downslope along TCB. Revise impacts and mitigations as needed.

2. Require that all Best Management Practices outlined in this report, as well as in the Fuel Modification Plan and Habitat Restoration Plan are implemented.

3. Require implementation of the *Native Tree Replacement Planting Mitigation, Maintenance and Monitoring Plan* following project completion.

4. Protection, fencing, and monitoring of biologically significant, historic or heritage trees will conform to ISA industry standard Best Management Practices and be supervised by a qualified Certified Arborist.

5. If a decision is made to not use existing volunteer seedlings/saplings for required mitigation, then any additional planting will be done using genetic material collected locally within the watershed and be planted in fall according to industry standards.

6. Soil of any seedlings grown for mitigation planting will be tested for *Phythophora* and not installed unless deemed safe.

7. All mitigation plantings will be installed in a random, natural pattern within the locations identified on the final preferred alternative plan.

8. The removal of any living limbs and all deadwood will be done under the supervision of a Certified Arborist or other qualified professional in accordance with the standards of the LA County LCP, Oak Tree Protection Ordinance and ISA. Remedial pruning to remove stub cuts should also be done. No trees will be "lolly-popped".

9. A nesting bird survey should be conducted according to industry standards prior to any activities in or around the trees.

10. Any roots larger than 1" diameter will be kept if possible. While exposed, they will be wrapped in burlap and kept moist. If it is necessary to cut any roots, they shall be cut cleanly.

11. All work done in the protected zone (edge of the dripline plus 5 feet) of trees shall be done using hand tools in accordance with the LA County Oak Tree Protection Ordinance and Best Management Practices.

12. Soil compaction within the root zone shall be minimized. No equipment, spoils or debris will be stored within the protected zone of the trees.

13. No dumping of liquids or solvents, paints, concrete washout or other harmful substances will be permitted. All cleaning fluids will be disposed of properly.

14. Monitoring will continue for 10 years (7 years for oaks) post approval of the permit. The arborist will submit a yearly report documenting condition of all tagged and planted mitigation trees based on two visits per year.

15. Fuel reduction for brush clearance will minimize impacts to the native trees and oaks and the native understory vegetation.

16. A copy of this report will be kept on site for reference during any of the proposed permitted activities.

17. Comply with all requirements proposed by the State Historic Preservation Office to protect and preserve Historic and Heritage trees in place, depending on the final preferred alternative.

REFERENCES CITED

Los Angeles County Dept. of Regional Planning. 2014. Los Angeles County Local Coastal Plan 2014
https://planning.lacounty.gov/coastal/smm

Los Angeles County Oak Woodlands Habitat Conservation Strategic Alliance. 2011. Los Angeles County Oak Woodland Conservation Management Plan. Prepared for Los Angeles County. http://planning.lacounty.gov/oakwoodlands.

Wiss, Janney, Elstner Associates, Inc. (WJE). 2019. Topanga Ranch Motel Condition Assessment and Conceptual Design for Rehabilitation. Prepared for James Neland, 225 Avenida Califia, San Clemente, CA 02672.

NATIVE TREE AND OAK TREE REPORT

TOPANGA LAGOON RESTORATION PLANNING

Topanga, CA 90290

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7.12.22

TABLE OF CONTENTS

CERTIFICATION OF ACCURACY OF REPORT	5
SUMMARY	6
PERMIT REQUEST	6
MITIGATION PROPOSED	9
ASSIGNMENT	11
LIMITS OF THE ASSIGNMENT	12
PURPOSE AND USE OF THE REPORT	12
SITE DESCRIPTION	12
PROJECT DESCRIPTION	13
Alternative 1: No Project/Managed Decline (0 acres restored)	13
Actions Common to All Project Alternatives	18
Topanga Canyon Boulevard Visitor Services	18
Alternative 2: Lagoon Habitat Maximized, Removal of Motel (9.5 wetted acres, as part of 11.7 acres restored)	20
Alternative 3: Least Lagoon Habitat Expansion, Retention of Motel (7.1 wetted acres, as part of 9.8 acres restored)	22
Alternative 4: Maximum Managed Retreat, Partial Motel Retention (7.1 wetted acres, as part of 10.8 acres restored)	24
METHODS FOR TREE INVENTORY	26
Native Trees Summary	27
Native Trees to Remain	28
ALTERNATIVE ANALYSIS	40
Non-Native Trees Summary	41
Coordination with Fuel Modification Plan for each Alternative	42
HERITAGE AND BIOLOGICALLY SIGNIFICANT TREES	45
HISTORIC TREES	45
Mitigation Required	49
Coordination with Habitat Restoration Plan	49
FENCING PLAN	49
INVASIVE BEETLES AND DISEASE MANAGEMENT	
RECOMMENDATIONS	51
REFERENCES CITED	52
Appendix A. Site Plan Showing Tree Locations for Each Alternative	
Appendix B. Field Data Sheets Summarizing Tree Condition Sorted by Native and Non-Native	
Appendix C. Photos of All Tagged Trees by Tag Number	
Appendix D. DRAFT Native Tree Replacement Planting Mitigation, Maintenance and Monitoring Plan	
Appendix E. Assumptions and Limiting Conditions	
Appendix F. Arborist Disclosure Statement	
Appendix G. Resumes	
LIST OF TABLES	
Table 1. Alternative 2 Native Tree Removals Proposed	6

Table 2. Alternative 2 Native Tree Encroachments Proposed	7
Table 3. Alternative 2 Historic and Heritage Non-Native Trees Removed	7
Table 4. Alternative 3 and 4 Native Tree Removals Proposed	8
Table 5. Alternative 3 and 4 Native Tree Encroachments Proposed	8
Table 6. Alternative 3 Historic and Heritage Non-Native Trees Removed	8
Table 7. Alternative 4 Historic and Heritage Non-Native Trees Removed	9
Table 8. Alternative 2 Tree Removals Proposed and Mitigation Requirement	10
Table 9. Alternative 2 Tree Encroachments Proposed and Mitigation Requirement	10
Table 10. Alternative 3 and 4 Tree Removals Proposed and Mitigation Requirement	10
Table 11. Alternative 3 and 4 Tree Encroachments Proposed and Mitigation Requirement	10
Table 12. Metadata for Maps	26
Table 13. Summary of 270 Protected and 15 Undersized Native Trees in the Topanga Lagoon Restoration Planning Area	28
Table 14. Summary of Protected Native Trees on Topanga Canyon Blvd.	28
Table 15. Summary of all Protected Native Trees to Remain in the Topanga Lagoon Restoration Planning Area	29
Table 16. Summary of Potential Impacts to Protected Native Trees in the Topanga Lagoon Restoration Area	40
Table 17. Summary of all Non-native Trees in the Topanga Lagoon Restoration Planning Area	41
Table 18. Summary of Non-native Trees along Topanga Canyon Blvd.	42
Table 19. Summary of Biologically Significant Trees	45
Table 20. Summary of Potentially Historic Trees	48
Table 21. Data on potentially Historic Trees (Heritage Trees in BOLD Red)	49
LIST OF FIGURES	
Figure 1. Topanga Lagoon Restoration Planning Area Parcel Map	13
Figure 2. Existing conditions showing LCP Habitat zones	14
Figure 3. Overall Topanga Lagoon Restoration Project Area Sections	15
Figure 4. Existing Conditions - Northeast	15
Figure 5. Existing Conditions - Northwest	16
Figure 6. Existing Conditions - Topanga Ranch Motel	16
Figure 7. Existing Conditions - Southeast	17
Figure 8. Existing Conditions - Southwest	17
Figure 9. All Trees within the Topanga Canyon Blvd. potential restoration area.	19
Figure 10. All Trees within the Alternative 2 and 200 ft Buffer Zone Using LACO Habitat Overlay	21

Figure 11. All Trees Within the Alternative 2 and 200 ft Buffer Zone Using LACO Habitat Overlay. Showing Ecological Constraints and Jurisdictional Delineation	21
Figure 12. All Trees within the Alternative 3 and 200 ft Buffer Zone Using LACO Habitat Overlay	23
Figure 13. All Trees within the Alternative 3 and 200 ft Buffer Zone Using LACO Habitat Overlay. Showing Ecological Constraints and Jurisdictional Delineation	23
Figure 14. All Trees within the Alternative 4 and 200 ft buffer Buffer Zone Using LACO Habitat Overlay	25
Figure 15. All Trees within the Alternative 4 and 200 ft Buffer Zone Using LACO Habitat Overlay. Showing Ecological Constraints and Jurisdictional Delineation	25
Figure 16. Alternative 1 Fuel Modification Zones with Individual Trees	43
Figure 17. Alternative 2 Preliminary Fuel Modification Zones with Individual Trees	43
Figure 18. Alternative 3 Preliminary Fuel Modification Zones with Individual Trees	44
Figure 19. Alternative 4 Fuel Modification Zones with Individual Trees	44
Figure 20. Aerial Photograph showing the Topanga Ranch Motel in 1940. Note that they were all relatively small trees at that time.	46
Figure 21. Aerial Photograph showing the Topanga Ranch Motel 4/11/1940. Note that they were all relatively small trees at that time. (Photo courtesy of the Spence Collection, UCLA Dept. of Geography)	46
Figure 22. Aerial Photograph showing the Topanga Ranch Motel 1940. Note that they were all relatively small trees at that time. (Photo courtesy of the Spence Collection, UCLA Dept. of Geography)	47
Figure 23. Aerial Photograph showing the Topanga Ranch Motel 8/6/1951. Note that they were all relatively small trees at that time. (Photo courtesy of the Spence Collection, UCLA Dept. of Geography)	47
Figure 24. Alternative 2 DRAFT Fencing Plan	50
Figure 25. Alternative 3 DRAFT Fencing Plan	50
Figure 23. Alternative 4 DRAFT Fencing Plan	51

CERTIFICATION OF ACCURACY OF REPORT

This report provides technical information regarding Native Tree resources to the California Coastal Commission and County of Los Angeles Department of Regional Planning as part of the environmental review of the proposed habitat restoration for Topanga Lagoon Restoration Project Area in Topanga, CA, referred to herein as the "parcel" or "property". The parcel is located in unincorporated Los Angeles County, within the Santa Monica Mountains Local Coastal Zone. The property is owned by CA Department of Parks and Recreation (CDPR) on the north side of PCH (~7 acres in the immediate restoration area), and also includes the Caltrans ROW along PCH including the bridge (~2 acres), and the public beach, parking lot, lifeguard headquarters/restroom and helipad managed by Los Angeles County Department of Beaches and Harbors (DBH) on the south side of PCH (~6 acres).

The potential work area includes the lagoon/ocean interface on the landward side of the bar-built sand berm and extends approximately 450 meters upstream into the creek with potential removal of fill on both the west and east sides. The disturbed potential work area is a subset of the overall project study area (59 acres including the extension along Topanga Canyon Blvd.) that extends upstream along Topanga Canyon Blvd. to include the former Rodeo Grounds floodplain area. The larger project study area is needed because one of the alternatives (Alternative 2) includes removal of the entire historic Topanga Ranch Motel. The potential for relocating parking and overnight accommodations along Topanga Canyon Blvd. required us to extend the potential impact analysis to include that area, although no formal plans are available as yet.

The findings contained herein are based on the following: a review of site plans, etc. provided by the Topanga Lagoon Restoration Planning process; the Santa Monica Mountains Land Use Plan (LUP); and GIS mapping and spatial analysis provided by RCD of the Santa Monica Mountains and Moffatt and Nichols Engineers. The proposed project consists of documenting the extent of Native Tree and Oak associated with each proposed project alternative for CEQA/NEPA and LA County Conditional Use Permit review and proposes appropriate mitigations and Best Management Practices (BMP). The proposed impacted and restoration areas are primarily located within 200 feet of sensitive habitat (H1, H1 buffer zone, H1 quiet zone, H2, or H2 "High Scrutiny") but also extend into designated H3 habitat along Topanga Canyon Blvd.

This Native Tree and Oak Report presents a true and accurate statement of the condition of the natural resources found in the Topanga Lagoon Restoration Planning area, Topanga, Los Angeles County, California on the dates of our site visits between March and November 2021 and complies with the requirements of the Santa Monica Mountains Local Coastal Plan criteria.

Respectfully submitted,

Rosi Dagit, Sr. Conservation Biologist, Certified Arborist ISA WS-1084

SUMMARY

This report provides information needed to evaluate the impacts and benefits associated with the restoration of Topanga Lagoon. At this stage of the planning process, 30% design alternatives provide the limits for assessing loss of native and non-native trees for use with the Coastal Development Permit (CDP) application and CEQA analysis. A total of 635 trees are within the project study area. Of these, 292 native trees of which 277 are of protected size plus 15 undersized that could potentially grow into protected size prior to implementation, and 343 are non-native trees representing 36 species in varying degrees of health with 252 located within the proposed lagoon project area. Once a preferred alternative is identified, it will be possible to further refine the numbers of protected native trees that will be removed or encroached upon, the benefits of removing invasive non-native trees and Arundo, and proposed locations for mitigation restoration plantings.

The overall project goal is to restore native riparian and transitional upland habitat while retaining as many native trees along the existing wetted edges of the creek channel as possible. A fuel modification plan, native tree and habitat restoration plan, mitigation and monitoring plan will also be refined once the preferred alternative is identified. This report documents the condition of the native trees that will be used to develop the additional plan documents required.

PERMIT REQUEST

In accordance with Coastal Development Permit requirements, a summary of trees to be removed and encroached upon are provided by Alternative below. Note that these removal and encroachment numbers are the worse-case scenario and subject to change once the preferred alternative is determined and final surveys are conducted.

Alternative 1 – No Permit needed.

Alternative 2 – If Alternative 2 is selected, it will require permission to remove a maximum of 32 protected native trees listed in Table 1 including:

Table 1. Alternative 2 Native Tree Removals Proposed

Number removed	Common Name	Scientific Name	Tag Numbers
1	Mountain Mahagony	*Cercocarpus* sp.	#537
2	Juniper*	*Juniperus californica*	#354, 438
6	Laurel Sumac	*Malosma laurina*	#302, 303, 357, 436, 445, 501
1	CA Sycamore	*Platanus racemosa*	#97
3	Lemonade Berry	*Rhus integrifolia*	#65. 516, 517
12	Arroyo Willow	*Salix lasiolepsis*	#98, 107, 108, 109, 111, 112, 269, 300, 301, 313, 366, 447
6	Red Willow	*Salix laevigata*	#310, 312, 361, 367, 381, 387
1	Elderberry	*Sambucus nigra*	#64

*All Juniper trees on the site are remnants of past cultivated landscaping and not native to the area

Alternative 2 will also require permission to encroach on an additional 14 native trees listed in Table 2.

Table 2. Alternative 2 Native Tree Encroachments Proposed

Tag Number Encroached	Common Name	Scientific Name	Percent Encroachment
#341	Laurel Sumac	*Malosma laurina*	15
#308	Coast Live Oak	*Quercus agrifolia*	6
#118	Arroyo Willow	*Salix lasiolepsis*	19
#267	Arroyo Willow	*Salix lasiolepsis*	6
#305	Arroyo Willow	*Salix lasiolepsis*	6
#306	Arroyo Willow	*Salix lasiolepsis*	7
#373	Arroyo Willow	*Salix lasiolepsis*	4
#383	Arroyo Willow	*Salix lasiolepsis*	39
#271	Red Willow	*Salix laevigata*	10
#295	Red Willow	*Salix laevigata*	11
#309	Red Willow	*Salix laevigata*	40
#368	Red Willow	*Salix laevigata*	29
#370	Red Willow	*Salix laevigata*	4
#360	Elderberry	*Sambucus nigra*	12

Additionally, Alternative 2 will require the removal of all 14 Historic and Heritage Non-Native Trees in the National Register of Historic Places-eligible Topanga Ranch Motel footprint. All trees dating to the period of significance of the Motel (1933-1952) as determined by photos and aerials are contributing features to the historic property. They are also considered Heritage if they are greater than 36 inches in diameter of one trunk according to the Los Angeles County definition.

Table 3. Alternative 2 Historic and Heritage Non-Native Trees Removed
Trees in **BOLD** are also Heritage size.

Tree Number	Common Name	Scientific Name	DBH Sum	Number of Trunks	Canopy Spread ft	Height (ft)	Latitude	Longitude
393	**Eucalyptus**	**Eucalyptus globulus**	**36.0**	**1**	**40**	**50**	**34.04000184**	**-118.58212257**
394	**Eucalyptus**	**Eucalyptus globulus**	**36.0**	**1**	**35**	**55**	**34.03998678**	**-118.58216799**
395	**Eucalyptus**	**Eucalyptus globulus**	**44.0**	**1**	**50**	**60**	**34.04001897**	**-118.58218178**
396	Aleppo Pine	Pinus halipensis	25.0	1	20	45	34.03965554	-118.58277797
406	**Eucalyptus**	**Eucalyptus globulus**	**46.2**	**1**	**25**	**50**	**34.03967573**	**-118.58267912**
407	**Eucalyptus**	**Eucalyptus globulus**	**61.2**	**5**	**35**	**55**	**34.03970093**	**-118.58256642**
418	Eucalyptus	Eucalyptus globulus	30.0	1	30	45	34.03982089	-118.58218334
419	Eucalyptus	Eucalyptus globulus	30.0	1	40	50	34.03987386	-118.58202028
420	**Eucalyptus**	**Eucalyptus globulus**	**48.0**	**1**	**20**	**25**	**34.03989730**	**-118.58187052**
421	Eucalyptus	Eucalyptus globulus	53.0	1	45	65	34.03991426	-118.58181914
422	Eucalyptus	Eucalyptus globulus	21.7	7	15	10	34.03993023	-118.58177129
423	**Canary Island palm**	**Phoenix canariensis**	**48.0**	**1**	**20**	**25**	**34.03989730**	**-118.58187052**
424	**Eucalyptus**	**Eucalyptus globulus**	**53.0**	**1**	**45**	**65**	**34.03991426**	**-118.58181914**
425	Euphorbia	Euphorbia sp.	21.7	7	15	10	34.03993023	-118.58177129

<u>Alternatives 3 and 4</u>
The proposed native protected tree impacts are the same for both alternatives. If either Alternative 3 or 4 is selected, it will require permission to remove a total of 26 protected native trees including:

Table 4. Alternative 3 and 4 Native Tree Removals Proposed

Number removed	Common Name	Scientific Name	Tag Numbers
2	Juniper	*Juniperus californica*	#354, 438
6	Laurel Sumac	*Malosma laurina*	#302, 303, 357, 436, 445, 501
1	CA Sycamore	*Platenus racemosa*	#97
3	Lemonade Berry	*Rhus integrifolia*	#65. 516, 517
9	Arroyo Willow	*Salix lasiolepsis*	#98, 108, 109, 269, 300, 301, 313, 366, 447
4	Red Willow	*Salix laevigata*	#361, 367, 381, 387
1	Elderberry	*Sambucus nigra*	#64

Alternatives 3 and 4 will also require permission to encroach on an additional 15 native trees.

Table 5. Alternative 3 and 4 Native Tree Encroachments Proposed.

Tag Number Encroached	Common Name	Scientific Name	Percent Encroachment
#341	Laurel Sumac	*Malosma laurina*	15
#308	Coast Live Oak	*Quercus agrifolia*	6
#118	Arroyo Willow	*Salix lasiolepsis*	19
#267	Arroyo Willow	*Salix lasiolepsis*	6
#305	Arroyo Willow	*Salix lasiolepsis*	6
#306	Arroyo Willow	*Salix lasiolepsis*	7
#358	Arroyo Willow	*Salix lasiolepsis*	40
#373	Arroyo Willow	*Salix lasiolepsis*	4
#383	Arroyo Willow	*Salix lasiolepsis*	39
#271	Red Willow	*Salix laevigata*	10
#295	Red Willow	*Salix laevigata*	11
#309	Red Willow	*Salix laevigata*	40
#368	Red Willow	*Salix laevigata*	29
#370	Red Willow	*Salix laevigata*	4
#360	Elderberry	*Sambucus nigra*	12

As shown in Table 6, assuming that the underlying fill can be maintained, then in Alternative 3 a total of four trees would be removed: historic and heritage trees #406 and 407, along with historic trees #418 and 419.

Table 6. Alternative 3 Historic and Heritage Non-Native Tree Removals
Trees in **BOLD** are also Heritage size.

Tree Number	Common Name	Scientific Name	DBH Sum	Number of Trunks	Canopy Spread ft	Height (ft)	Latitude	Longitude
406	**Eucalyptus**	**Eucalyptus globulus**	**46.2**	**1**	**25**	**50**	**34.03967573**	**-118.58267912**
407	**Eucalyptus**	**Eucalyptus globulus**	**61.2**	**5**	**35**	**55**	**34.03970093**	**-118.58256642**
418	Eucalyptus	Eucalyptus globulus	30.0	1	30	45	34.03982089	-118.58218334
419	Eucalyptus	Eucalyptus globulus	30.0	1	40	50	34.03987386	-118.58202028

For Alternative 4, a total of nine Historic Trees would be removed, including six that also qualify as Heritage trees as shown in Table 7. Again, this assumes that the existing fill can be retained.

Table 7. Alternative 3 Historic and Heritage Non-Native Tree Removals
Trees in **BOLD** are also Heritage size.

Tree Number	Common Name	Scientific Name	DBH Sum	Number of Trunks	Canopy Spread ft	Height (ft)	Latitude	Longitude
393	**Eucalyptus**	**Eucalyptus globulus**	**36.0**	**1**	**40**	**50**	**34.04000184**	**-118.58212257**
394	**Eucalyptus**	**Eucalyptus globulus**	**36.0**	**1**	**35**	**55**	**34.03998678**	**-118.58216799**
395	**Eucalyptus**	**Eucalyptus globulus**	**44.0**	**1**	**50**	**60**	**34.04001897**	**-118.58218178**
396	Aleppo Pine	Pinus halipensis	25.0	1	20	45	34.03965554	-118.58277797
406	**Eucalyptus**	**Eucalyptus globulus**	**46.2**	**1**	**25**	**50**	**34.03967573**	**-118.58267912**
407	**Eucalyptus**	**Eucalyptus globulus**	**61.2**	**5**	**35**	**55**	**34.03970093**	**-118.58256642**
418	Eucalyptus	Eucalyptus globulus	30.0	1	30	45	34.03982089	-118.58218334
419	Eucalyptus	Eucalyptus globulus	30.0	1	40	50	34.03987386	-118.58202028
420	**Eucalyptus**	**Eucalyptus globulus**	**48.0**	**1**	**20**	**25**	**34.03989730**	**-118.58187052**

MITIGATION PROPOSED

Mitigation requirements for impacts within the jurisdiction of Los Angeles County Local Coastal Plan (22.44.950, 22.44.1920) include 10:1 replacement for any native tree removed, or that encroaches within 3 ft of the trunk or encroaches into more than 30% of the tree protected zone. A 5:1 replacement is required for encroachment of 10-30% and monitoring only is required for encroachment of less than 10%. Native trees must be monitored with annual reports submitted for 10 years post impact (7 years for oaks). Any mitigation trees that die must be replaced.

At this time a preferred alternative has not been identified, so potential mitigation actions for each Alternative are listed below. Removal of non-native trees (with perhaps some of those deemed historic in the Topanga Ranch Motel) will be completed to meet California Fish and Wildlife requirements for habitat restoration.

To meet CDPR and the LCP requirements for restoration planting material to be sources from within the watershed, we propose that seeds, stakes and cuttings to propagate replacement willows, cottonwood and elderberry are gathered onsite to grow in anticipation of restoration revegetation planting. Upon selection of the preferred alternative, an addendum to this report will be prepared showing locations of any required mitigation planting locations proposed.

Alternative 1 – No mitigation needed. All 270 protected native trees and xxx non-native trees would remain as is.

Alternative 2 would require a total of 320 native trees (Table 8) planted based on the native tree removal and 50 additional native trees (Table 9) based on the encroachment request. Because the Historic and Heritage Trees are considered a part of the historic landscape of the Topanga Ranch Motel, it is not possible to replace them. A mitigation will be proposed as part of the State Historic Preservation Office consultation which is pending.

Table 8. Alternative 2 Tree Removals Proposed and Mitigation Requirement

Number removed	Common Name	Scientific Name	Number of Replacement Trees Required
1	Mountain Mahagony	*Cercocarpus* sp.	10
2	Juniper	*Juniperus californica*	20
6	Laurel Sumac	*Malosma laurina*	60
1	CA Sycamore	*Platenus racemosa*	10
3	Lemonade Berry	*Rhus integrifolia*	30
12	Arroyo Willow	*Salix lasiolepsis*	120
6	Red Willow	*Salix laevigata*	60
1	Elderberry	*Sambucus nigra*	10

Table 9. Alternative 2 Tree Encroachments Proposed and Mitigation Requirement

Tag Number Encroached	Common Name	Scientific Name	Percent Encroachment	Number of Mitigation Trees Needed
#341	Laurel Sumac	*Malosma laurina*	15	5
#308	Coast Live Oak	*Quercus agrifolia*	6	0
#118	Arroyo Willow	*Salix lasiolepsis*	19	5
#267	Arroyo Willow	*Salix lasiolepsis*	6	0
#305	Arroyo Willow	*Salix lasiolepsis*	6	0
#306	Arroyo Willow	*Salix lasiolepsis*	7	0
#373	Arroyo Willow	*Salix lasiolepsis*	4	0
#383	Arroyo Willow	*Salix lasiolepsis*	39	10
#271	Red Willow	*Salix laevigata*	10	5
#295	Red Willow	*Salix laevigata*	11	5
#309	Red Willow	*Salix laevigata*	40	10
#368	Red Willow	*Salix laevigata*	29	5
#370	Red Willow	*Salix laevigata*	4	0
#360	Elderberry	*Sambucus nigra*	12	5

Alternative 3 and Alternative 4 would require a total of 270 trees (Table 7) planted based on the native tree removal and 60 additional native trees (Table 8) based on the encroachment request.

Alternative 3 proposed removal of only four Historic and Heritage Trees, while Alternative 4 would require removal of nine Historic and Heritage Trees. Mitigation for impacts to the larger historical resource, which may include replanting of similar tree species in an appropriate configuration, will be proposed as part of the State Historic Preservation Office consultation which is pending.

Table 10. Alternative 3 and 4 Tree Removals Proposed and Mitigation Requirement

Number removed	Common Name	Scientific Name	Number of Replacement Trees Required
2	Juniper	*Juniperus californica*	20
6	Laurel Sumac	*Malosma laurina*	60
1	CA Sycamore	*Platenus racemosa*	10
3	Lemonade Berry	*Rhus integrifolia*	30
9	Arroyo Willow	*Salix lasiolepsis*	90
4	Red Willow	*Salix laevigata*	40
1	Elderberry	*Sambucus nigra*	10

Table 11. Alternative 3 and 4 Tree Encroachments Proposed and Mitigation Requirement

Tag Number Encroached	Common Name	Scientific Name	Percent Encroachment	Number of Mitigation Trees Needed
#341	Laurel Sumac	*Malosma laurina*	15	5
#308	Coast Live Oak	*Quercus agrifolia*	6	0
#118	Arroyo Willow	*Salix lasiolepsis*	19	5
#267	Arroyo Willow	*Salix lasiolepsis*	6	0
#305	Arroyo Willow	*Salix lasiolepsis*	6	0
#306	Arroyo Willow	*Salix lasiolepsis*	7	0
#358	Arroyo Willow	*Salix lasiolepsis*	40	10
#373	Arroyo Willow	*Salix lasiolepsis*	4	0
#383	Arroyo Willow	*Salix lasiolepsis*	39	10
#271	Red Willow	*Salix laevigata*	10	5
#295	Red Willow	*Salix laevigata*	11	5
#309	Red Willow	*Salix laevigata*	40	10
#368	Red Willow	*Salix laevigata*	29	5
#370	Red Willow	*Salix laevigata*	4	0
#360	Elderberry	*Sambucus nigra*	12	5

As required by the Los Angeles County Local Coastal Plan, a DRAFT *Native Tree Replacement Planting Mitigation, Maintenance and Monitoring Plan* describing mitigation, monitoring and reporting has been included as APPENDIX D to guide future restoration planting and direct fuel modification protocols according to Local Implementation Plan (LIP) standards (22.44.950) for each proposed alternative. Upon completion of the CEQA process, this document will be updated to provide details associated with the preferred alternative selected. On-site restoration will be utilized at the site to allow for long-term sustainability of the replacement plantings, the potential to expand/connect to riparian and transitional upland habitats.

All replacement trees should be planted on native soil and should be the same species as the removed native trees with appropriate associated native vegetation in the understory.

ASSIGNMENT

After discussing the projects with State Parks, and the Los Angeles Department of Beaches and Harbors, as well as with LA County Department of Regional Planning, County Foresters, and other permitting agencies between June 2020 and November 2021, it was agreed that the assignment was as follows:

1. Tag and assess all native trees over 5-inch Diameter at Standard Height (DSH) within the potential disturbed and restoration area for each proposed alternative. (Note this is less than the 6” requirement of the LCP but due to the anticipated time lag between preparing this report and implementation, we erred on the side of including trees that might grow into the protected range during that time.)
2. Tag any native trees under 5 inches DSH that could potentially qualify as a mitigation tree in the restoration area.

3. Confirm that tree locations are properly indicated on the 30% Conceptual Site Plan, and within all four Alternative Designs, potential fuel modification zones and landscape restoration areas.
4. Map canopy dripline limits to scale on the map and reflect current canopy extent and tree protected zones.
5. Identify any historic or heritage trees and provide recommendations on whether to remove or retain, and any associated mitigations.
6. Determine the extent of the impacts and encroachments to individual native trees proposed to remain.
7. Analyze the impacts to protected H1, H1Buffer, H2 and H3 Habitat categories as well as fuel modification zones.
8. Define the Permit Request and potential impacts in accordance with the Los Angeles County Oak Protection Ordinance and the Local Coastal Plan.
9. Identify locations for replacement planting. (To be done once a preferred alternative is selected).
10. Provide recommendations for meeting the Permit requirements for mitigating any impacts or loss of protected native trees and riparian woodlands on the site.

LIMITS OF THE ASSIGNMENT

Due to time and budget constraints, the conditions of the trees are based upon visual assessment only. No root excavations were done. A final survey of tree positions will be completed once the preferred alternative is selected.

PURPOSE AND USE OF THE REPORT

The purpose of this report is to provide all information needed to meet the requirements of the California Coastal Commission and Los Angeles County Local Coastal Program related to implementing the proposed restoration and applying for a Conditional Use Permit (CUP). Mitigation recommendations incorporate those required by Los Angeles County, State Parks and other relevant permitting agencies such as CA Department of Fish and Wildlife.

SITE DESCRIPTION

The Topanga Lagoon Restoration Project is located on State Parks parcels APN 4448-002-900 and 4448-002-901on the north side of Pacific Coast Highway (PCH) and west of Topanga Canyon Blvd. Also included is parcel 4448-001-900, which is owned by the Los Angeles County Department of Beaches and Harbors.

Figure 1. Topanga Lagoon Restoration Planning Area Parcel Map

PROJECT DESCRIPTION

The Topanga Lagoon Restoration Project is a coordinated multiagency plan that seeks to expand the existing lagoon footprint, which is less than 1 acre, to 9-12 acres, a significant portion of its former 30-acre extent. The project will address the current causes of resource damage, while proactively building resilience to future environmental challenges. This plan also seeks to improve coastal access and recreation in a way that supports and enhances biological and cultural values.

The range of alternatives allows us to consider the benefits and challenges of the different restoration approaches. This allows a final preferred alternative to be chosen at the end of the environmental review process that best meet the project's needs. Analysis of potential native tree impacts will be factored into that decision.

Alternative 1: No Project/Managed Decline (0 acres restored):

No change in tree condition would occur.

Under this alternative, the project would not occur. Therefore, there would be no change to the lagoon footprint or habitat quality, and no new bridge would be constructed. Damage to the lifeguard headquarters due to coastal erosion would continue to occur and would likely require future relocation by another project. The Topanga Ranch Motel would continue to deteriorate, and existing non-conforming concessions and septic systems are anticipated to be restricted in the future. No improvements to habitat would occur and non-native trees would remain along with the Arundo patches. Sea level rise

would continue to reduce beach area available and threaten the integrity of the Pacific Coast Highway. Figure 1 provides an overview of the project area showing section boundaries which correspond to detailed maps for each section showing tree locations and tree protected zones (TPZ) which are found in Figures 4-7. CDPR is the landowner for all sections north of PCH, and DBH is the landowner for the sections south of PCH.

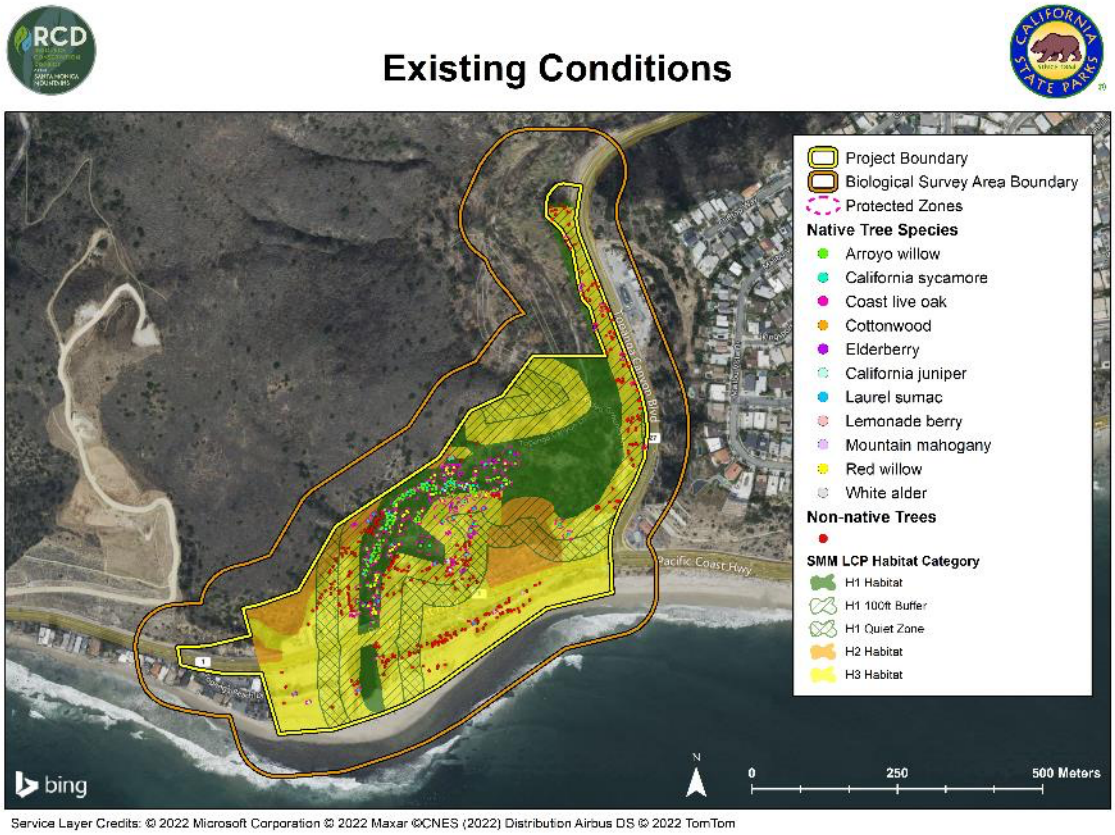


Figure 2. Existing Conditions Showing LCP Habitat Zones

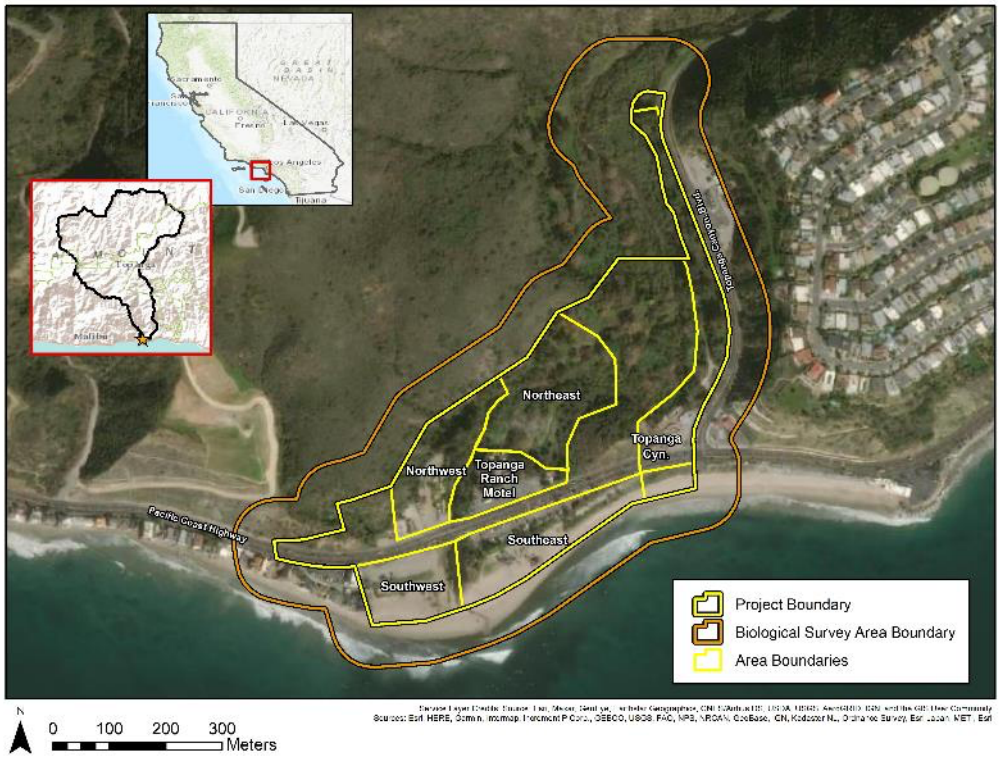


Figure 3. Overall Topanga Lagoon Restoration Project Area Sections

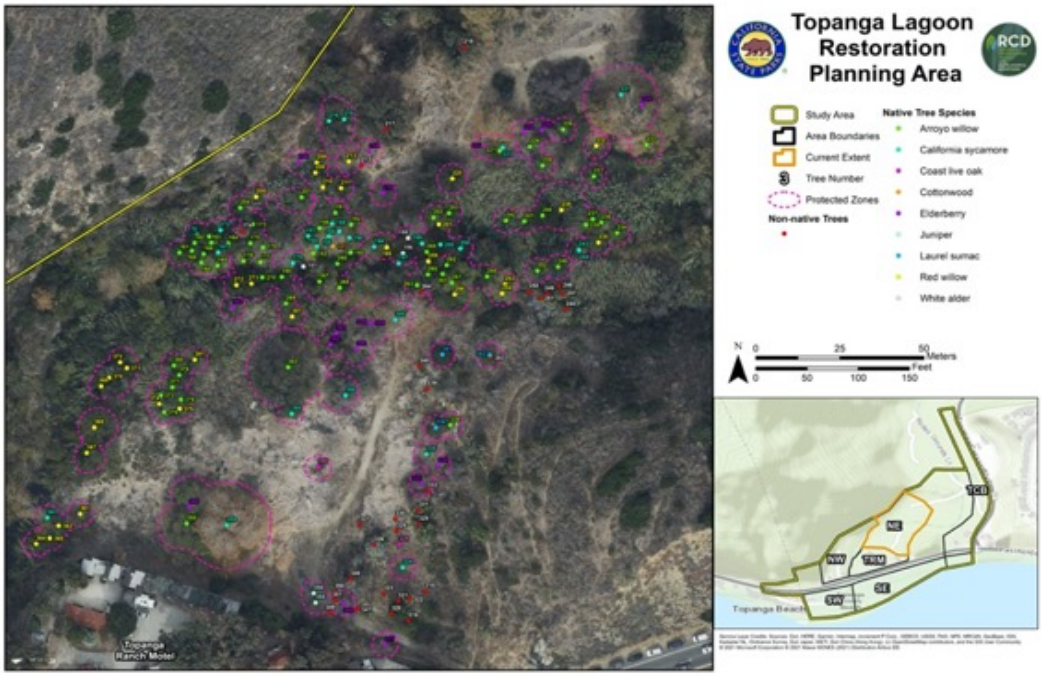


Figure 4. Existing Conditions - Northeast

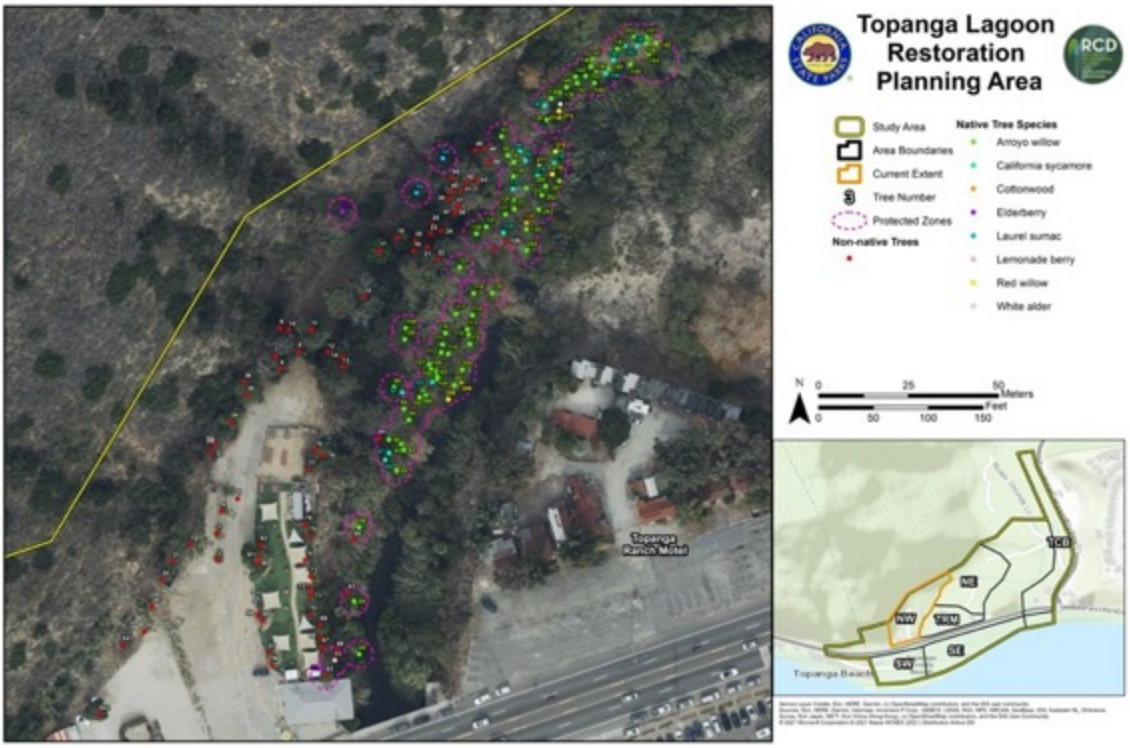


Figure 5. Existing Conditions - Northwest

Figure 6. Existing Conditions - Topanga Ranch Motel

Figure 7. Existing Conditions - Southeast

Figure 8. Existing Conditions - Southwest

Actions Common to All Project Alternatives.
Alternatives 2-4 are the "Project Alternatives". Each of these alternatives provides a different road map to restoring the lagoon, buffering its resources from future sea level rise, and meeting the project goals. However, these Project Alternatives have many things in common.

Under all Project Alternatives the lagoon area would be expanded to 9-12 acres, with wetted areas encompassing 7-10 acres. This would require removing much of the existing artificial fill onsite to create a more natural topography and expanded open space areas. The native trees growing on the wetted banks, as well as others that have been identified as important biological resources will be retained in all alternatives. Grading will be avoided within the footprint of the existing wetted lagoon, creek channel, and the beach berm at its mouth.

The project area would be improved by replacing invasive plants with native wetland, riparian and upland vegetation. Relocation of key buildings, structures and infrastructure and undergrounding of associated utilities would occur to facilitate this.

The length of the existing Caltrans bridge would be expanded to accommodate a widened lagoon and would improve fish migration and the quantity/quality of lagoon habitats. The primary bridge span would increase to 200 feet, with secondary/side spans increasing 40-100 feet, depending on the specific alternative chosen.

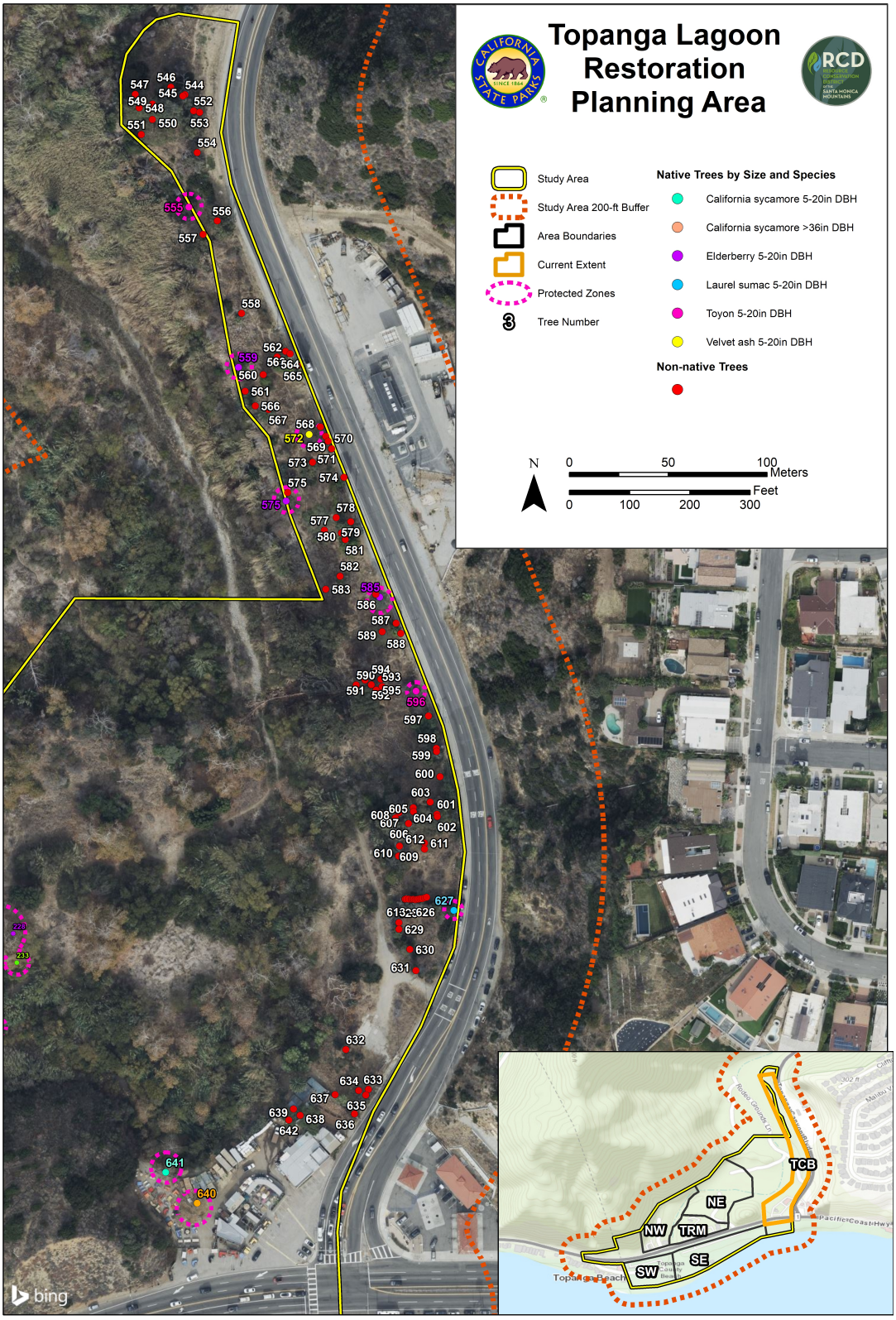
A plan for determining the final fate of the Topanga Ranch Motel is included in each alternative, as are improved locations for concessions and parking. Prehistoric cultural sites would be protected in place.

Coastal access and interpretive elements would be included in all alternatives. This includes pedestrian access under the PCH on the east and west sides of the lagoon, and several options for emergency vehicle access on the east. The lifeguard tower, beach restrooms and emergency facilities would be relocated further from the beach and existing wetted areas edge to address existing storm damage, and to better protect against future sea level rise and coastal erosion.

It should be noted that some of the options included in a specific alternative could be "mixed and matched" to create the best feasible alternative. This includes: keeping the expanded Caltrans bridge at the same location or shifting inland; full or partial retention of the Topanga Ranch Motel and some onsite concessions; inclusion of more than one wetted lagoon channel; expanding existing beach area through bridge realignment; alternative emergency access routes to the beach; and final placement of relocated beach facilities. The array of alternatives was chosen to show the full range of options available.

Topanga Canyon Boulevard Visitor Services
Depending on the alternative selected, moving some visitor services (camping, parking, etc.) to the upper terraced zone adjacent to the west side of Topanga Canyon Boulevard could be included. Examining the potential for wastewater services, slope stabilization,

etc. are in development. Mapping of this area was restricted to the top of slope and does not include trees extending into the 200-foot buffer zone as they are at a different elevation, buffered by large arundo patches and are not expected be impacted. Figure 9 provides details of tree locations for this portion of the project area.



Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Figure 9. All Trees Within the Topanga Canyon Blvd. Potential Restoration Area.

Alternative 2: Lagoon Habitat Maximized, Removal of Motel (9.5 wetted acres, as part of 11.7 acres restored):

Native trees located on the wetted banks will be retained, along with those in the northern floodplain area that have been identified as biologically significant. Most of the non-native trees would be removed, although a few may be retained along the slope south of PCH. Restoration of riparian, transitional and upland vegetation will expand the riparian corridor and allow for the creek to naturally respond to changes in sea level rise.

This alternative provides the maximum increase in lagoon, wetland, riparian and transitional habitats. It includes restoration of more natural side channels on the western side of the lagoon that are based on historic topography and would accommodate changing sea level and storm surge conditions. The historic Topanga Ranch Motel and onsite concessions would be removed from the project area. Partial or full relocation or replacement of public parking, concessions and overnight accommodations would occur along the west side of Topanga Canyon Boulevard in the project area.)

To provide for a wider lagoon and improve fish migration, the existing Caltrans bridge would be replaced with a longer one along the same alignment. The span of the new bridge would total at least 460 feet, (200-foot primary span, with secondary/side spans of 130 feet each) and includes handicapped parking on a lower level, with additional parking on the upper level, emergency access, retaining walls, and PCH changes.

The lifeguard headquarters, beach restroom and helipad are currently threatened by coastal erosion. To protect from future damage, they will be demolished and rebuilt closer to the realigned access road.

Figure 10 provides an overview of the LA County habitat zones as they are currently mapped and Figure 11 identifies the ecological constraints and jurisdictional delineation boundaries that are guiding restoration grading. The boundaries may change slightly based on updated mapping conducted for the Biological Report and once a final alternative is selected, any changes to tree position within the H zones will be updated.

Detailed maps showing tree protected zones, habitat zones and fuel modification zones in relation to the current extent of proposed grading for each alternative are found in Appendix A.

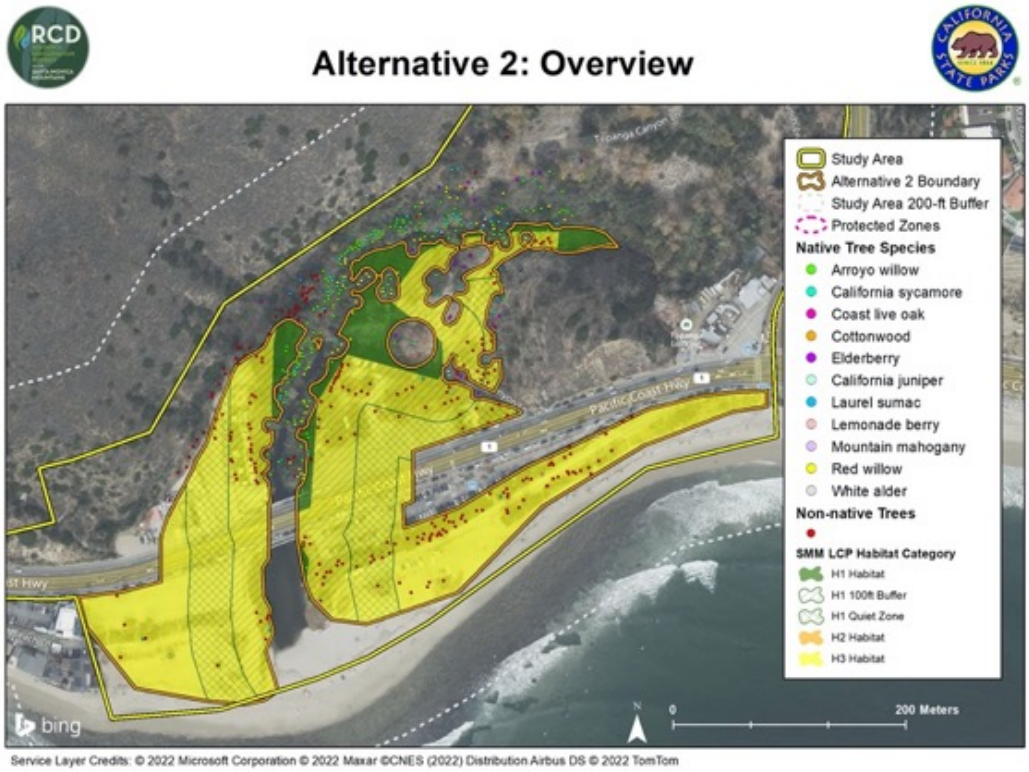


Figure 10. All Trees within the Alternative 2 and 200 ft Buffer Zone Using LACO Habitat Overlay.

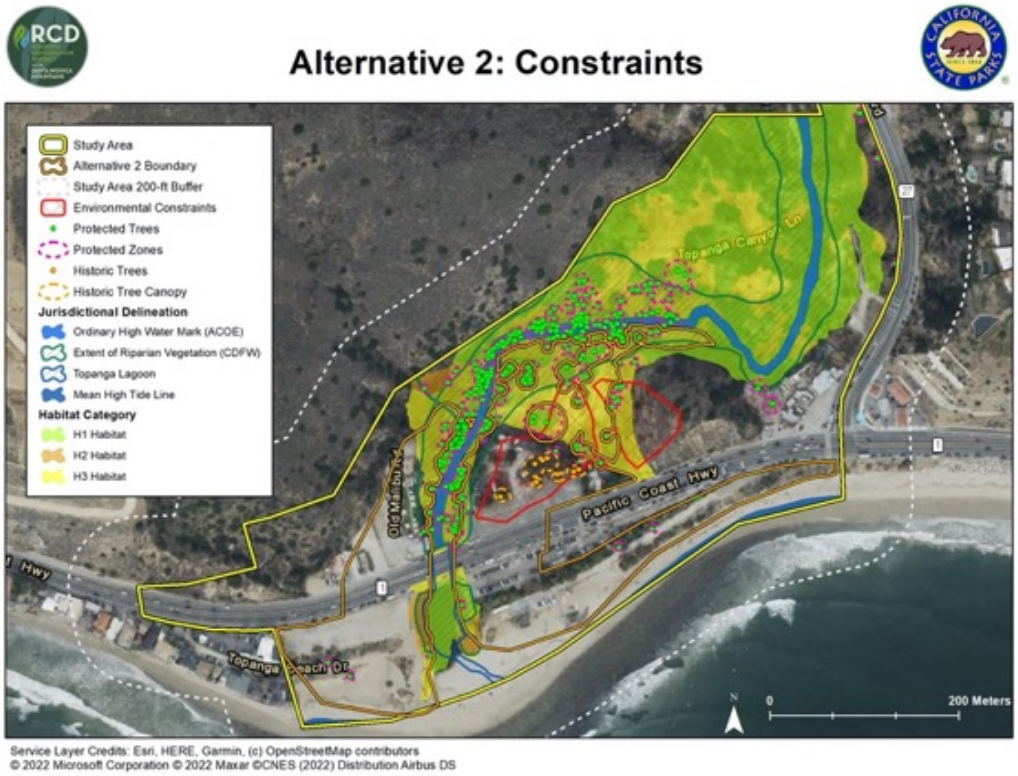


Figure 11. All Trees within the Alternative 2 and 200 ft Buffer Zone Using LACO Habitat Overlay Showing Ecological Constraints and Jurisdictional Delineation.

Alternative 3: Least Lagoon Habitat Expansion, Retention of Motel (7.1 wetted acres, as part of 9.8 acres restored):

Native trees located on the wetted banks will be retained, along with those in the northern floodplain area that have been identified as biologically significant. Most of the non-native trees would be removed, although up to eight of the mature eucalyptus trees (Trees #393, 394, 395, 419, 420, 421, 422, 424), a Canary Island Palm (Tree #423) and mature Euphorbia (Tree #425) deemed historic as part of the Topanga Ranch Motel will be retained within the renovated motel footprint. Restoration of riparian, transitional and upland vegetation will expand the riparian corridor and allow for the creek to naturally respond to changes in sea level rise. On the south side of PCH, most of the non-native trees would be removed and replaced with native species.

This alternative also provides some expanded lagoon, wetland, riparian and transitional habitat in the western part of the project but allows for only one main channel.

The Topanga Ranch Motel is renovated in its historic configuration. One existing concession (currently the Reel Inn restaurant) would be remodeled and continue to be operated. No other existing concessions would remain along PCH. Partial or full relocation or replacement of public parking, concessions and overnight accommodations along the west side of Topanga Canyon Blvd. in the project study area is being evaluated. The lifeguard headquarters would be demolished and rebuilt slightly east, and the helipad is on the same level as PCH and parking lot.

Figure 12 provides an overview of the LA County habitat zones as they are currently mapped and Figure 13 identifies the ecological constraints and jurisdictional delineation boundaries that are guiding restoration grading. The boundaries may change slightly based on updated mapping conducted for the Biological Report and once a final alternative is selected, any changes to tree position within the H zones will be updated.

Detailed maps showing tree protected zones, habitat zones and fuel modification zones in relation to the current extent of proposed grading for each alternative are found in Appendix A.

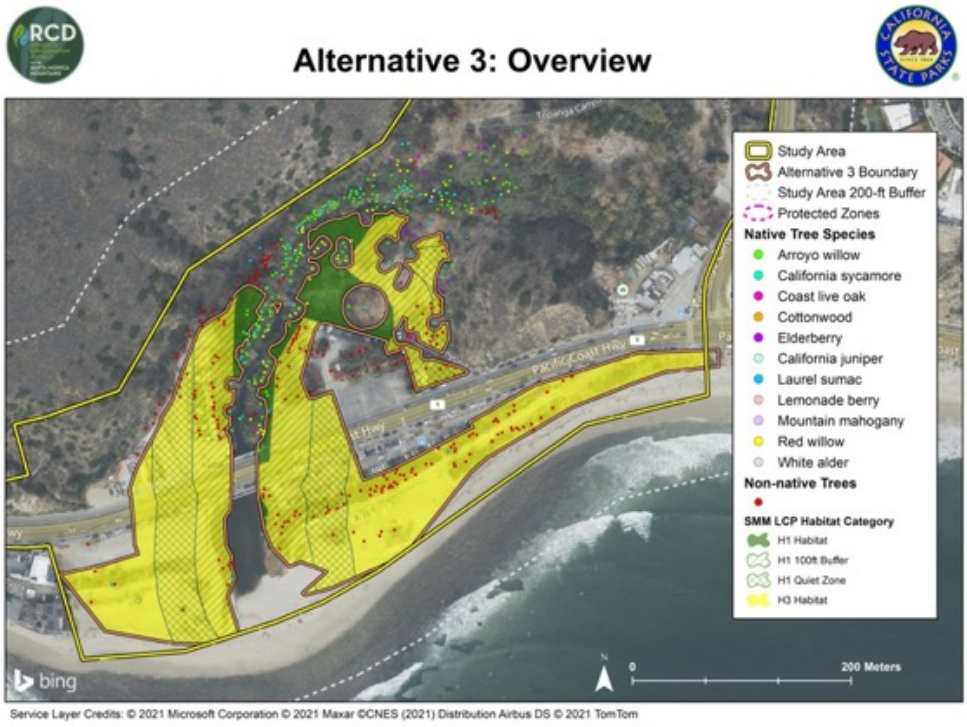


Figure 12. All Trees Within the Alternative 3 and 200 ft Buffer Zone Using LACO Habitat Overlay.

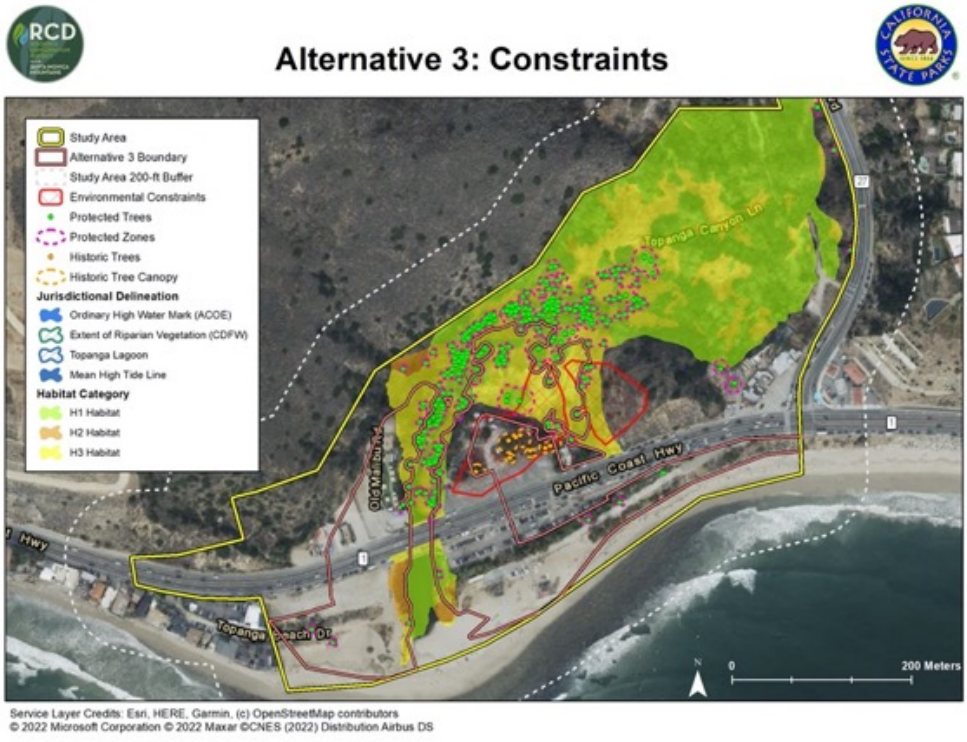


Figure 13. All Trees within the Alternative 3 and 200 ft Buffer Zone Using LACO Habitat Overlay Showing Ecological Constraints and Jurisdictional Delineation.

Alternative 4: Maximum Managed Retreat, Partial Motel Retention (7.1 wetted acres, as part of 10.8 acres restored):

Native trees located on the wetted banks will be retained, along with those in the northern floodplain area that have been identified as biologically significant. Most of the non-native trees would be removed, although up to seven of the mature eucalyptus trees (Trees #394, 395, 419, 420, 421, 422, 424), a Canary Island Palm (Tree #423) and mature Euphorbia (Tree #425) deemed historic as part of the Topanga Ranch Motel could be retained within the renovated motel footprint. Restoration of riparian, transitional and upland vegetation will expand the riparian corridor and allow for the creek to naturally respond to changes in sea level rise. On the south side of PCH, the non-native trees will be removed and replaced with native species.

The alignment of PCH moves north in this alternative, permitting the maximum amount of beach area and managed retreat. A portion of the historic Topanga Ranch Motel is retained with parking adjusted and allows for remodel and continued operation of the restaurant (current Reel Inn), while also providing expanded lagoon, wetland, riparian and transitional habitat mostly on the west. No other concessions remain and parking locations shift. Partial or full relocation or replacement of public parking, concessions and overnight accommodations along the west side of Topanga Canyon Blvd. in the project area is under consideration. The helipad and lifeguard headquarters are not as closely sited. This alternative maximizes managed retreat and provides the most sea level rise resilience.

Figure 14 provides an overview of the LA County habitat zones as they are currently mapped and Figure 15 identifies the ecological constraints and jurisdictional delineation boundaries that are guiding restoration grading. The boundaries may change slightly based on updated mapping conducted for the Biological Report and once a final alternative is selected, any changes to tree position within the H zones will be updated.

Detailed maps showing tree protected zones, habitat zones and fuel modification zones in relation to the current extent of proposed grading for each alternative are found in Appendix A.

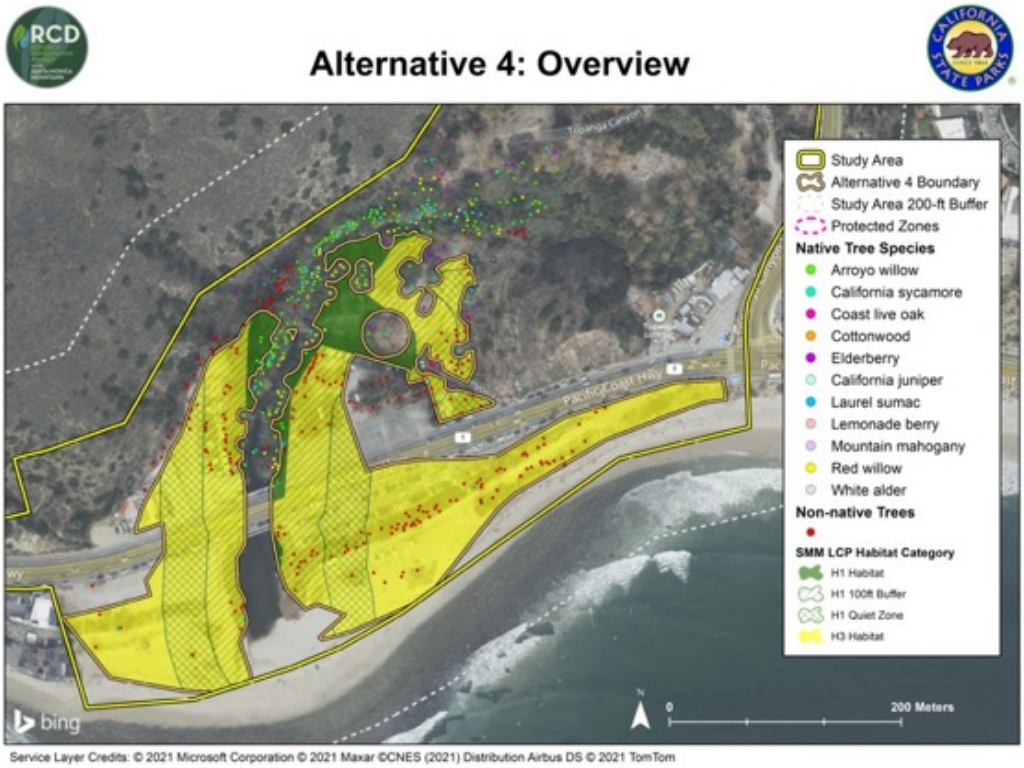


Figure 14. All Trees within the Alternative 4 and 200 ft Buffer Zone Using LACO Habitat Overlay.

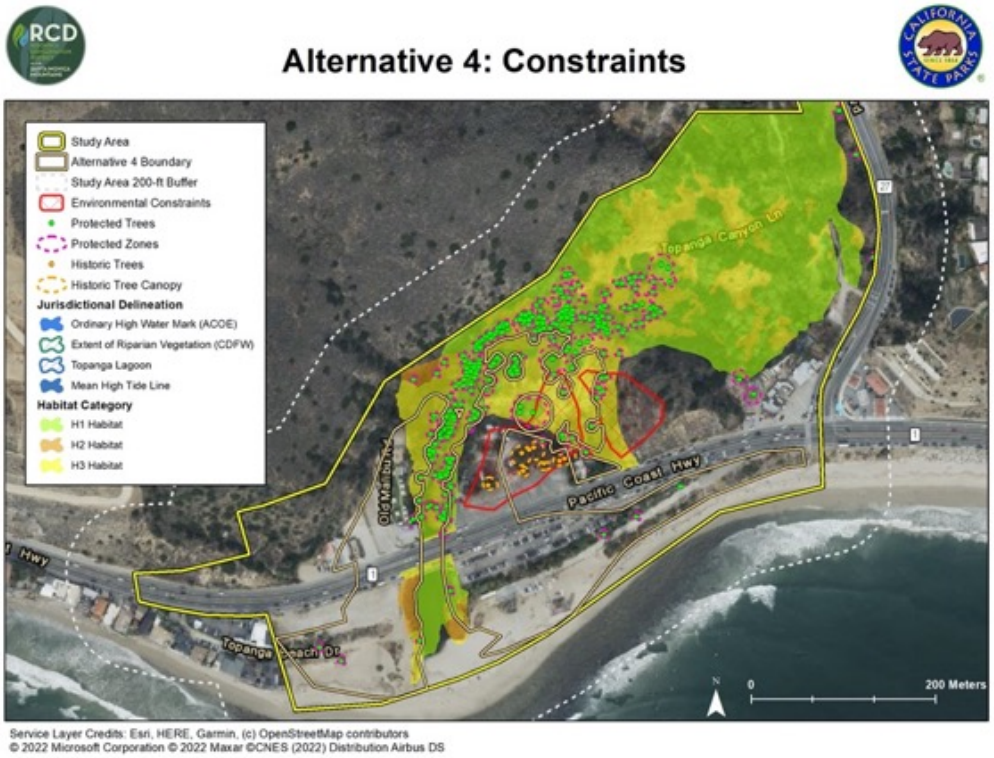


Figure 15. All Trees within the Alternative 4 and 200 ft Buffer Zone Using LACO Habitat Overlay Showing Ecological Constraints and Jurisdictional Delineation.

METHODS FOR TREE INVENTORY

Data for this report was collected between March - November 2021. All trees with a single trunk over five inches in diameter, or having more than two trunks with a combined diameter of over eight inches, were tagged with round, stamped, numbered tags at approximately 54 inches above grade (DSH= diameter at standard height) on the north side of the tree (unless inaccessible). Note that although the county requirement for a protected native tree is 6 inch for a single trunk, due to the time lag between the initial field assessment and implementation, we anticipated potential growth and identified all potentially protected trees. Non-native trees with one trunk larger than 6 inches or two trunks adding to more than 8 inches were also tagged.

Native trees under 5 inch diameter were also tagged to document demography of the site and identify potential volunteer trees that could be used for mitigation. Tree height was visually estimated, number of trunks and DSH were measured and canopy extent estimated in four cardinal directions. Tree protected zones (TPZ) were mapped based on the outer dripline of the tree canopy plus either 5 ft or 15 ft from a trunk, depending on which is larger.

Tag numbers between 0-642 were used with the exception of 26, 27, 169, 337 and 344 which were lost.

Tree location was mapped using the EOS Positioning Systems Arrow 100. The geographic coordinate system used was WGS 1984, and the projection used was Mercator Auxiliary Sphere. The range of accuracy was 0.30 to 3 meters. Data was collected using ArcGIS Collector, and maps were created using ESRI Arcmap 10.8. Quality Assurance/Quality Control review of the data fields and map locations was conducted. Latitude and longitude coordinates are provided in decimal degrees.

Once a preferred alternative is selected the final tree survey will be conducted to verify locations of all trees within the potentially disturbed area in accordance with county standards.

Table 12. Metadata for Maps

File name	File type	Properties (coordinates, etc)	Source/date
LA County H Zones	Shapefile	NAD 1983/GCS1983	LA County, unk date
Vegetation Alliances	Shapefile	NAD 1983/GCS 1983	National Park Service, 2007
Basemap imagery	Basemap	n/a	Maxar/ESRI, 2/2/2020
Impact area	Map layer	NAD 1983/GCS 1983	RCDSMM?
School site boundary	Map layer	NAD 1983/GCS 1983	Courtney M, April 2020
Impact area 200-ft buffer	Map layer	NAD 1983/GCS 1983	Courtney M, April 2020

CA State Parks Boundary	Shapefile	unknown	Noa, April 2020
Updated H Zones	Map layer	NAD 1983/GCS 1983	Courtney M, April 2020
Updated vegetation alliances	Map layer	NAD 1983/GCS 1983	Courtney M, April 2020

Trees were assigned a health and vigor rating based on a summary of the condition of roots, trunk, scaffold branches, small branches and twigs, and foliage according to the standards of the *International Society of Arboriculture Guide to Judging Plant Condition*. Each factor was given a point score according to the guidelines (5 being the highest score, 1 the worst). The total value was divided by 25 (the maximum amount of points possible) and multiplied by 100 to obtain a percent rating. Notes on pests, disease, mechanical injury, constrained roots or other potential impacts were also documented.

Excellent (90-100%) - A healthy and vigorous tree characteristic of its species and reasonably free of any visible signs of stress, disease or pest infestation.

Good (70-89%) - A healthy and vigorous tree characteristic of its species with less than 25% of the tree affected by visible signs of stress, disease or pest infestation.

Fair (50-69%) - A healthy and vigorous tree characteristic of its species with 25-75% of the tree affected by visible signs of stress, disease or pest infestation.

Poor (25-49%) - Greater than 75% of this tree is affected by visible signs of stress, disease or pests and appears to be in a general state of decline.

Very Poor/Dead (0-24%) - The tree exhibits few, if any, signs of life.

A summary of all Protected native trees by species and size class is provided in Table 10, with Table 14 summarizing all the non-native trees found. Full details on each individual tree are found in Appendix B. Photos of each tree are found in Appendix C. Heritage Trees (those natives with a single trunk greater with a diameter of over 36 inches) are in bold in the appendix tables. Historic trees are also noted. A summary of the number of each species of native trees located within each alternative disturbed area are listed in Tables 12 and 13.

Native Tree Summary

There are a total of 292 native trees in the project area of which 277 are of protected size plus 15 undersized natives in the overall project area summarized in Tables 10 and 11. Details on tree identification, scientific and common name, location (latitude and longitude in decimal degrees), recommended action (retain, remove), % encroachment into the protected zone, DSH, condition and comments are found in Appendix B. Photos of all trees are found in Appendix C.

Table 13. Summary of 270 Protected and 15 undersized Native Trees in the Topanga Lagoon Restoration Planning Area

Common Name	Scientific Name	Total Number <5" DSH	Total Number 5-20" DSH	Total Number 20.1-36" DSH	Total Number >36" DSH	Total Number
White Alder	*Alnus rhombifolia*	0	2	0	2	**4**
Mountain mahogany	*Cercocarpus sp.*	0	1	0	0	**1**
Juniper*	*Juniperus californica*	0	2	2	0	**4**
Laurel Sumac	*Malosma laurina*	0	8	4	0	**12**
California Sycamore	*Platanus racemosa*	6	31	4	3	**44**
Cottonwood	*Populus fremontii*	0	2	0	0	**2**
Coast Live Oak	*Quercus agrifolia*	1	2	0	0	**3**
Lemonade Berry	*Rhus integrifolia*	0	3	0	0	**3**
Arroyo Willow	*Salix lasiolepsis*	8	90	28	16	**142**
Red Willow	*Salix laevigata*	0	22	14	14	**50**
Elderberry	*Sambucus nigra*	0	6	7	7	**20**
	TOTAL	**15**	**169**	**59**	**42**	**285**

*Junipers are remnants of past landscaping and not native to the area.

Additionally, there are 7 native trees of protected size representing four species located along Topanga Canyon Blvd. summarized in Table 11.

Table 14. Summary of Protected Native Trees on Topanga Canyon Blvd.

Tree Number	Common Name	Scientific Name	DBH sum	Number of Trunks	Condition Category	Latitude	Longitude
640	CA Sycamore	*Platanus racemosa*	42	1	Good	34.04043047	-118.579964
641	CA Sycamore	*Platanus racemosa*	39	3	Good	34.04054659	-118.5801072
559	Elderberry	*Sambucus nigra*	40	3	Good	34.04361439	-118.5797774
575	Elderberry	*Sambucus nigra*	10	10	Good	34.04307558	-118.5795344
627	Laurel Sumac	*Malosma laurina*	23	8	Good	34.04152361	-118.5787778
555	Toyon	*Heteromeles arbutifolia*	17	3	Good	34.04422193	-118.5799692
596	Toyon	*Heteromeles arbutifolia*	21	10	Fair	34.04236099	-118.5789687

Native Trees to Remain

The goal of the project is habitat restoration, so to that end, all the primarily willow trees lining the wetted banks of the creek will be preserved and protected during grading. Additionally, biologically significant Trees #358-360, 383 and 388-392 will also be retained in all Alternatives and recommendations for protecting these trees during construction are included in the recommendations. Additional details for each of these trees is found in Appendix B.

Table 15. Summary of all Protected Native Trees to Remain in the Topanga Lagoon Restoration Planning Area

Tree Number	Common Name	Scientific Name	DSH Sum	Number trunks	Canopy Spread ft	Condition Category	Latitude	Longitude
16	Elderberry	Sambucus nigra	24.4	4	15	Good	34.0405401	-118.5832700
45	Laurel sumac	Malosma laurina	10.9	11	10	Good	34.0406884	-118.5829889
46	Laurel sumac	Malosma laurina	14.0	5	10	Good	34.0406010	-118.5830670
51	Arroyo Willow	Salix lasiolepsis	70.2	20	30	Good	34.0407458	-118.5828130
52	California sycamore	Platanus racemosa	7.6	1	25	Good	34.0406860	-118.5827406
55	Arroyo Willow	Salix lasiolepsis	18.5	5	25	Good	34.0406983	-118.5827934
64	Elderberry	Sambucus nigra	24.5	3	20	Fair	34.0394314	-118.5833343
65	Lemonade Berry	Rhus integrifolia	8.9	2	25	Excellent	34.0394217	-118.5832907
80	Arroyo Willow	Salix lasiolepsis	24.7	5	15	Excellent	34.0394453	-118.5831765
81	Laurel Sumac	Malosma laurina	22.0	6	15	Fair	34.0395380	-118.5831522
82	Arroyo Willow	Salix lasiolepsis	17.5	4	10	Fair	34.0395225	-118.5831756
84	Arroyo Willow	Salix lasiolepsis	14.3	4	20	Fair	34.0395750	-118.5832354
86	Arroyo Willow	Salix lasiolepsis	20.0	2	10	Good	34.0397602	-118.5832236
87	California sycamore	Platanus racemosa	9.0	2	15	Excellent	34.0399478	-118.5831369
88	Arroyo Willow	Salix lasiolepsis	13.0	5	0	Excellent	34.0399040	-118.5831132
90	Arroyo Willow	Salix lasiolepsis	10.0	4	6	Fair	34.0399811	-118.5831377
92	Arroyo Willow	Salix lasiolepsis	20.9	11	0	Fair	34.0399560	-118.5830932
93	Arroyo Willow	Salix lasiolepsis	12.0	1	40	Good	34.0399712	-118.5831010
94	Arroyo Willow	Salix lasiolepsis	11.0	3	30	Good	34.0400316	-118.5830781
98	Arroyo Willow	Salix lasiolepsis	14.3	2	20	Fair	34.0401123	-118.5831252
99	Arroyo Willow	Salix lasiolepsis	8.7	4	6	Excellent	34.0400963	-118.5830298
100	Arroyo Willow	Salix lasiolepsis	19.0	4	15	Excellent	34.0400799	-118.5830274

101	California sycamore	Platanus racemosa	5.5	1	0	Excellent	34.0401092	-118.5830340
102	California sycamore	Platanus racemosa	8.0	1	20	Excellent	34.0401271	-118.5830097
103	Arroyo Willow	Salix lasiolepsis	7.2	4	20	Excellent	34.0401352	-118.5829956
104	Arroyo Willow	Salix lasiolepsis	12.7	8	10	Good	34.0401420	-118.5829940
105	Arroyo Willow	Salix lasiolepsis	27.4	13	10	Good	34.0401540	-118.5829970
107	Arroyo Willow	Salix lasiolepsis	23.0	7	15	Good	34.0401715	-118.5830194
108	Arroyo Willow	Salix lasiolepsis	11.2	2	15	Good	34.0402336	-118.5830952
109	Arroyo Willow	Salix lasiolepsis	7.4	2	6	Good	34.0402614	-118.5830925
110	Arroyo Willow	Salix lasiolepsis	18.7	7	20	Excellent	34.0401987	-118.5829637
111	Arroyo Willow	Salix lasiolepsis	13.7	5	8	Good	34.0402220	-118.5829810
112	Arroyo Willow	Salix lasiolepsis	26.5	12	20	Good	34.0402018	-118.5829850
113	Arroyo Willow	Salix lasiolepsis	12.2	9	8	Good	34.0402607	-118.5829070
114	Arroyo Willow	Salix lasiolepsis	8.5	2	13	Good	34.0402241	-118.5828989
115	Arroyo Willow	Salix lasiolepsis	11.5	4	8	Good	34.0402472	-118.5829025
116	Arroyo Willow	Salix lasiolepsis	41.1	17	10	Good	34.0402508	-118.5829722
117	Arroyo Willow	Salix lasiolepsis	15.0	3	7	Good	34.0402991	-118.5829419
118	Arroyo Willow	Salix lasiolepsis	12.6	5	13	Good	34.0402964	-118.5828920
119	Arroyo Willow	Salix lasiolepsis	26.5	5	10	Good	34.0403516	-118.5828896
120	Arroyo Willow	Salix lasiolepsis	11.2	3	10	Good	34.0403529	-118.5828337
121	Arroyo Willow	Salix lasiolepsis	24.6	5	0	Fair	34.0404160	-118.5829330
124	Arroyo Willow	Salix lasiolepsis	11.3	11	15	Good	34.0405858	-118.5827718
125	California sycamore	Platanus racemosa	11.5	4	10	Good	34.0405041	-118.5828028
127	Arroyo Willow	Salix lasiolepsis	8.2	5	6	Good	34.0405191	-118.5828549
128	Arroyo Willow	Salix lasiolepsis	10.3	5	10	Good	34.0405006	-118.5828843
129	Cottonwood	Populus fremontii	8.0	5	6	Fair	34.0405302	-118.5827341
130	Arroyo Willow	Salix lasiolepsis	33.2	19	10	Good	34.0405140	-118.5827339
131	Arroyo Willow	Salix lasiolepsis	11.0	6	6	Good	34.0405503	-118.5827979

132	California sycamore	Platanus racemosa	11.2	5	10	Good	34.0406140	-118.5827755
133	Arroyo Willow	Salix lasiolepsis	14.4	10	6	Fair	34.0406166	-118.5827358
134	Arroyo Willow	Salix lasiolepsis	15.8	5	10	Good	34.0406454	-118.5827753
135	Arroyo Willow	Salix lasiolepsis	14.6	5	10	Good	34.0407897	-118.5826773
136	California sycamore	Platanus racemosa	10.0	1	20	Excellent	34.0408249	-118.5826846
137	White Alder	Alnus rhombifolia	7.6	2	10	Good	34.0408292	-118.5826377
138	Arroyo Willow	Salix lasiolepsis	11.7	5	10	Good	34.0408430	-118.5826658
139	Arroyo Willow	Salix lasiolepsis	19.5	8	10	Good	34.0408579	-118.5826405
140	Arroyo Willow	Salix lasiolepsis	30.4	10	10	Good	34.0408718	-118.5826199
141	Arroyo Willow	Salix lasiolepsis	6.1	2	15	Excellent	34.0408829	-118.5825874
142	Arroyo Willow	Salix lasiolepsis	8.3	3	3	Fair	34.0408986	-118.5825931
143	Arroyo Willow	Salix lasiolepsis	14.2	5	0	Fair	34.0409008	-118.5825632
144	Arroyo Willow	Salix lasiolepsis	17.2	9	20	Excellent	34.0409091	-118.5825313
145	Arroyo Willow	Salix lasiolepsis	8.1	6	15	Excellent	34.0408837	-118.5825360
146	Arroyo Willow	Salix lasiolepsis	8.3	5	10	Excellent	34.0409246	-118.5825477
148	California sycamore	Platanus racemosa	9.0	2	30	Excellent	34.0409077	-118.5825021
149	Arroyo Willow	Salix lasiolepsis	6.4	1	6	Good	34.0409208	-118.5824962
150	California sycamore	Platanus racemosa	14.7	1	25	Excellent	34.0409409	-118.5824796
151	Arroyo Willow	Salix lasiolepsis	8.3	1	15	Excellent	34.0409695	-118.5824684
152	California sycamore	Platanus racemosa	30.6	5	20	Excellent	34.0409783	-118.5824444
153	Arroyo Willow	Salix lasiolepsis	62.8	10	30	Excellent	34.0410001	-118.5824191
154	Arroyo Willow	Salix lasiolepsis	9.5	1	30	Excellent	34.0409592	-118.5823737
155	California sycamore	Platanus racemosa	11.6	1	30	Excellent	34.0409780	-118.5824090
156	Arroyo Willow	Salix lasiolepsis	8.0	2	20	Good	34.0409854	-118.5823826
157	Arroyo Willow	Salix lasiolepsis	10.0	1	10	Good	34.0410003	-118.5823815
159	Arroyo Willow	Salix lasiolepsis	14.3	5	13	Excellent	34.0409310	-118.5824286
160	Arroyo Willow	Salix lasiolepsis	17.5	3	10	Excellent	34.0410021	-118.5822224

161	Arroyo Willow	Salix lasiolepsis	16.7	2	10	Excellent	34.0410283	-118.5822933
162	Arroyo Willow	Salix lasiolepsis	16.1	5	15	Excellent	34.0410555	-118.5822448
163	Arroyo Willow	Salix lasiolepsis	25.9	5	20	Good	34.0410570	-118.5821911
164	Arroyo Willow	Salix lasiolepsis	8.5	2	10	Excellent	34.0410561	-118.5821366
165	Arroyo Willow	Salix lasiolepsis	9.0	1	10	Good	34.0409946	-118.5821700
166	Arroyo Willow	Salix lasiolepsis	6.0	1	0	Good	34.0410255	-118.5822154
167	California sycamore	Platanus racemosa	13.4	1	20	Excellent	34.0410304	-118.5821684
168	Arroyo Willow	Salix lasiolepsis	13.8	3	0	Fair	34.0410341	-118.5822537
170	California sycamore	Platanus racemosa	10.0	2	25	Excellent	34.0410778	-118.5822373
171	Arroyo Willow	Salix lasiolepsis	44.5	7	15	Excellent	34.0410740	-118.5821979
172	California sycamore	Platanus racemosa	6.8	1	10	Good	34.0410914	-118.5821626
173	Arroyo Willow	Salix lasiolepsis	11.2	2	15	Good	34.0411088	-118.5820586
175	Arroyo Willow	Salix lasiolepsis	8.5	5	10	Excellent	34.0410570	-118.5820660
176	Arroyo Willow	Salix lasiolepsis	10.6	3	3	Good	34.0410083	-118.5820869
177	Arroyo Willow	Salix lasiolepsis	15.6	5	15	Excellent	34.0410056	-118.5820325
178	Arroyo Willow	Salix lasiolepsis	22.0	4	10	Excellent	34.0410460	-118.5820249
179	California sycamore	Platanus racemosa	13.4	1	25	Excellent	34.0410045	-118.5819280
180	Arroyo Willow	Salix lasiolepsis	9.0	4	6	Excellent	34.0409664	-118.5819629
181	White Alder	Alnus rhombifolia	48.6	6	25	Excellent	34.0409956	-118.5818937
182	Arroyo Willow	Salix lasiolepsis	16.2	2	10	Good	34.0410317	-118.5818621
183	California sycamore	Platanus racemosa	5.2	1	25	Good	34.0410790	-118.5818797
184	California sycamore	Platanus racemosa	15.0	2	20	Excellent	34.0410514	-118.5818508
185	California sycamore	Platanus racemosa	7.9	1	20	Excellent	34.0410804	-118.5818130
186	Arroyo Willow	Salix lasiolepsis	5.4	1	35	Excellent	34.0411014	-118.5818432
187	Cottonwood	Populus fremontii	17.2	1	30	Excellent	34.0410524	-118.5818002
188	California sycamore	Platanus racemosa	7.2	1	20	Excellent	34.0411136	-118.5818036
190	California sycamore	Platanus racemosa	7.4	1	20	Excellent	34.0410761	-118.5817469

191	Arroyo Willow	Salix lasiolepsis	6.5	1	6	Fair	34.0411441	-118.5817939
192	Arroyo Willow	Salix lasiolepsis	9.2	4	3	Excellent	34.0411122	-118.5817421
193	Arroyo Willow	Salix lasiolepsis	13.9	7	8	Excellent	34.0410358	-118.5817421
194	California sycamore	Platanus racemosa	10.2	1	25	Excellent	34.0410525	-118.5816667
195	Red Willow	Salix laevigata	33.5	7	35	Excellent	34.0410514	-118.5816263
196	White Alder	Alnus rhombifolia	6.1	1	30	Excellent	34.0410362	-118.5815736
198	White Alder	Alnus rhombifolia	55.1	6	30	Excellent	34.0410778	-118.5815583
199	California sycamore	Platanus racemosa	6.2	1	20	Excellent	34.0410633	-118.5815129
200	California sycamore	Platanus racemosa	10.1	1	15	Excellent	34.0410614	-118.5814536
201	Red Willow	Salix laevigata	29.6	6	30	Excellent	34.0411167	-118.5814601
202	Arroyo Willow	Salix lasiolepsis	26.0	4	6	Fair	34.0411351	-118.5814775
203	Arroyo Willow	Salix lasiolepsis	17.8	5	8	Good	34.0411477	-118.5814277
204	Arroyo Willow	Salix lasiolepsis	39.0	11	10	Good	34.0411536	-118.5821001
205	Red Willow	Salix laevigata	46.7	7	25	Good	34.0411844	-118.5820492
206	Elderberry	Sambucus nigra	22.9	13	20	Excellent	34.0412816	-118.5819146
207	Arroyo Willow	Salix lasiolepsis	46.8	9	25	Good	34.0411850	-118.5819032
208	Red Willow	Salix laevigata	10.6	3	0	Poor	34.0412528	-118.5818599
209	Red Willow	Salix laevigata	37.6	8	15	Good	34.0412807	-118.5818563
210	Red Willow	Salix laevigata	15.8	5	13	Excellent	34.0412133	-118.5818347
211	Red Willow	Salix laevigata	56.1	16	20	Poor	34.0412116	-118.5817766
213	Red Willow	Salix laevigata	15.6	5	10	Excellent	34.0412849	-118.5817527
214	Elderberry	Sambucus nigra	17.6	16	25	Excellent	34.0413131	-118.5816886
215	California sycamore	Platanus racemosa	10.8	1	35	Excellent	34.0414001	-118.5817700
216	California sycamore	Platanus racemosa	14.3	2	35	Excellent	34.0413945	-118.5818183
219	Elderberry	Sambucus nigra	75.6	15	15	Excellent	34.0411999	-118.5816411
220	Red Willow	Salix laevigata	106.9	19	40	Good	34.0412422	-118.5814187
221	Arroyo Willow	Salix lasiolepsis	18.9	6	10	Good	34.0413199	-118.5812678

222	Elderberry	Sambucus nigra	18.9	12	10	Excellent	34.0413315	-118.5813138
223	California sycamore	Platanus racemosa	25.0	2	40	Excellent	34.0413289	-118.5812579
224	Elderberry	Sambucus nigra	15.0	1	20	Excellent	34.0413709	-118.5811904
225	Elderberry	Sambucus nigra	38.5	4	30	Excellent	34.0413780	-118.5811331
226	Arroyo Willow	Salix lasiolepsis	38.5	8	30	Good	34.0413813	-118.5810644
227	California sycamore	Platanus racemosa	74.5	5	55	Excellent	34.0414788	-118.5808798
228	Elderberry	Sambucus nigra	31.1	7	15	Excellent	34.0414521	-118.5808123
229	Arroyo Willow	Salix lasiolepsis	14.0	5	20	Good	34.0413328	-118.5811705
230	Arroyo Willow	Salix lasiolepsis	36.1	5	15	Good	34.0412817	-118.5811287
231	Arroyo Willow	Salix lasiolepsis	12.0	5	13	Excellent	34.0412543	-118.5809632
232	Red Willow	Salix laevigata	12.0	1	20	Good	34.0413379	-118.5809569
233	Arroyo Willow	Salix lasiolepsis	31.5	5	25	Good	34.0413426	-118.5807957
234	Arroyo Willow	Salix lasiolepsis	20.3	3	25	Excellent	34.0411002	-118.5808857
235	Red Willow	Salix laevigata	7.0	2	20	Excellent	34.0410736	-118.5809452
236	Arroyo Willow	Salix lasiolepsis	23.8	3	20	Excellent	34.0411283	-118.5809368
237	Arroyo Willow	Salix lasiolepsis	24.8	5	15	Excellent	34.0411373	-118.5809644
238	Arroyo Willow	Salix lasiolepsis	14.4	3	20	Excellent	34.0411213	-118.5809863
239	Red Willow	Salix laevigata	41.5	3	40	Excellent	34.0411606	-118.5810661
240	Arroyo Willow	Salix lasiolepsis	5.5	1	10	Fair	34.0411453	-118.5811269
241	Arroyo Willow	Salix lasiolepsis	15.8	3	15	Excellent	34.0411283	-118.5811847
242	Arroyo Willow	Salix lasiolepsis	9.3	2	15	Excellent	34.0411299	-118.5812433
243	California sycamore	Platanus racemosa	6.0	2	18	Excellent	34.0410534	-118.5810077
245	Arroyo Willow	Salix lasiolepsis	25.3	2	15	Excellent	34.0410052	-118.5810736
252	Arroyo Willow	Salix lasiolepsis	11.5	1	10	Good	34.0409937	-118.5811399
253	Red Willow	Salix laevigata	59.4	7	20	Excellent	34.0409550	-118.5812441
254	Red Willow	Salix laevigata	8.5	2	6	Fair	34.0409300	-118.5812526
255	Arroyo Willow	Salix lasiolepsis	17.0	2	20	Good	34.0409756	-118.5813016

256	Red Willow	Salix laevigata	64.5	6	40	Excellent	34.0409253	-118.5814053
257	Arroyo Willow	Salix lasiolepsis	33.8	7	18	Good	34.0409572	-118.5814150
258	California sycamore	Platanus racemosa	6.8	1	20	Excellent	34.0410512	-118.5813892
259	Red Willow	Salix laevigata	9.9	3	10	Good	34.0410152	-118.5814919
260	Arroyo Willow	Salix lasiolepsis	10.6	1	25	Excellent	34.0409790	-118.5814928
261	Arroyo Willow	Salix lasiolepsis	12.5	1	20	Excellent	34.0409807	-118.5814454
262	Arroyo Willow	Salix lasiolepsis	7.9	1	25	Excellent	34.0410057	-118.5814324
263	Arroyo Willow	Salix lasiolepsis	32.0	3	25	Good	34.0409496	-118.5815269
265	Arroyo Willow	Salix lasiolepsis	6.7	1	0	Fair	34.0410406	-118.5814972
266	Arroyo Willow	Salix lasiolepsis	31.0	2	30	Fair	34.0410045	-118.5817843
267	Arroyo Willow	Salix lasiolepsis	40.9	4	40	Good	34.0409553	-118.5818407
268	Arroyo Willow	Salix lasiolepsis	42.0	5	20	Fair	34.0409393	-118.5817757
269	Arroyo Willow	Salix lasiolepsis	19.3	5	25	Fair	34.0408938	-118.5819478
270	Arroyo Willow	Salix lasiolepsis	59.1	18	25	Good	34.0409641	-118.5820251
271	Red Willow	Salix laevigata	15.5	2	35	Good	34.0409468	-118.5820602
272	Red Willow	Salix laevigata	52.8	16	20	Good	34.0409421	-118.5821082
273	Red Willow	Salix laevigata	20.6	5	20	Good	34.0407951	-118.5826415
274	Red Willow	Salix laevigata	16.2	5	20	Good	34.0408118	-118.5826413
275	Red Willow	Salix laevigata	8.3	2	10	Fair	34.0407096	-118.5826496
276	California sycamore	Platanus racemosa	6.1	2	20	Excellent	34.0406810	-118.5826531
277	Red Willow	Salix laevigata	27.6	5	20	Excellent	34.0406721	-118.5826980
278	Red Willow	Salix laevigata	22.2	7	15	Good	34.0406531	-118.5826585
279	California sycamore	Platanus racemosa	6.4	2	6	Good	34.0406484	-118.5827020
280	Arroyo Willow	Salix lasiolepsis	7.1	3	13	Good	34.0406228	-118.5826777
282	Arroyo Willow	Salix lasiolepsis	11.5	2	15	Good	34.0406002	-118.5826889
283	Arroyo Willow	Salix lasiolepsis	12.8	2	20	Good	34.0405643	-118.5826979
284	Arroyo Willow	Salix lasiolepsis	22.5	5	13	Good	34.0404611	-118.5827320

285	Arroyo Willow	Salix lasiolepsis	15.2	6	10	Good	34.0401596	-118.5829203
286	Red Willow	Salix laevigata	12.9	4	10	Fair	34.0401218	-118.5829094
287	Arroyo Willow	Salix lasiolepsis	32.5	5	20	Fair	34.0401124	-118.5829308
288	Red Willow	Salix laevigata	16.7	6	15	Fair	34.0400866	-118.5829310
289	Arroyo Willow	Salix lasiolepsis	25.3	5	20	Good	34.0398986	-118.5829567
290	Red Willow	Salix laevigata	24.2	7	10	Excellent	34.0399147	-118.5829637
291	Arroyo Willow	Salix lasiolepsis	18.3	4	18	Excellent	34.0399118	-118.5829151
292	Red Willow	Salix laevigata	27.4	5	15	Excellent	34.0398822	-118.5829349
293	Red Willow	Salix laevigata	20.1	6	5	Fair	34.0398394	-118.5829508
294	Arroyo Willow	Salix lasiolepsis	12.4	2	20	Good	34.0398023	-118.5829666
295	Red Willow	Salix laevigata	20.6	3	25	Excellent	34.0397810	-118.5829772
296	Arroyo Willow	Salix lasiolepsis	7.3	1	0	Fair	34.0397874	-118.5830317
297	Red Willow	Salix laevigata	22.8	2	6	Fair	34.0397661	-118.5830289
298	Arroyo Willow	Salix lasiolepsis	21.3	2	10	Good	34.0397782	-118.5830824
300	Arroyo Willow	Salix lasiolepsis	33.9	10	20	Good	34.0397063	-118.5829367
301	Arroyo Willow	Salix lasiolepsis	16.8	8	18	Good	34.0396811	-118.5829271
302	Laurel Sumac	Malosma laurina	12.8	5	10	Excellent	34.0395888	-118.5829117
303	Laurel Sumac	Malosma laurina	8.8	5	6	Excellent	34.0395687	-118.5829228
305	Arroyo Willow	Salix lasiolepsis	18.0	3	6	Good	34.0396232	-118.5829847
306	Arroyo Willow	Salix lasiolepsis	36.7	6	30	Good	34.0395339	-118.5829708
307	Red Willow	Salix laevigata	14.0	1	25	Good	34.0394796	-118.5829940
308	Coast Live Oak	Quercus agrifolia	18.0	1	30	Excellent	34.0394425	-118.5830277
309	Red Willow	Salix laevigata	26.9	3	20	Good	34.0394472	-118.5829820
310	Red Willow	Salix laevigata	5.8	1	6	Fair	34.0394377	-118.5829539
311	Red Willow	Salix laevigata	12.3	5	10	Good	34.0394269	-118.5830066
312	Red Willow	Salix laevigata	10.1	3	6	Good	34.0394173	-118.5829625
313	Arroyo Willow	Salix lasiolepsis	34.8	4	15	Good	34.0393069	-118.5830011

314	Red Willow	Salix laevigata	18.0	3	3	Fair	34.0395182	-118.5830662
317	Elderberry	Sambucus nigra	14.3	5	20	Good	34.0400048	-118.5816028
324	California sycamore	Platanus racemosa	7.7	2	10	Excellent	34.0401764	-118.5815582
333	Elderberry	Sambucus nigra	82.5	11	20	Good	34.0404473	-118.5814917
334	Elderberry	Sambucus nigra	50.0	7	15	Good	34.0404976	-118.5814396
335	California sycamore	Platanus racemosa	8.6	5	10	Excellent	34.0405281	-118.5814781
336	Laurel Sumac	Malosma laurina	34.1	9	15	Good	34.0406018	-118.5814488
338	Arroyo Willow	Salix lasiolepsis	41.4	4	20	Fair	34.0406093	-118.5814025
341	Laurel Sumac	Malosma laurina	34.9	12	30	Excellent	34.0408032	-118.5814590
342	Laurel Sumac	Malosma laurina	13.0	7	15	Excellent	34.0407893	-118.5812920
345	California sycamore	Platanus racemosa	70.9	8	40	Excellent	34.0408536	-118.5815947
346	Elderberry	Sambucus nigra	24.4	7	20	Good	34.0400535	-118.5817457
354	Juniper	Juniperus californica	7.6	2	20	Excellent	34.0399774	-118.5818070
355	Juniper	Juniperus californica	8.5	1	15	Excellent	34.0400707	-118.5818233
356	Juniper	Juniperus californica	18.3	5	25	Excellent	34.0400964	-118.5818296
357	Laurel Sumac	Malosma laurina	18.4	12	10	Excellent	34.0400845	-118.5820735
358	Arroyo Willow	Salix Lasiolepsis	51.5	2	35	Excellent	34.0403038	-118.5822054
359	California sycamore	Platanus racemosa	71.5	3	48	Excellent	34.0403032	-118.5821423
360	Elderberry	Sambucus nigra	12.5	3	10	Excellent	34.0403492	-118.5821978
361	Red Willow	Salix laevigata	20.0	2	15	Excellent	34.0403095	-118.5826000
362	Red Willow	Salix laevigata	41.7	3	10	Good	34.0402763	-118.5826684
363	California sycamore	Platanus racemosa	24.4	2	25	Excellent	34.0402977	-118.5827052
364	Arroyo Willow	Salix laevigata	43.0	3	20	Excellent	34.0402258	-118.5827399
365	Red Willow	Salix laevigata	9.5	1	10	Good	34.0402421	-118.5826962
366	Arroyo Willow	Salix Lasiolepsis	9.8	1	0	Good	34.0401614	-118.5827452

367	Red Willow	Salix laevigata	45.8	5	30	Excellent	34.0404765	-118.5825819
368	Red Willow	Salix laevigata	69.5	10	40	Excellent	34.0405467	-118.5825587
369	Red Willow	Salix laevigata	18.5	2	8	Good	34.0406600	-118.5825387
370	Red Willow	Salix laevigata	49.6	11	35	Excellent	34.0406834	-118.5825135
371	Red Willow	Salix laevigata	34.0	4	0	Good	34.0407105	-118.5824568
372	Arroyo Willow	Salix laevigata	25.6	3	30	Excellent	34.0407261	-118.5824786
373	Arroyo Willow	Salix Lasiolepsis	15.3	2	6	Fair	34.0406368	-118.5823473
374	Arroyo Willow	Salix laevigata	11.7	2	6	Good	34.0406138	-118.5823508
375	Arroyo Willow	Salix laevigata	13.7	3	10	Fair	34.0406016	-118.5822849
376	Arroyo Willow	Salix Lasiolepsis	7.6	2	10	Good	34.0405917	-118.5823345
377	Arroyo Willow	Salix Lasiolepsis	8.8	1	10	Excellent	34.0406597	-118.5823092
378	Arroyo Willow	Salix Lasiolepsis	18.0	2	15	Good	34.0406272	-118.5822814
379	Arroyo Willow	Salix Lasiolepsis	36.4	5	10	Good	34.0406934	-118.5822880
380	Arroyo Willow	Salix Lasiolepsis	27.4	5	20	Excellent	34.0407194	-118.5823054
381	Arroyo Willow	Salix laevigata	37.8	5	25	Good	34.0407362	-118.5822386
382	Elderberry	Sambucus nigra	23.9	10	13	Excellent	34.0408808	-118.5821202
383	Arroyo Willow	Salix lasiolepsis	68.7	9	45	Good	34.0407193	-118.5819377
384	California sycamore	Platanus racemosa	11.4	3	30	Excellent	34.0405781	-118.5818957
385	Coast Live Oak	Quercus agrifolia	9.4	5	10	Excellent	34.0404575	-118.5818471
386	California sycamore	Platanus racemosa	25.1	4	35	Excellent	34.0405270	-118.5817410
387	Arroyo Willow	Salix laevigata	35.8	5	5	Good	34.0408583	-118.5819274
388	Elderberry	Sambucus nigra	85.9	13	35	Good	34.0408453	-118.5816727
389	Elderberry	Sambucus nigra	20.5	3	15	Excellent	34.0408433	-118.5816744
390	Elderberry	Sambucus nigra	56.0	5	20	Good	34.0407715	-118.5817177
391	Elderberry	Sambucus nigra	5.1	1	6	Excellent	34.0408135	-118.5817851
392	Elderberry	Sambucus nigra	36.8	5	20	Excellent	34.0407834	-118.5818028
436	Laurel Sumac	Malosma laurina	17.9	6	25	Excellent	34.0383957	-118.5841805

438	Juniper	Juniperus californica	19.2	2	15	Excellent	34.0382823	-118.5839961
445	Laurel Sumac	Malosma laurina	32.8	14	15	Excellent	34.0384462	-118.5832269
447	Arroyo Willow	Salix lasiolepsis	24.4	6	10	Excellent	34.0388454	-118.5829377
501	Laurel Sumac	Malosma laurina	15.8	6	14	Excellent	34.0392990	-118.5814393
516	Lemonade Berry	Rhus integrifolia	13.5	4	8	Excellent	34.0394350	-118.5811129
517	Lemonade Berry	Rhus integrifolia	7.3	2	5	Excellent	34.0394512	-118.5811222
537	Mountain mahogany	Cercocarpus sp.	10.5	6	8	Excellent	34.0396898	-118.5806932

ALTERNATIVE ANALYSIS

Table 13 summarizes the numbers of each species of native protected tree that would be removed, retained or encroached upon in the lagoon restoration area based on the 30% alternative design level. A final determination and refinement of tree impacts will be prepared as the design evolves further, thus these numbers indicate a "worse case" level of impact for each alternative. Details specific to each individual tree are found in Appendix B by tag number. All trees would remain in Alternative 1 as they are currently.

Table 16. Summary of Potential Impacts to Protected Native Trees in the Topanga Lagoon Restoration Area.

Alternative	Common Name	Scientific Name	Number to Remove	Number Encroached Upon	Number to Remain		master list count	undersize
ALTERNATIVE 1	Arroyo Willow	*Salix lasiolepsis*	0	0	134		134	8
	CA Sycamore	*Platanus racemosa*	0	0	38		38	6
	Coast Live Oak	*Quercus agrifolia*	0	0	2		2	1
	Cottonwood	*Populus fremontii*	0	0	2		2	
	Elderberry	*Sambucus nigra*	0	0	20		20	
	Juniper	*Juniperus californica*	0	0	4		4	
	Laurel Sumac	*Malosma laurina*	0	0	12		12	
	Lemonade Berry	*Rhus integrifolia*	0	0	3		3	
	Mountain Mahogany	*Cercocarpus sp.*	0	0	1		1	
	Red Willow	*Salix laevigata*	0	0	50		50	
	White Alder	*Alnus rhombifolia*	0	0	4		4	
TOTAL ALTERANTIVE 1			**0**	**0**	**270**		**270**	**15**
ALTERNATIVE 2	Arroyo Willow	*Salix lasiolepsis*	12	6	116		134	8
	CA Sycamore	*Platanus racemosa*	1	0	37		38	6
	Coast Live Oak	*Quercus agrifolia*	0	1	1		2	1
	Cottonwood	*Populus fremontii*	0	0	2		2	
	Elderberry	*Sambucus nigra*	1	1	18		20	
	Juniper	*Juniperus californica*	2	0	2		4	
	Laurel Sumac	*Malosma laurina*	6	1	5		12	
	Lemonade Berry	*Rhus integrifolia*	3	0	0		3	
	Mountain Mahogany	*Cercocarpus sp.*	1	0	0		1	
	Red Willow	*Salix laevigata*	6	5	39		50	
	White Alder	*Alnus rhombifolia*	0	0	4		4	
TOTAL ALTERNATIVE 2	270		**32**	**14**	**224**		**270**	**15**
ALTERNATIVE 3	Arroyo Willow	*Salix lasiolepsis*	9	7	118		134	8
	CA Sycamore	*Platanus racemosa*	1	0	37		38	6
	Coast Live Oak	*Quercus agrifolia*	0	1	1		2	1
	Cottonwood	*Populus fremontii*	0	0	2		2	
	Elderberry	*Sambucus nigra*	1	1	18		20	
	Juniper	*Juniperus californica*	2	0	2		4	
	Laurel Sumac	*Malosma laurina*	6	1	5		12	
	Lemonade Berry	*Rhus integrifolia*	3	0	0		3	
	Mountain Mahogany	*Cercocarpus sp.*	0	0	1		1	
	Red Willow	*Salix laevigata*	4	5	41		50	
	White Alder	*Alnus rhombifolia*	0	0	4		4	
TOTAL ALTERNATIVE 3	270		**26**	**15**	**229**		**270**	**15**
ALTERNATIVE 4	Arroyo Willow	*Salix lasiolepsis*	9	7	118		134	8
	CA Sycamore	*Platanus racemosa*	1	0	37		38	6
	Coast Live Oak	*Quercus agrifolia*	0	1	1		2	1
	Cottonwood	*Populus fremontii*	0	0	2		2	
	Juniper	*Juniperus californica*	2	0	2		4	
	Laurel Sumac	*Malosma laurina*	6	1	5		12	
	Lemonade Berry	*Rhus integrifolia*	3	0	0		3	
	Mountain Mahogany	*Cercocarpus sp.*	0	0	1		1	
	Red Willow	*Salix laevigata*	4	5	41		50	
	White Alder	*Alnus rhombifolia*	0	0	4		4	
	Elderberry	*Sambucus nigra*	1	1	18		20	
TOTAL ALTERNATIVE 4	270		**26**	**15**	**229**		**270**	**15**

Non-native Trees Summary

In addition to the native trees, the site also has 343 non-native trees representing 36 species in varying degrees of health with 252 within the proposed lagoon project area as shown in Table 14 and an additional 91 non-native trees located along Topanga Canyon Blvd. shown in Table 15. Full details for these trees are found in Appendix B.

All non-native trees within the project area will be removed with the exception of some of eucalyptus trees (Trees #393, 394, 395, 419, 420, 421, 422, 424), a Canary Island Palm (Tree #423) and mature Euphorbia (Tree #425) within the Topanga Ranch Motel footprint in Alternatives 3 and 4. These trees have been identified as historically significant for the motel and while they would all be removed for Alternative 2, all would remain in Alternative 3 and all but #393 would remain in Alternative 4.

Table 17. Summary of all Non-native Trees in the Topanga Lagoon Restoration Planning Area

Common Name	Scientific Name	Total Number <5" DSH	Total Number 5-20" DSH	Total Number 21-36" DSH	Total Number >36" DSH	Total Number
Acacia	*Acacia sp.*	0	1	1	0	2
Aleppo Pine	*Pinus halipensis*	0	2	1	1	4
Banana	*Musa sp.*	0	1	0	0	1
Bird of Paradise	*Strelitzia reginae*	0	1	0	2	3
Black Acacia	*Acacia melanoxylon*	0	0	1	0	1
Blue Gum	*Eucalyptus globulus*	2	20	23	13	58
Brazilian Pepper	*Schinus terebinthifolia*	0	5	5	0	10
California Pepper	*Schinus mole*	0	1	0	1	2
Canary Island Palm	*Phoenix canariensis*	0	0	1	1	2
Canary Island Pine	*Pinus canariensis*	0	4	0	0	4
Chinese Elm	*Ulmus parvifolia*	0	2	0	0	2
Cypress	*Cupressus semperivirens*	0	1	1	0	2
Date Palm	*Phoenix dactylifera*	0	0	1	1	2
Dracaena	*Dracaena draco*	0	1	1	2	4
Dracaena	*Dracaena sp.*	0	13	11	6	30
Elm	*Ulmus sp.*	0	3	0	0	3
Eucalyptus	*Eucalyptus sp.*	0	4	2	0	6
Euphorbia	*Euphorbia sp.*	0	0	1	0	1
Fan Palm	*Washingtonia sp.*	0	51	10	0	61
Ficus	*Ficus benjamina*	0	5	2	0	7
Ficus	*Ficus sp.*	1	8	7	0	16
Lemon	*Citrus aurantiifolia*	0	1	0	0	1
Mexican Fan Palm	*Washingtonia robusta*	0	0	0	1	1
Monetery Pine	*Pinus radiata*	0	2	0	0	2
Monkey Puzzle	*Auaracaura spp.*	0	1	0	0	1
Myoporum	*Myoporum laetum*	0	6	0	0	6
Myoporum	*Myoporum sp*	0	1	1	0	2
Olive	*Olea Europeans*	0	0	0	1	1
Podocarpus	*Podocarpus sp.*	0	1	0	0	1
Red Box	*Eucalyptus polyanthemos*	0	0	1	0	1
Red River Gum	*Eucalyptus camaldulensis*	0	0	1	0	1
Rubber Fig	*Ficus elastica*	0	0	1	1	2
Spineless Yucca	*Yucca gigantea*	0	1	1	0	2
Sweet Pittosporum	*Pittosporum sp.*	0	1	0	0	1
Tamarisk	*Tamarix ramosissima*	0	1	3	3	7
Tree Tobacco	*Nicotiana glauca*	0	2	0	0	2
	TOTAL	**3**	**140**	**76**	**33**	**252**

Because the plans are not yet available, we are not able to identify which 91 non-native trees along Topanga Canyon Blvd. will be impacted. Additional data on tree metrics will be collected and available once the preferred alternative and associated impacts are identified.

Table 18. Summary of Non-native Trees along Topanga Canyon Blvd.

Common Name	Scientific Name	Total Number
Brazilian Pepper	*Schinus terebinthifolia*	3
California Pepper	*Schinus molle*	2
Canary Island Palm	*Pinus canariensis*	2
Cherry	*Prunus sp.*	20
Chinese Elm	*Ulmus parvifolia*	1
Cypress	*Cupressus semperivirens*	2
Dracaena	*Dracaena draco*	3
Eucalytpus	*Eucalyptus globulus*	27
Ficus	*Ficus benjamina*	8
Fire Thorn	*Pyracantha sp.*	1
Hibiscus	*Hibiscus sp.*	1
Jacaranda	*Jacaranda mimosifolia*	2
Mexican Fan Palm	*Washingtonia sp.*	3
Monkey Puzzle	*Araucaria sp.*	1
Monterey Pine	*Pinus radiata*	1
Pine	*Pinus sp*	8
Pittosporum	*Pittosporum sp.*	3
Pomegranate	*Pomegranate granatum*	1
Rubber Plant	*Ficus elastica*	1
Velvet Ash	*Fraxinus velutina*	1
TOTAL		**91**

Coordination with Fuel Modification Plans for each Alternative

The fuel modification limits shown in Figures 16-19 below for each alternative are preliminary and a final list of protected native trees that would be potentially impacted within a fuel modification zone will be developed once the preferred alternative is identified.

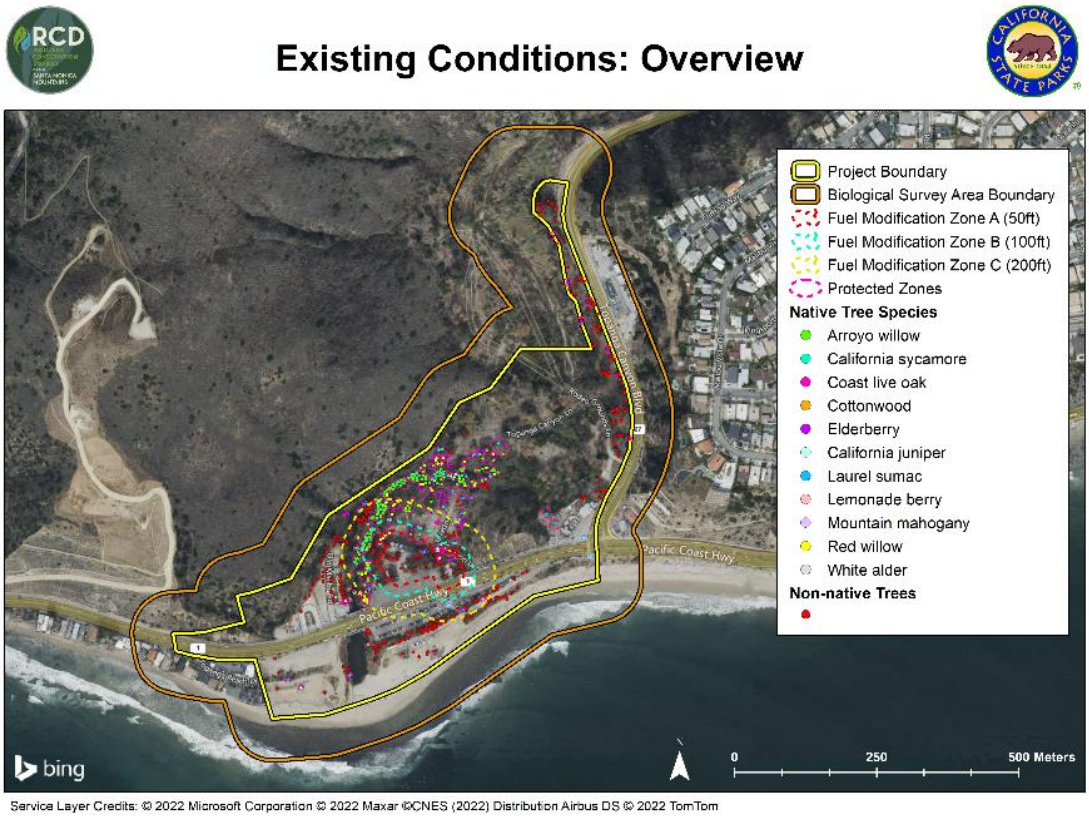


Figure 16. Alternative 1 Fuel Modification Zones with individual trees

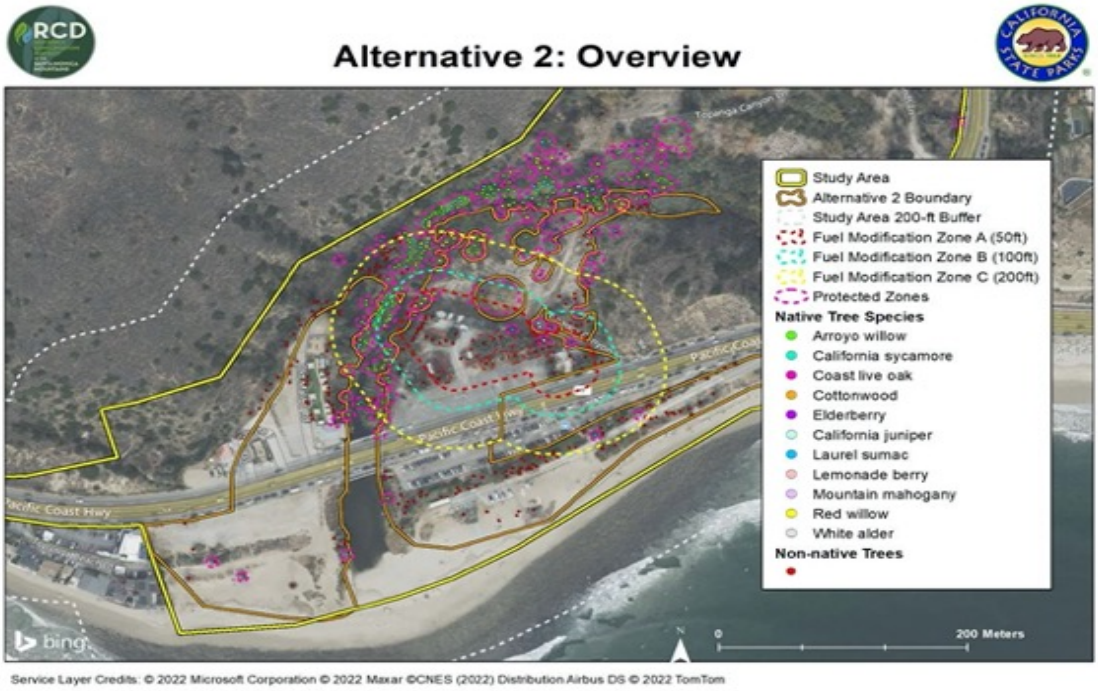


Figure 17. Alternative 2 Preliminary Fuel Modification Zones with individual trees

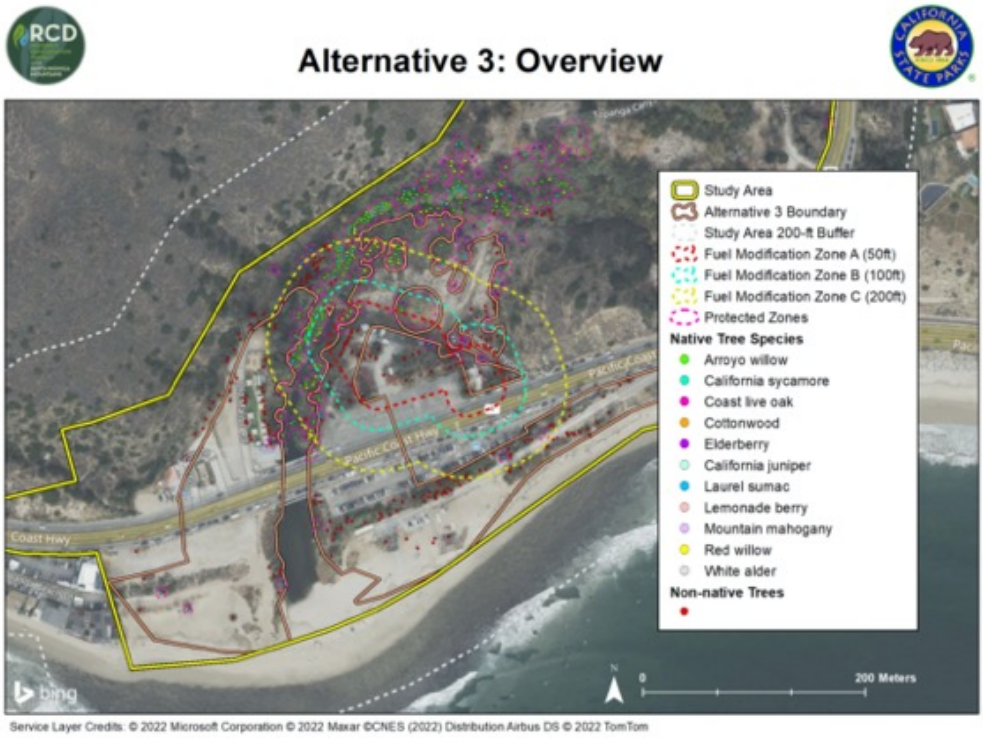


Figure 18. Alternative 3 Preliminary Fuel Modification Zones with individual trees

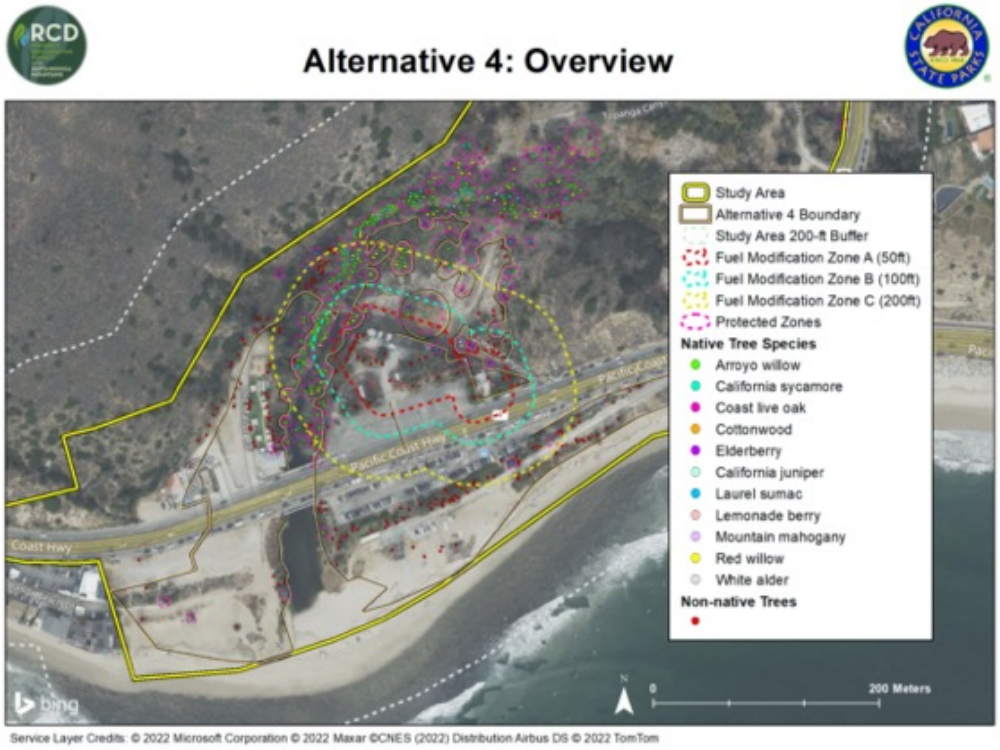


Figure 19. Alternative 4 Fuel Modification Zones with individual trees

HERITAGE AND BIOLOGICALLY SIGNIFICANT TREES

LA County defines heritage trees as having a single trunk greater than 36 inches at DSH or having significant historic or cultural significance. No native trees in the project area meet that definition.

Although there is no formal definition for biologically significant tree, in the case of this project, we avoided impacts to several native tree clusters due to their co-location and size. Trees #358 Arroyo Willow, #359 CA Sycamore and #360 Elderberry are considered a biologically significant cluster and will remain, as will the cluster of elderberry and CA Sycamore (#383, 384, 386, 388, 389, 390, 391, 392). Table 19 provides the details on native trees that meet the County standard OR have been identified by State Parks as biologically significant.

Table 19. Summary of Biologically Significant Trees

Tree Number	Common Name	Scientific Name	DSH Sum	Number trunks	Canopy Spread ft	Condition Category	Latitude	Longitude
358	Arroyo Willow	Salix Lasiolepsis	51.5	2	35	Excellent	34.0403038	-118.5822054
359	CA Sycamore	Platanus racemosa	71.5	3	48	Excellent	34.0403032	-118.5821423
360	Elderberry	Sambucus nigra	12.5	3	10	Excellent	34.0403492	-118.5821978
383	Arroyo Willow	Salix lasiolepsis	68.7	9	45	Good	34.0407193	-118.5819377
384	CA Sycamore	Platanus racemosa	11.4	3	30	Excellent	34.0405781	-118.5818957
386	CA Sycamore	Platanus racemosa	25.1	4	35	Excellent	34.0405270	-118.5817410
388	Elderberry	Sambucus nigra	85.9	13	35	Good	34.0408453	-118.5816727
389	Elderberry	Sambucus nigra	20.5	3	15	Excellent	34.0408433	-118.5816744
390	Elderberry	Sambucus nigra	56.0	5	20	Good	34.0407715	-118.5817177
391	Elderberry	Sambucus nigra	5.1	1	6	Excellent	34.0408135	-118.5817851
392	Elderberry	Sambucus nigra	36.8	5	20	Excellent	34.0407834	-118.5818028

HISTORIC TREES

Analysis of historical aerial photographs from the Spence Collection (used with permission from the UCLA Department of Geography) was done to identify any trees present on the site between 1933 and 1952, which is considered to be the historic period of significance for the Topanga Ranch Motel. The trees surrounding the Topanga Ranch Motel would be considered to be contributors to the historic landscape if they were planted between 1933 and 1952. The historic evaluation conducted by WJE (2019) identified all but #410 Canary Island Palm of the 30 trees within the motor court as contributing to the historical condition.

However, based on analysis of aerial photos show in Figures 20-23, only 14 trees (see Table 20) meet the criteria for historic significance due to presence within the historic time period. Based on the size of the other trees in the courtyard and the fact that they are not present in the aerials, it appears that the majority were either planted later than the period of significance and thus would not be deemed historic. A number of small plants and other trees including Cypress, visible in the aerials are no longer on the site.

Because the trees are considered part of the historic context of the Topanga Ranch Motel, removal will be evaluated as part of the State Historic Preservation Office consultation which is pending.

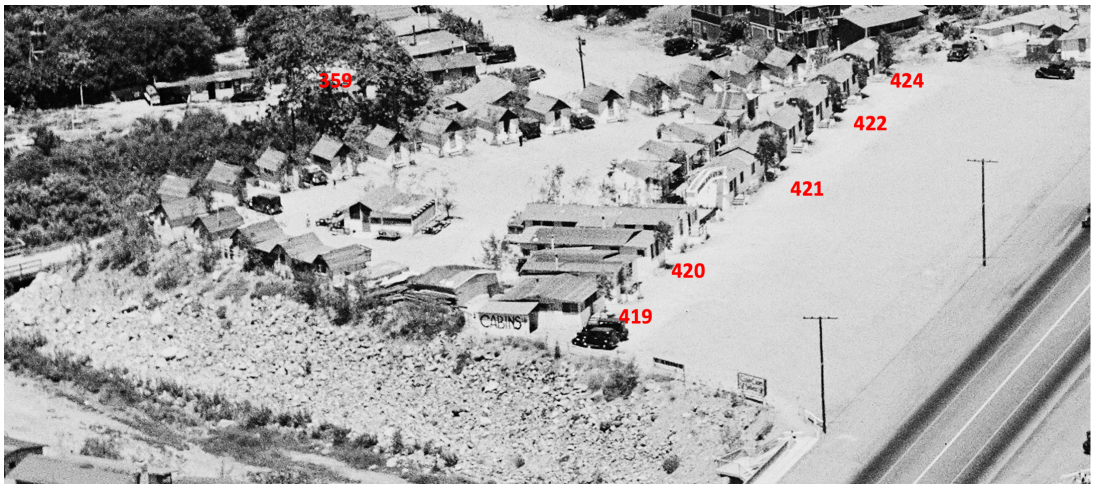


Figure 20. Aerial Photograph showing the Topanga Ranch Motel 7/14/1935. Note that they were all relatively small trees at that time. (Photo courtesy of the Spence Collection, UCLA Dept. of Geography)

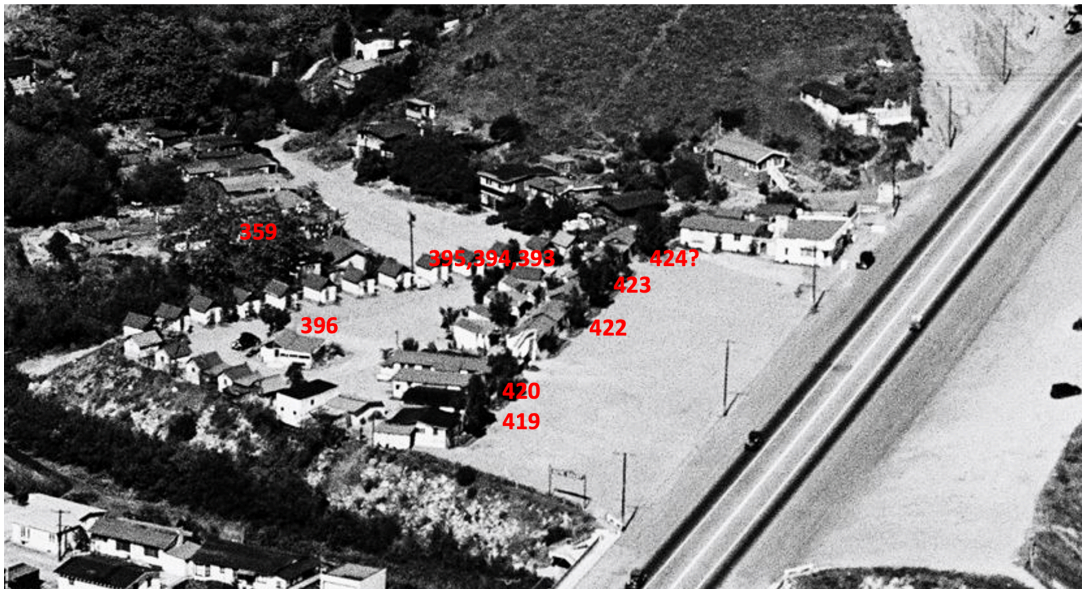


Figure 21. Aerial Photograph showing the Topanga Ranch Motel 4/11/1940. Note that they were all relatively small trees at that time. (Photo courtesy of the Spence Collection, UCLA Dept. of Geography)

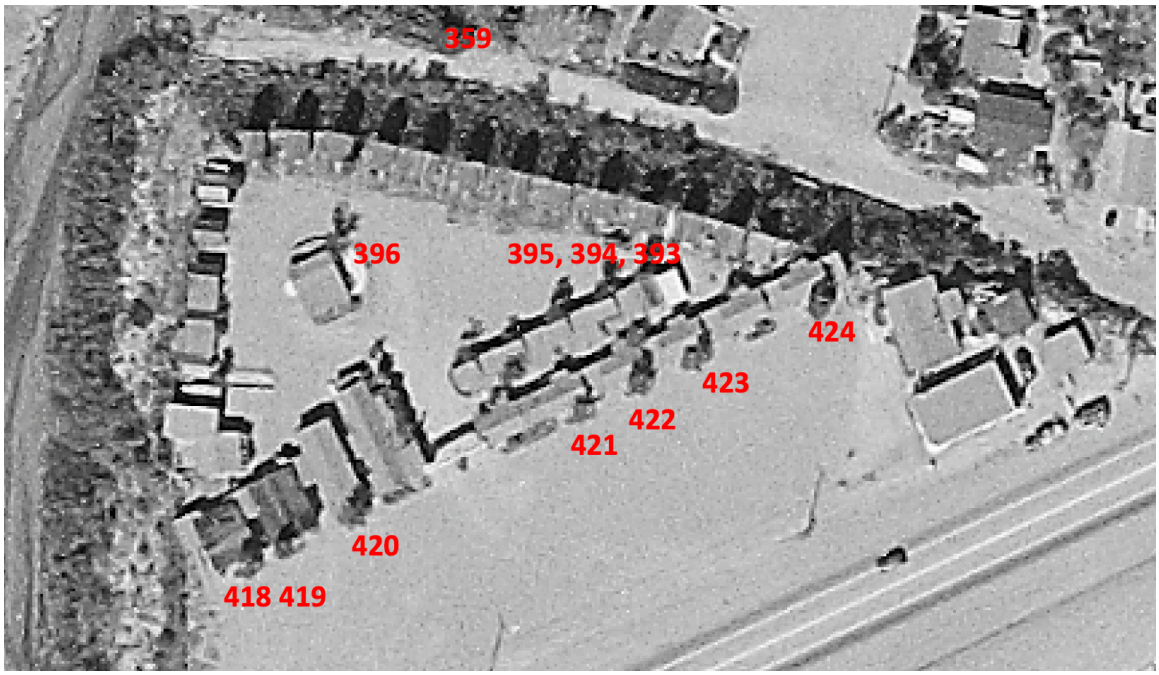


Figure 22. Aerial Photograph showing the Topanga Ranch Motel 1940. Note that they were all relatively small trees at that time. (Photo courtesy of the Spence Collection, UCLA Dept. of Geography)

Figure 23. Aerial Photograph showing the Topanga Ranch Motel 8/6/1951. Note that they were all relatively small trees at that time. (Photo courtesy of the Spence Collection, UCLA Dept. of Geography)

Table 20 provides a summary of all the trees within the Topanga Ranch Motel footprint. Those highlighted in red appear to meet the criteria for historic significance. In Alternative 2, all 30 trees would be removed including all 14 considered potentially historic. For Alternative 3, a total of 9 trees would be removed of which four Eucalyptus (#406. 407, 418 and 419) are considered potentially historic. These same four trees, plus #396 and 420 are the potentially historic trees that would be removed in Alternative 4, but a total of 14 trees would be removed overall.

Nine of the 14 potentially Historic trees (shown in bold red in Table 17) also meet the criteria as Heritage trees due to having a single trunk exceeding 36 inch DSH. Data on all 14 trees are provided in Table 18.

Table 20. Summary of Potentially Historic Trees
Heritage Trees are shown in BOLD Red

Tree Number	Common Name	Scientific Name	Historic based on 1935-1951Photos	WJE List 2019	Alternative 2 Removed	Alternative 3 Removed	Alternative 4 Removed
352	Banana	Musa sp.		X	X		
353	Giant Bird of Paradise	Strelitzia reginae		X	X		
354	Juniper	Juniperus californica		X	X		
355	Juniper	Juniperus californica		X	X		
356	Juniper	Juniperus californica		X	X		
357	Laurel Sumac	Malosma laurina		X	X		
353	Giant Bird of Paradise	Strelitzia reginae		X	X		
393	**Eucalyptus**	**Eucalyptus globulus**	**X**	**X**	**X**		
394	**Eucalyptus**	**Eucalyptus globulus**	**X**	**X**	**X**		
395	**Eucalyptus**	**Eucalyptus globulus**	**X**	**X**	**X**		
396	Aleppo Pine	Pinus halipensis	X	X	X		X
397	Aleppo Pine	Pinus halipensis		X	X		X
398	Cypress	Cupressus semperivirens		X	X		X
399	Date palm	Phoenix sp.		X	X		X
400	Ficus	Ficus sp.		X	X	X	X
401	Cypress	Cupressus sempervirens		X	X	X	X
406	**Eucalyptus**	**Eucalyptus globulus**	**X**	**X**	**X**	X	X
407	**Eucalyptus**	**Eucalyptus globulus**	**X**	**X**	**X**	X	X
408	Bird of paradise	Strelitzia reginae		X	X	X	X
409	Bird of paradise	Strelitzia reginae		X	X	X	X
410	Canary Island palm	Phoenix canariensis		X	X		
411	Brazilian Pepper	Schinus terebinthifolia		X	X	X	X
418	Eucalyptus	Eucalyptus globulus	X	X	X	X	X
419	Eucalyptus	Eucalyptus globulus	X	X	X	X	X
420	**Eucalyptus**	**Eucalyptus globulus**	**X**	**X**	**X**		X
421	**Eucalyptus**	**Eucalyptus globulus**	**X**	**X**	**X**		
422	Eucalyptus	Eucalyptus globulus	X	X	X		
423	**Canary Island palm**	**Phoenix canariensis**	**X**	**X**	**X**		
424	**Eucalyptus**	**Eucalyptus globulus**	**X**	**X**	**X**		
425	Euphorbia	Euphorbia sp.	X	X	X		
		TOTAL	14	30	30	9	14

Table 21. Data on potentially Historic Trees (Heritage Trees in BOLD Red)

Tree Number	Common Name	Scientific Name	DBH Sum	Number of Trunks	Canopy Spread ft	Height (ft)	Latitude	Longitude
393	**Eucalyptus**	**Eucalyptus globulus**	**36.0**	**1**	**40**	**50**	**34.04000184**	**-118.58212257**
394	**Eucalyptus**	**Eucalyptus globulus**	**36.0**	**1**	**35**	**55**	**34.03998678**	**-118.58216799**
395	**Eucalyptus**	**Eucalyptus globulus**	**44.0**	**1**	**50**	**60**	**34.04001897**	**-118.58218178**
396	Aleppo Pine	Pinus halipensis	25.0	1	20	45	34.03965554	-118.58277797
406	**Eucalyptus**	**Eucalyptus globulus**	**46.2**	**1**	**25**	**50**	**34.03967573**	**-118.58267912**
407	**Eucalyptus**	**Eucalyptus globulus**	**61.2**	**5**	**35**	**55**	**34.03970093**	**-118.58256642**
418	Eucalyptus	Eucalyptus globulus	30.0	1	30	45	34.03982089	-118.58218334
419	Eucalyptus	Eucalyptus globulus	30.0	1	40	50	34.03987386	-118.58202028
420	**Eucalyptus**	**Eucalyptus globulus**	**48.0**	**1**	**20**	**25**	**34.03989730**	**-118.58187052**
421	**Eucalyptus**	**Eucalyptus globulus**	**53.0**	**1**	**45**	**65**	**34.03991426**	**-118.58181914**
422	Eucalyptus	Eucalyptus globulus	21.7	7	15	10	34.03993023	-118.58177129
423	**Canary Island palm**	**Phoenix canariensis**	**48.0**	**1**	**20**	**25**	**34.03989730**	**-118.58187052**
424	**Eucalyptus**	**Eucalyptus globulus**	**53.0**	**1**	**45**	**65**	**34.03991426**	**-118.58181914**
425	Euphorbia	Euphorbia sp.	21.7	7	15	10	34.03993023	-118.58177129

Mitigation Required

Removal of historic and heritage trees is considered a significant impact, even though they are all non-native and their current locations are causing impacts to the foundations of the Topanga Ranch Motel buildings. Because the Historic and Heritage Trees are considered a part of the historic landscape of the Topanga Ranch Motel, it is not possible to replace them. A mitigation plan for the loss of historic landscape will be proposed as part of the State Historic Preservation Office consultation, which is pending.

Coordination of Mitigation Planting with Habitat Restoration Plan

Once the preferred alternative is identified, a Habitat Restoration Plan will be developed. At that time the required number of mitigation trees for each species will be incorporated into the planting plan. Location of mitigation trees will be outside any potential areas of disturbance and will be monitored as part of the overall post-construction project monitoring plan.

FENCING PLAN

Protective fencing will be installed to protect remaining trees from construction impacts in accordance with all regulatory requirements. Preliminary fencing plans (Figures 20-22) for Alternatives 2-4 have been developed based on the 30% design. Once the preferred alternative is identified, a final Fencing Plan meeting all regulatory requirements will be prepared to protect all native trees and any historic non-native trees that will be retained.

Figure 24. Alternative 2 DRAFT Fencing Plan

Figure 25. Alternative 3 DRAFT Fencing Plan

Figure 26. Alternative 4 DRAFT Fencing Plan

INVASIVE BEETLES AND DISEASE MANAGEMENT

Recent infestations of non-native insects such as the Invasive Shot Hole Borer, and potential for disease are issues of concern for protecting existing native trees that will remain as well as additional trees that will be planted as part of the restoration.

The Early Detection Rapid Response Plan for Invasive Beetles in Los Angeles County (Dagit and Burnap 2019) has been adopted by Los Angeles County as the protocol for detecting and managing existing and new infestations. Implementation of the recommended visual and trapping protocols should be incorporated into the ongoing maintenance and monitoring plan for the project.

RECOMMENDATIONS

1. Require that all Best Management Practices outlined in this report, as well as in the Fuel Modification Plan and Habitat Restoration Plan are implemented.

2. Require implementation of the *Native Tree Replacement Planting Mitigation, Maintenance and Monitoring Plan* following project completion.

3. Protection, fencing, and monitoring of biologically significant, historic or heritage trees will conform to ISA industry standard Best Management Practices and be supervised by a qualified Certified Arborist.

4. If a decision is made to not use existing volunteer baby trees for required mitigation, then any additional planting will be done using genetic material collected locally within the watershed and be planted in fall according to industry standards.

5. Soil of any seedlings grown for mitigation planting will be tested for *Phythophora* and not installed unless deemed safe.

6. All mitigation plantings will be installed in a random, natural pattern within the locations identified on the final preferred alternative plan.

7. The removal of any living limbs and all deadwood will be done under the supervision of a Certified Arborist or other qualified professional in accordance with the standards of the LA County LCP, Oak Tree Protection Ordinance and ISA. Remedial pruning to remove stub cuts should also be done. No trees will be "lolly-popped".

8. A nesting bird survey should be conducted according to industry standards prior to any activities in or around the trees.

9. Any roots larger than 1" diameter will be kept if possible. While exposed, they will be wrapped in burlap and kept moist. If it is necessary to cut any roots, they shall be cut cleanly.

10. All work done in the protected zone (edge of the dripline plus 5 feet) of trees shall be done using hand tools in accordance with the LA County Oak Tree Protection Ordinance and Best Management Practices.

11. Soil compaction within the root zone shall be minimized. No equipment, spoils or debris will be stored within the protected zone of the trees.

12. No dumping of liquids or solvents, paints, concrete washout or other harmful substances will be permitted. All cleaning fluids will be disposed of properly.

13. Monitoring will continue for 10 years (7 years for oaks) post approval of the permit. The arborist will submit a yearly report documenting condition of all tagged and planted mitigation trees based on two visits per year.

14. Fuel reduction for brush clearance will minimize impacts to the native trees and oaks and the native understory vegetation.

15. A copy of this report will be kept on site for reference during any of the proposed permitted activities.

16. Comply with all requirements proposed by the State Historic Preservation Office to protect and preserve Historic and Heritage trees in place, depending on the final preferred alternative.

REFERENCES CITED

Los Angeles County Dept. of Regional Planning. 2014. Los Angeles County Local Coastal Plan 2014
https://planning.lacounty.gov/coastal/smm

Los Angeles County Oak Woodlands Habitat Conservation Strategic Alliance. 2011. Los Angeles County Oak Woodland Conservation Management Plan. Prepared for Los Angeles County. http://planning.lacounty.gov/oakwoodlands.

Wiss, Janney, Elstner Associates, Inc. (WJE). 2019. Topanga Ranch Motel Condition Assessment and Conceptual Design for Rehabilitation. Prepared for James Neland, 225 Avenida Califia, San Clemente, CA 02672.

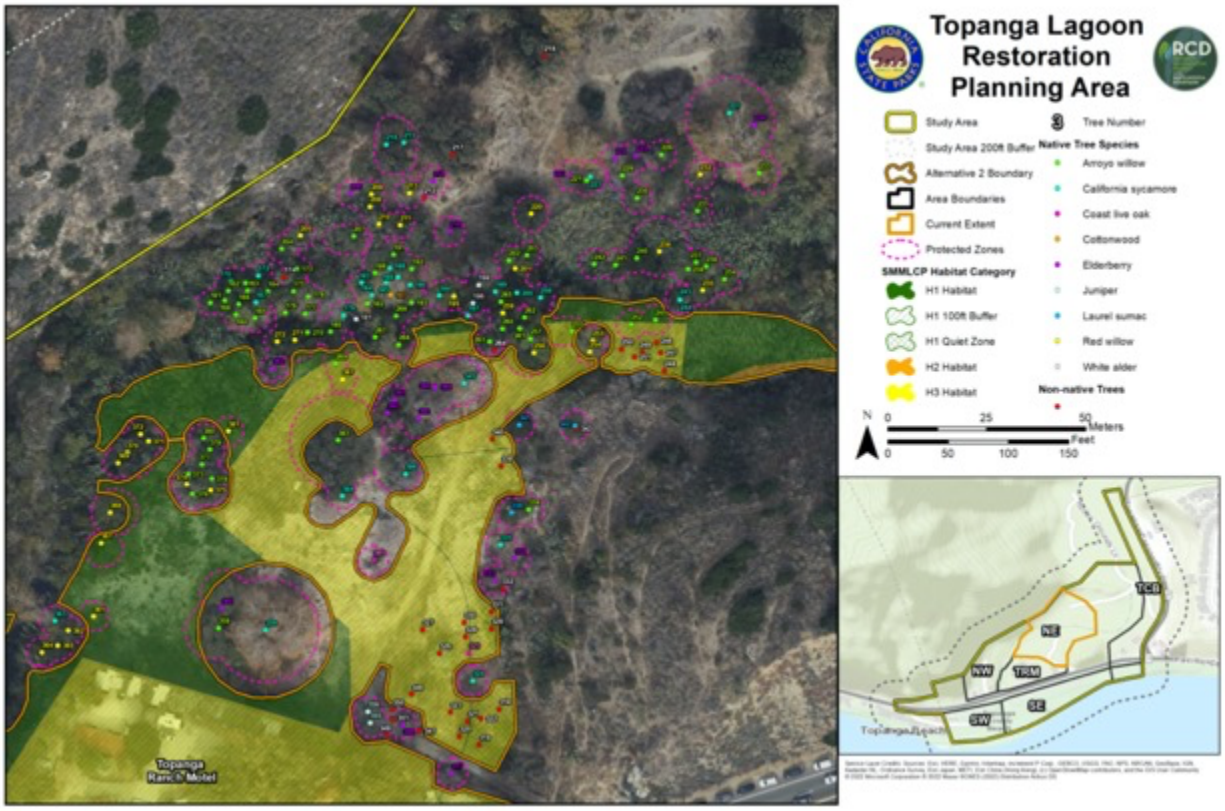
APPEDIX A

TOPANGA LAGOON RESTORATION PROJECT

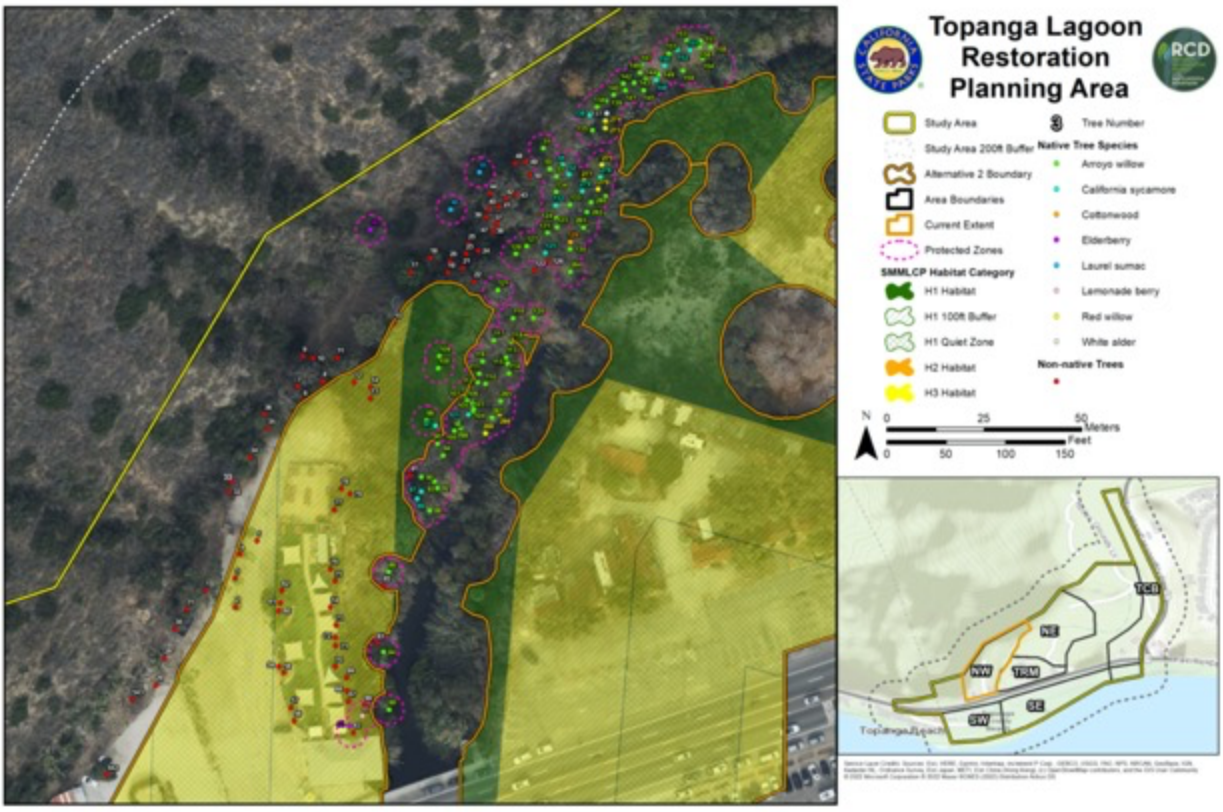
DETAILED ALTERNATIVE TREE MAPS

ALTERNATIVE 2

Habitat Overlays by Tree Section



Alternative 2 Northeast Section



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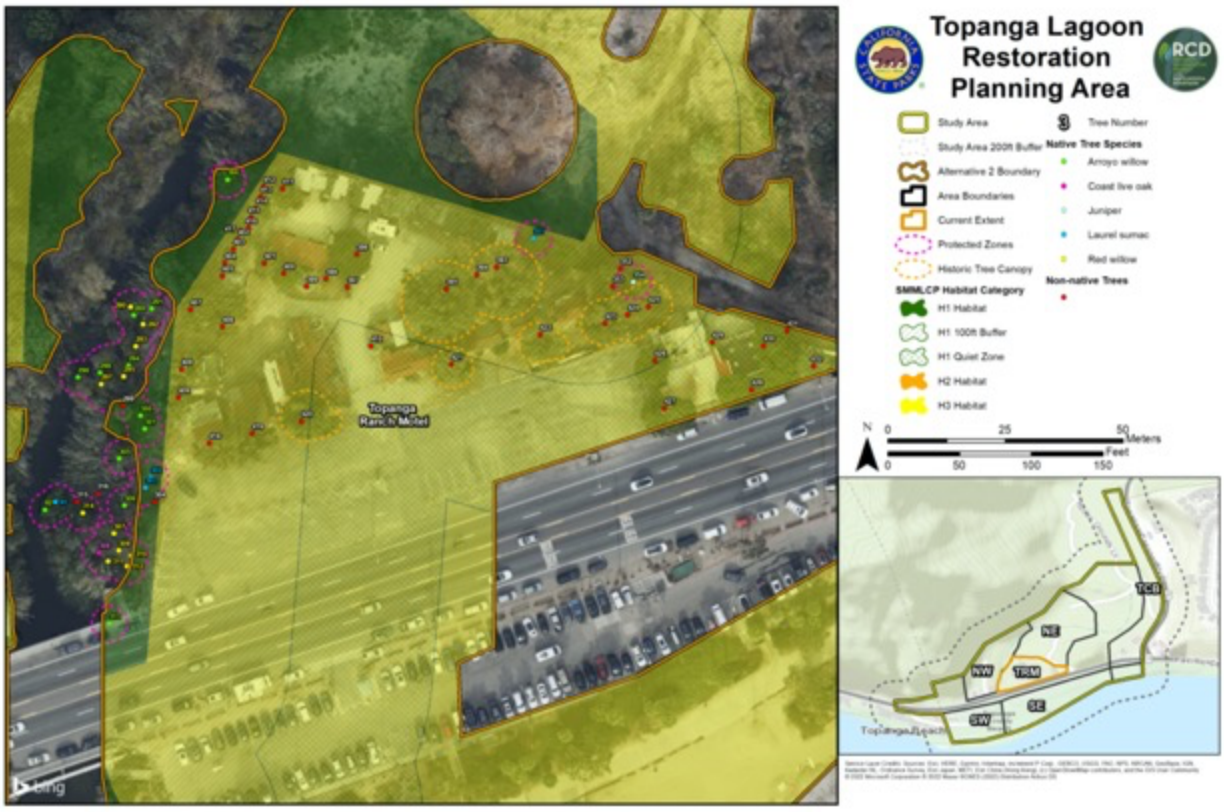
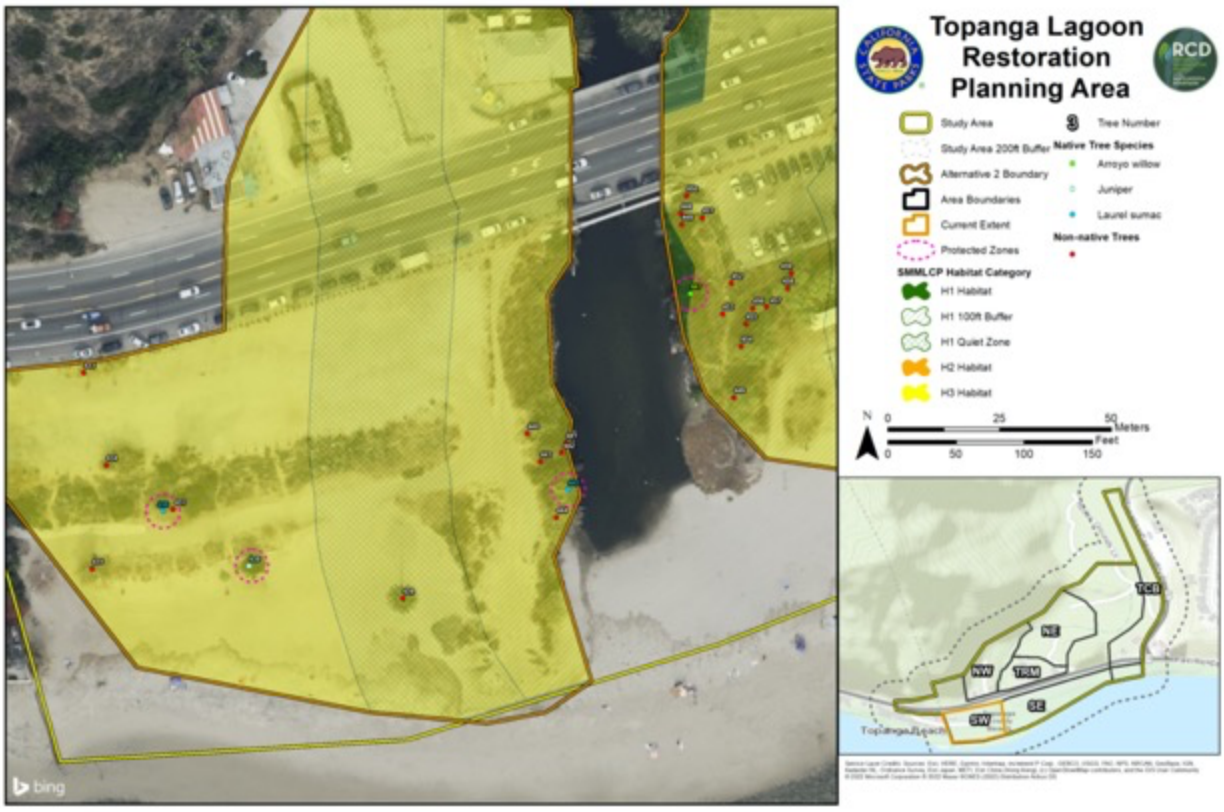


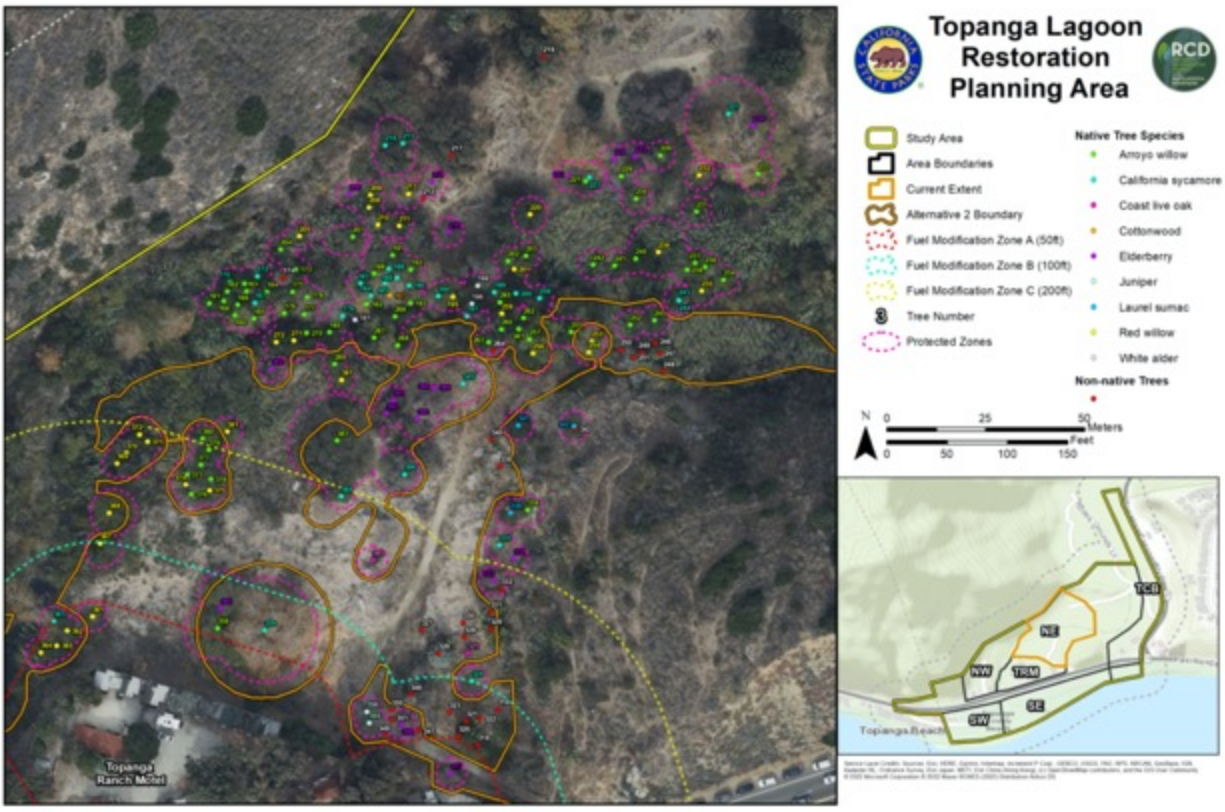
Alternative 2 Topanga Ranch Motel Section

Alternative 2 Southeast Section

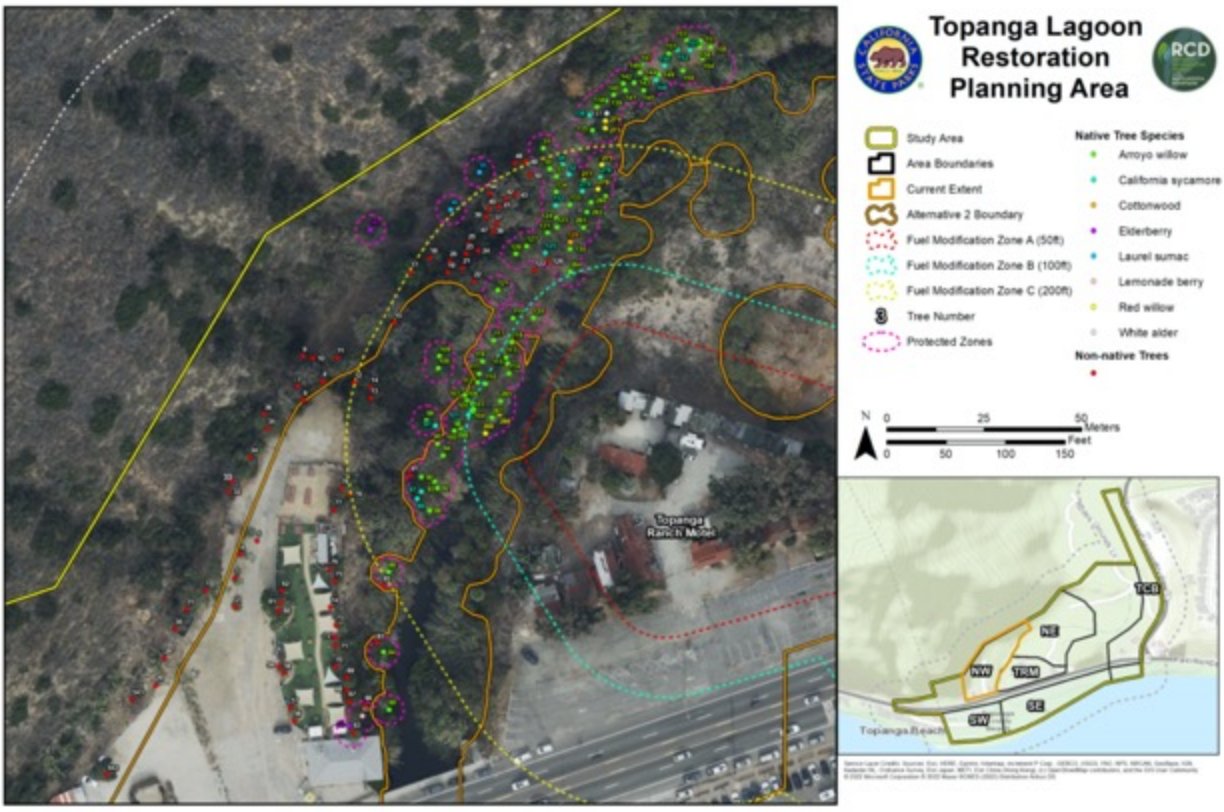


Alternative 2 Southwest Section

Fuel Modification by Tree Section



Alternative 2 Northeast Section



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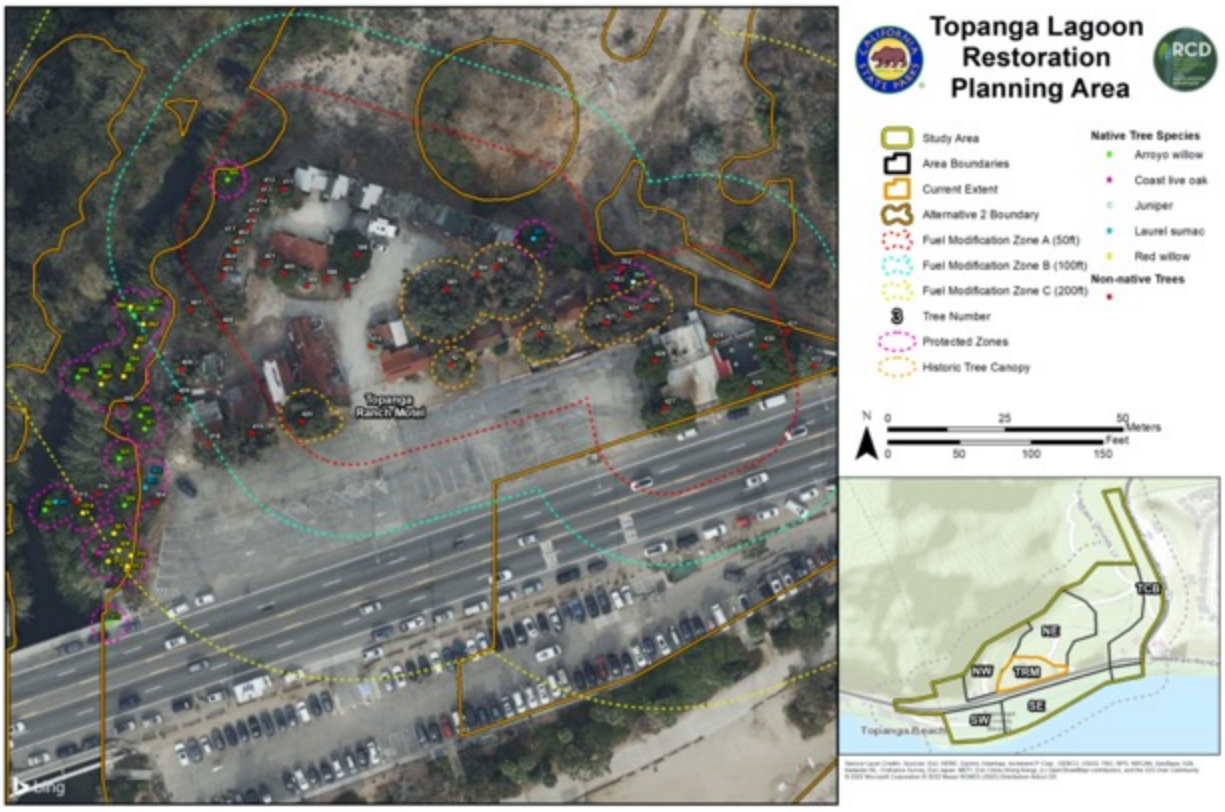


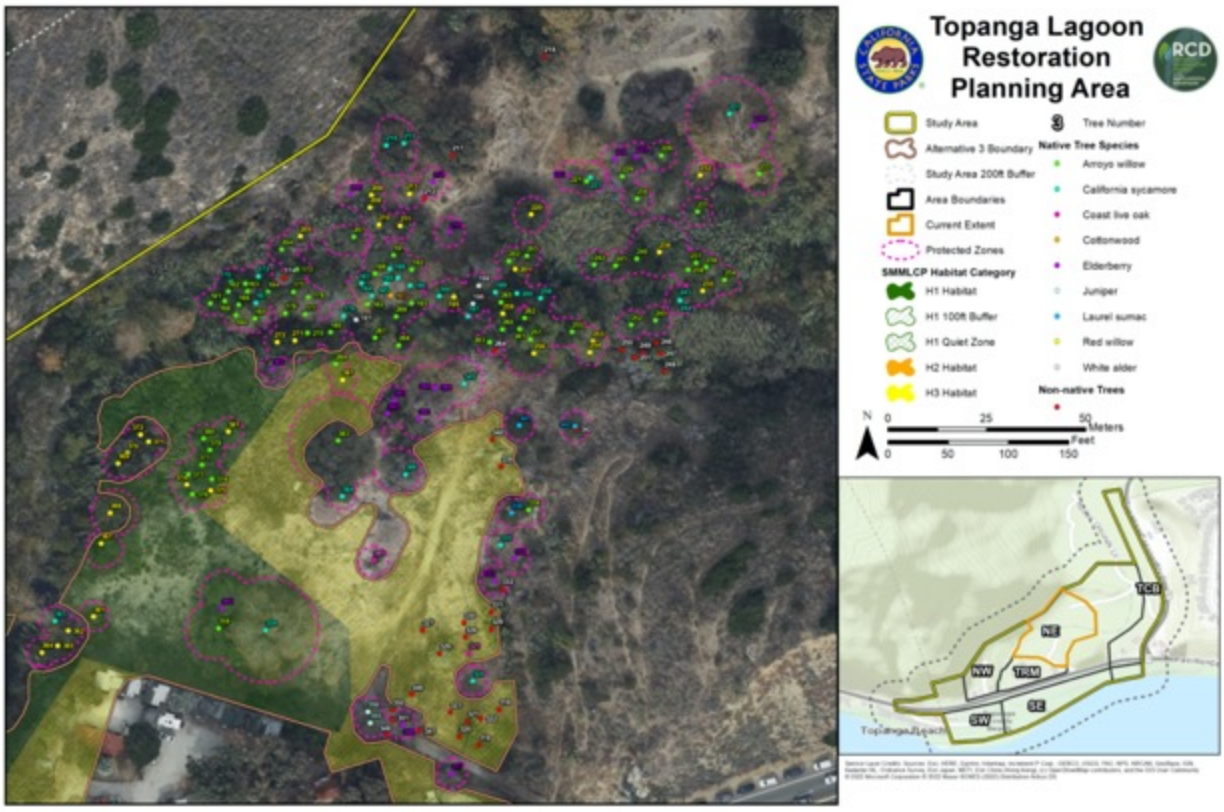
Alternative 2 Topanga Ranch Motel

Alternative 2 Southeast Section

Alternative 2 Southwest Section

ALTERNATIVE 3

Habitat Overlays by Tree Section



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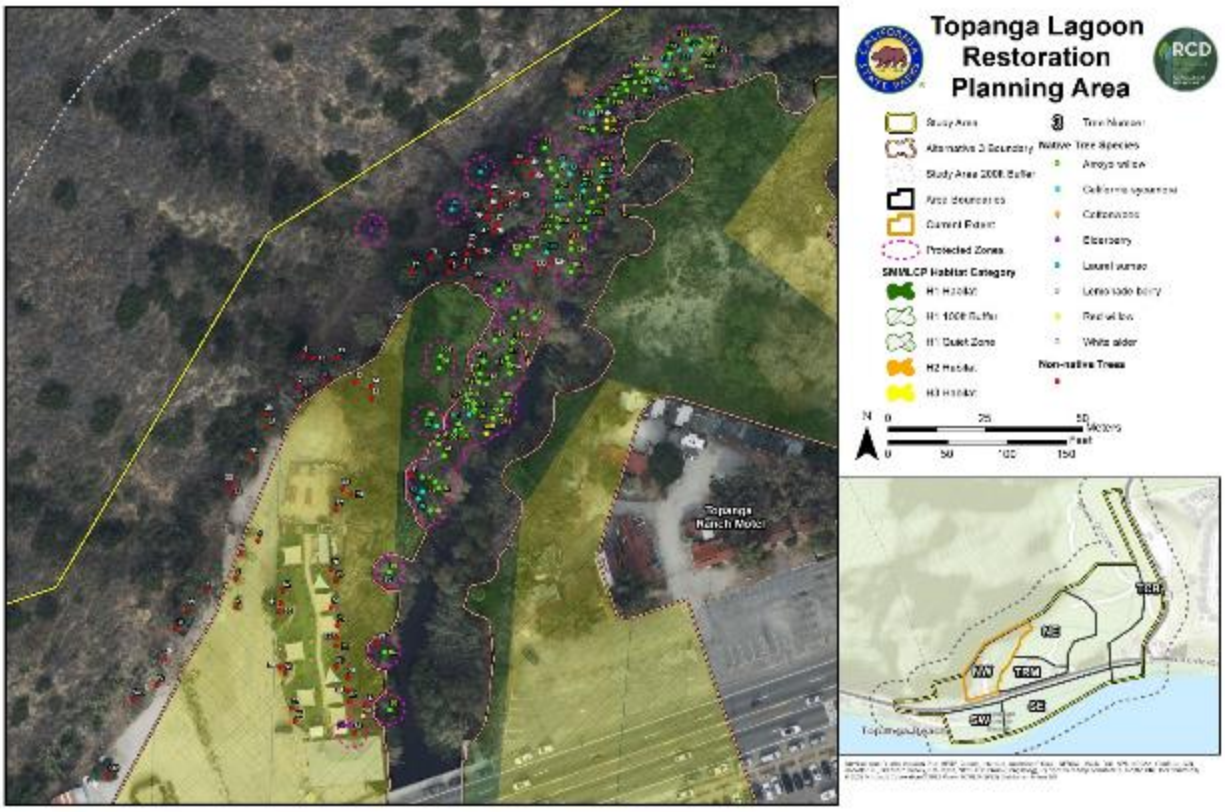

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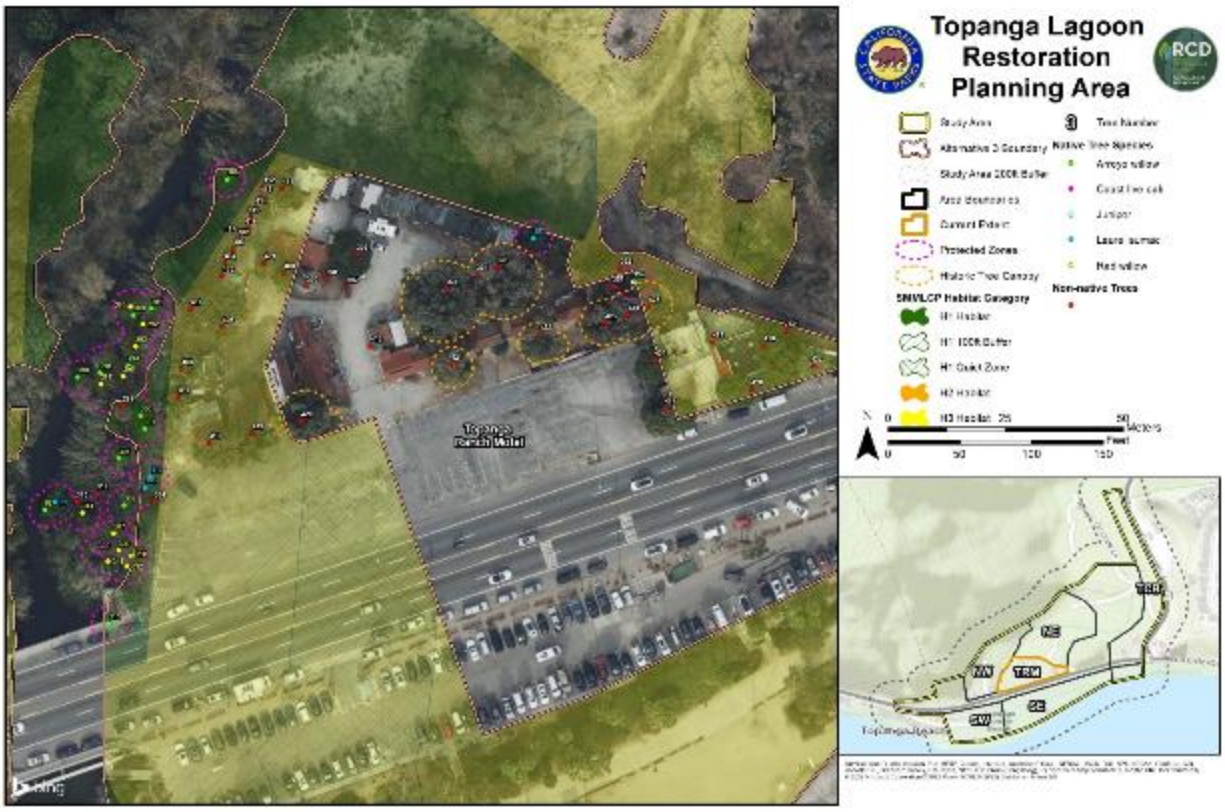
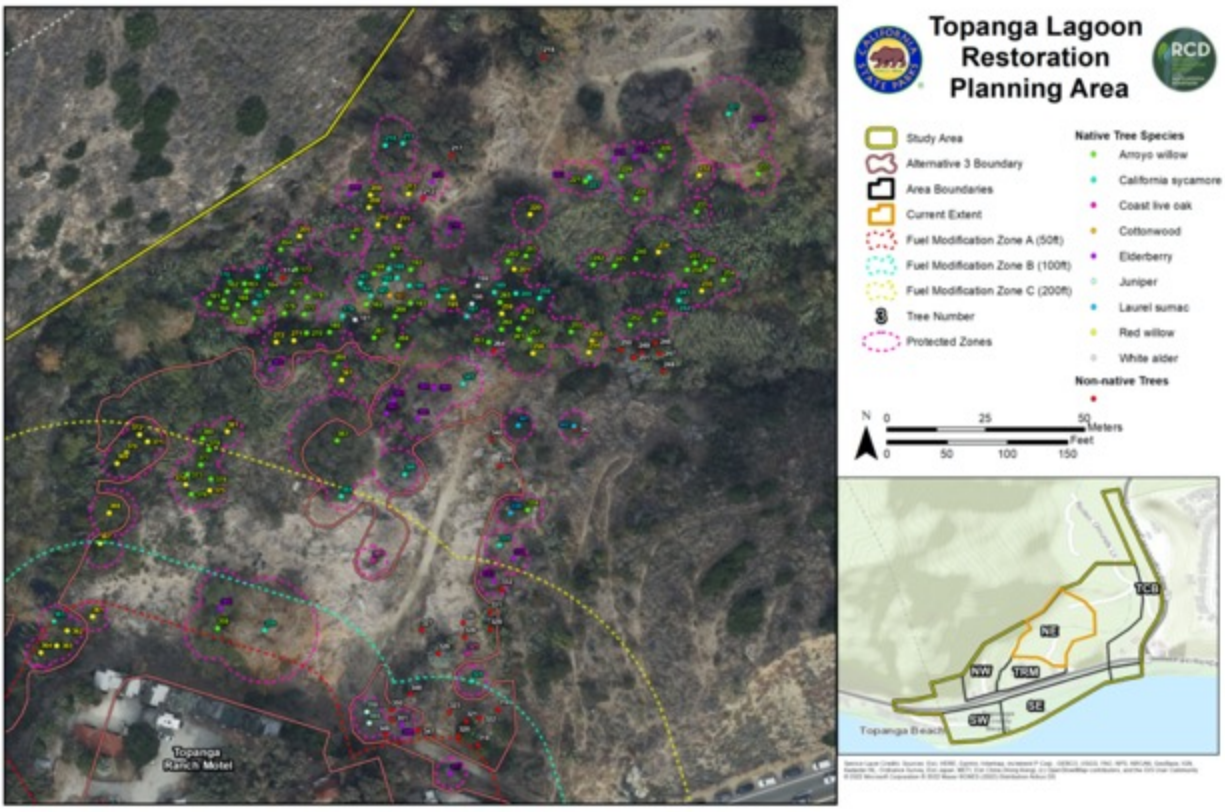


Alternative 3 Topanga Ranch Motel Section

Alternative 3 Southeast Section

Alternative 3 Southwest Section

Fuel Modification by Tree Section



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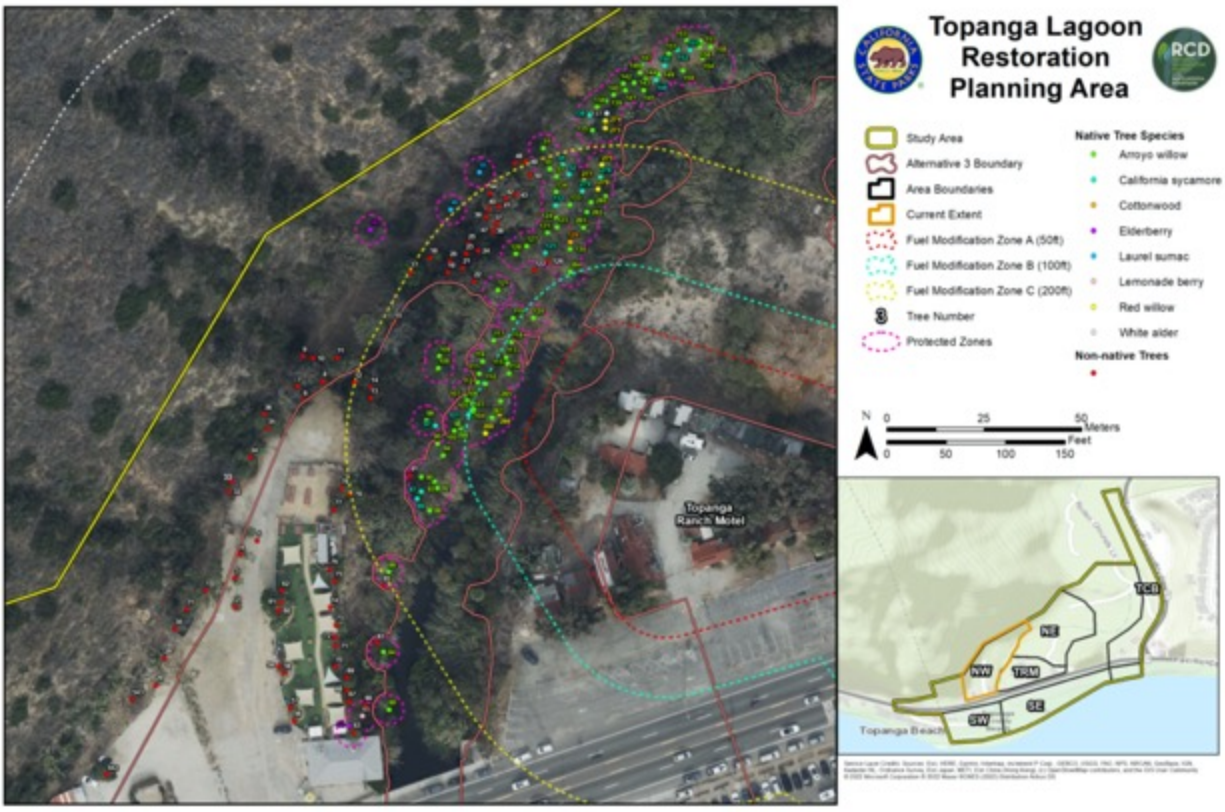
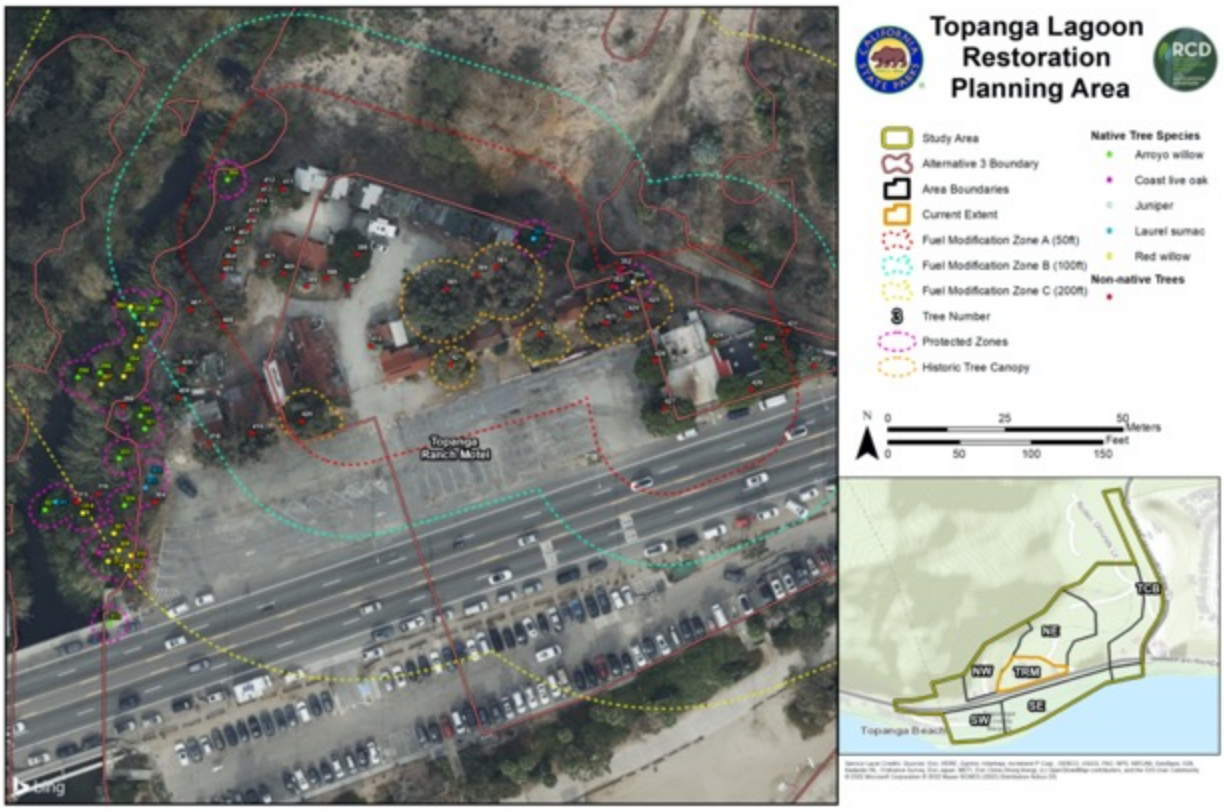


Alternative 3 Northwest Section

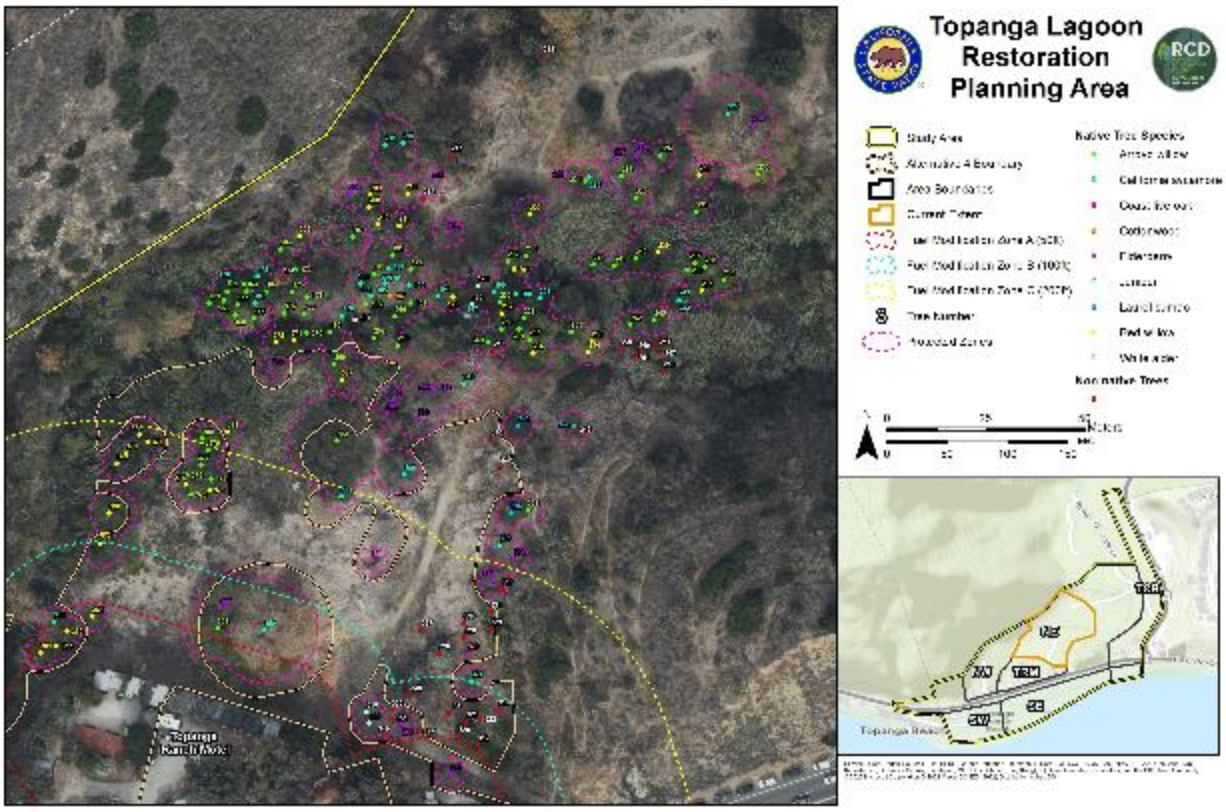


Alternative 3 Topanga Ranch Motel Section

Alternative 4 Southeast Section

Alternative 4 Southwest Section

Fuel Modification by Tree Section



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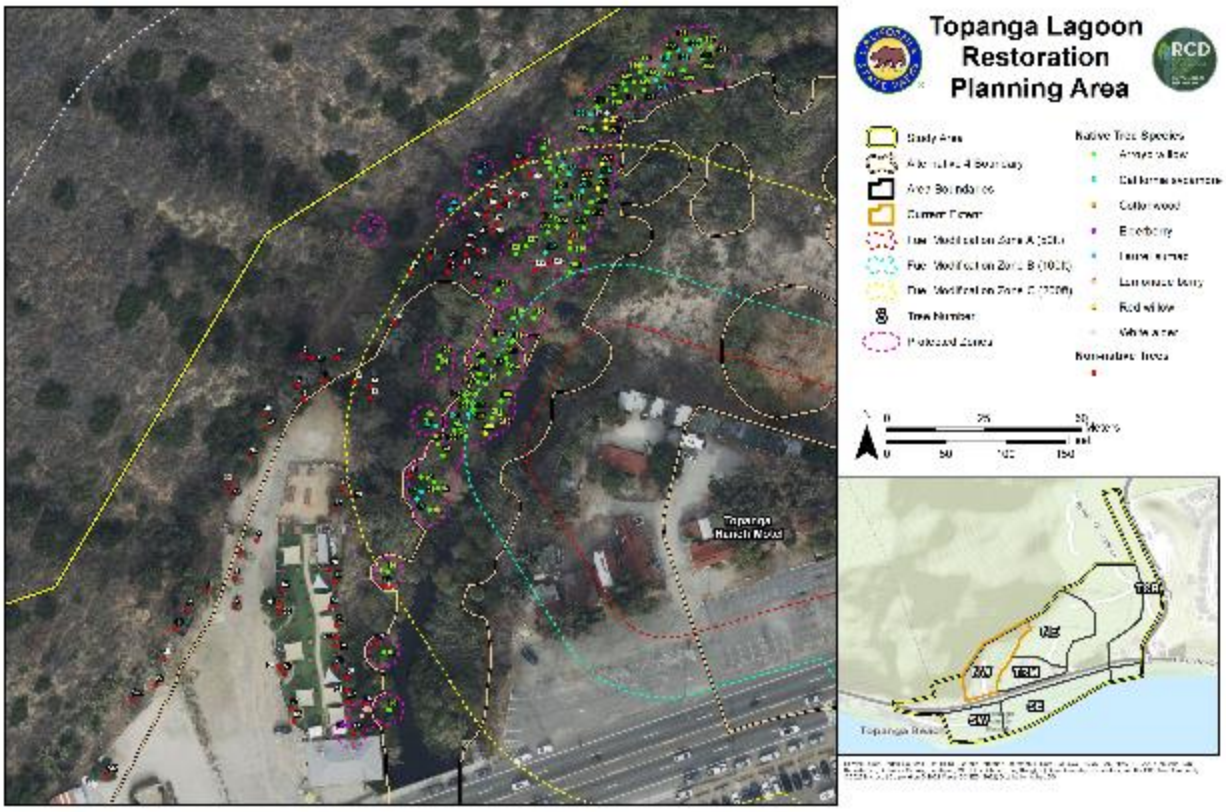
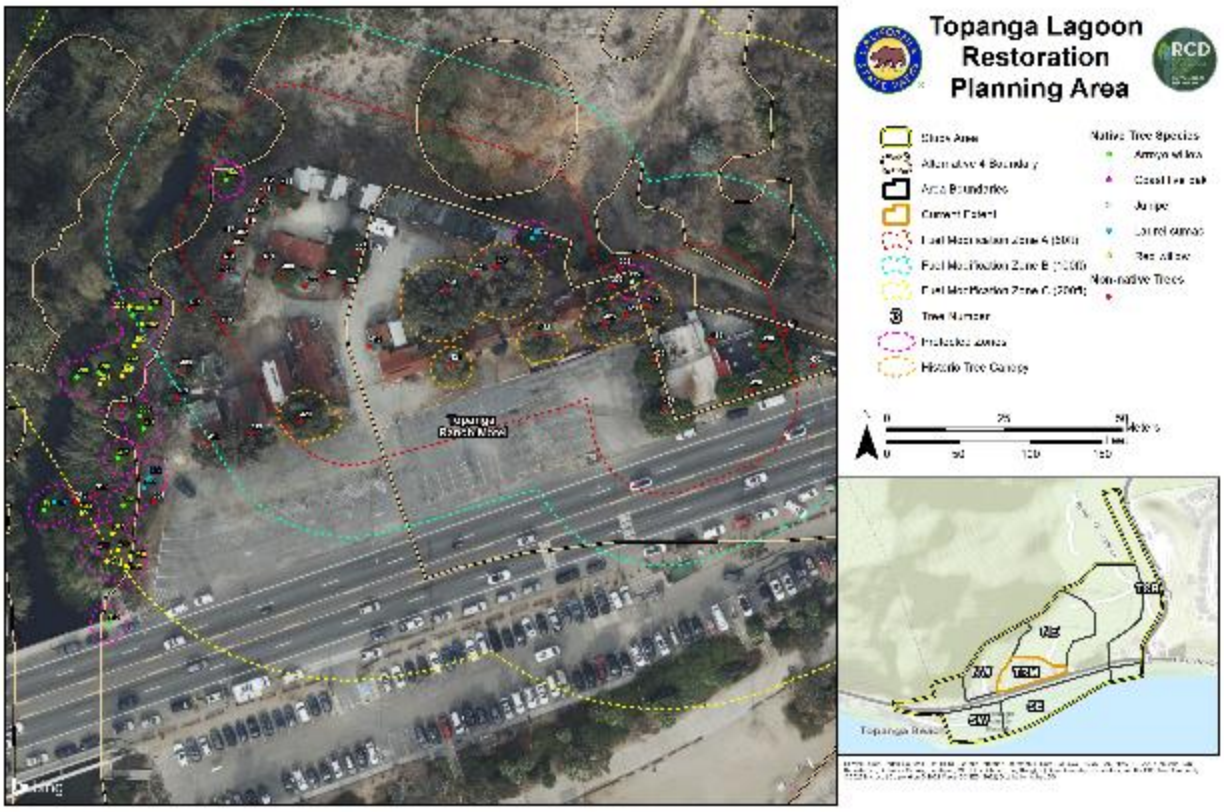


Alternative 4 Northwest Section



Alternative 4 Topanga Ranch Motel Section

Alternative 4 Southeast Section

Alternative 4 Southwest Section

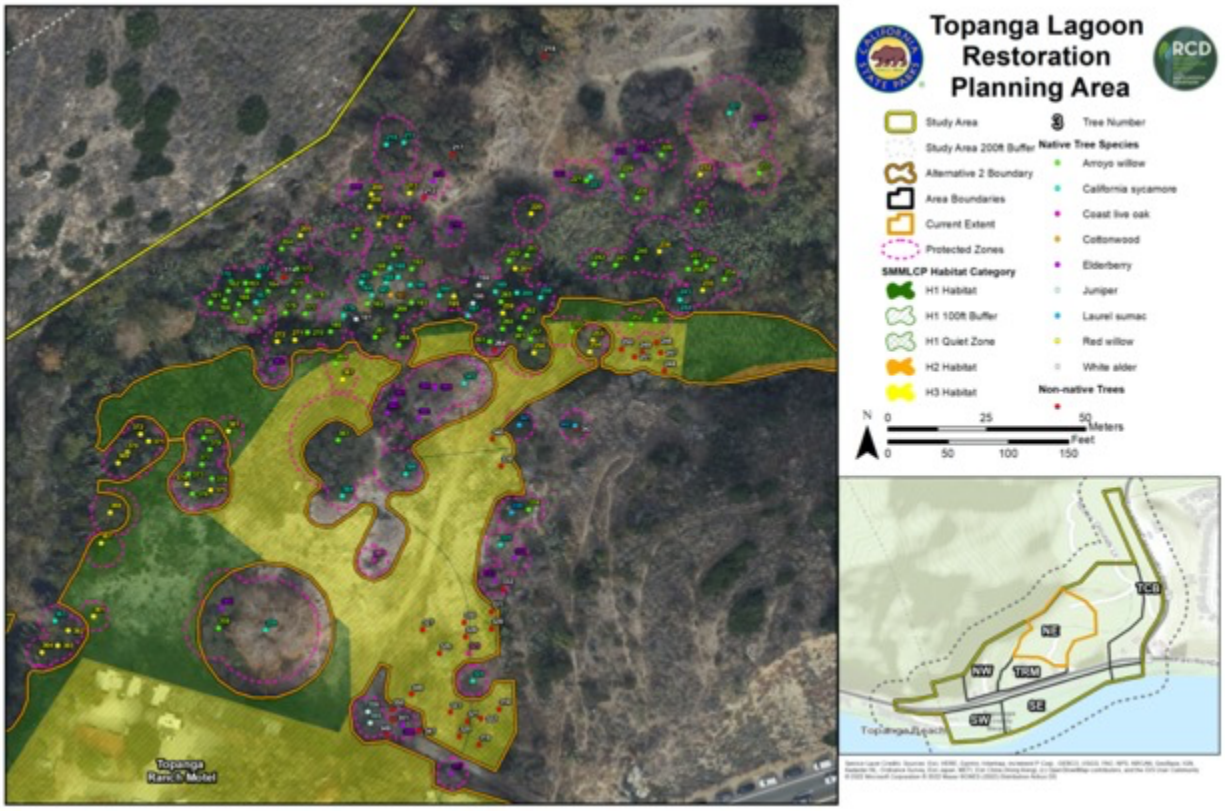
APPEDIX A

TOPANGA LAGOON RESTORATION PROJECT

DETAILED ALTERNATIVE TREE MAPS

ALTERNATIVE 2

Habitat Overlays by Tree Section



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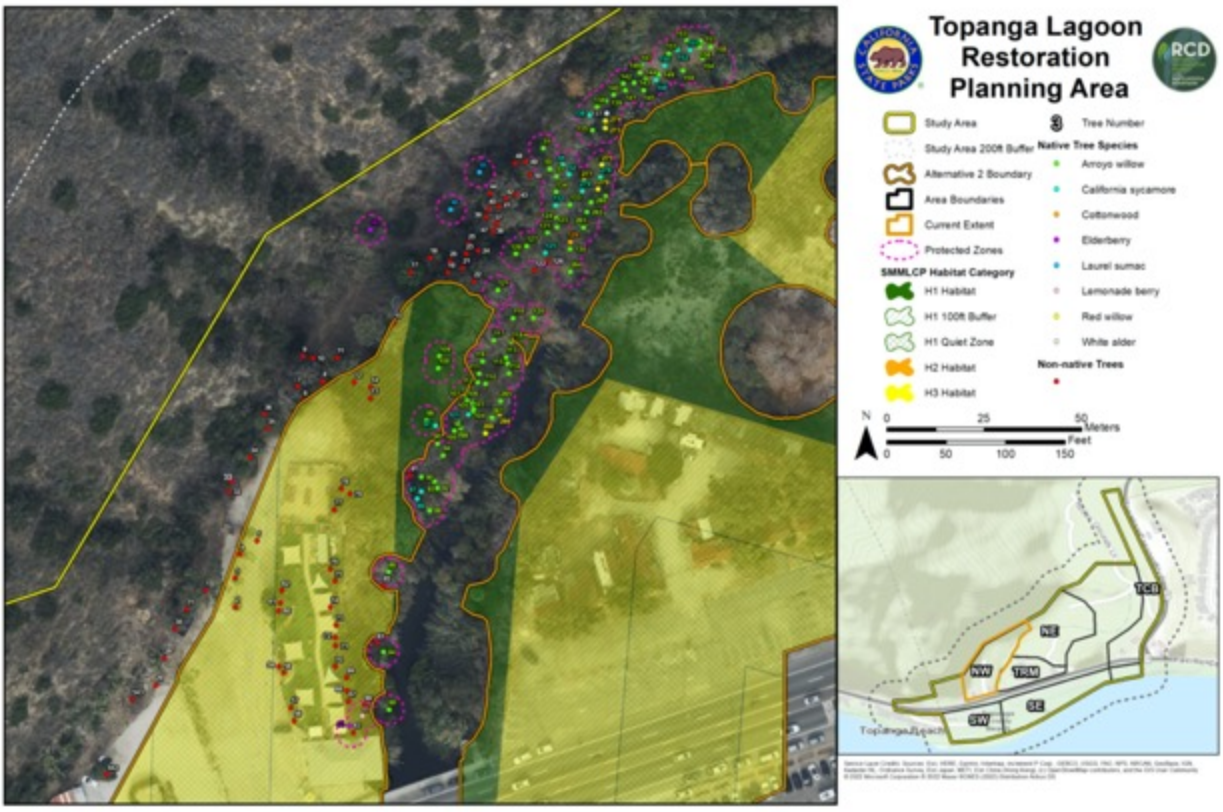

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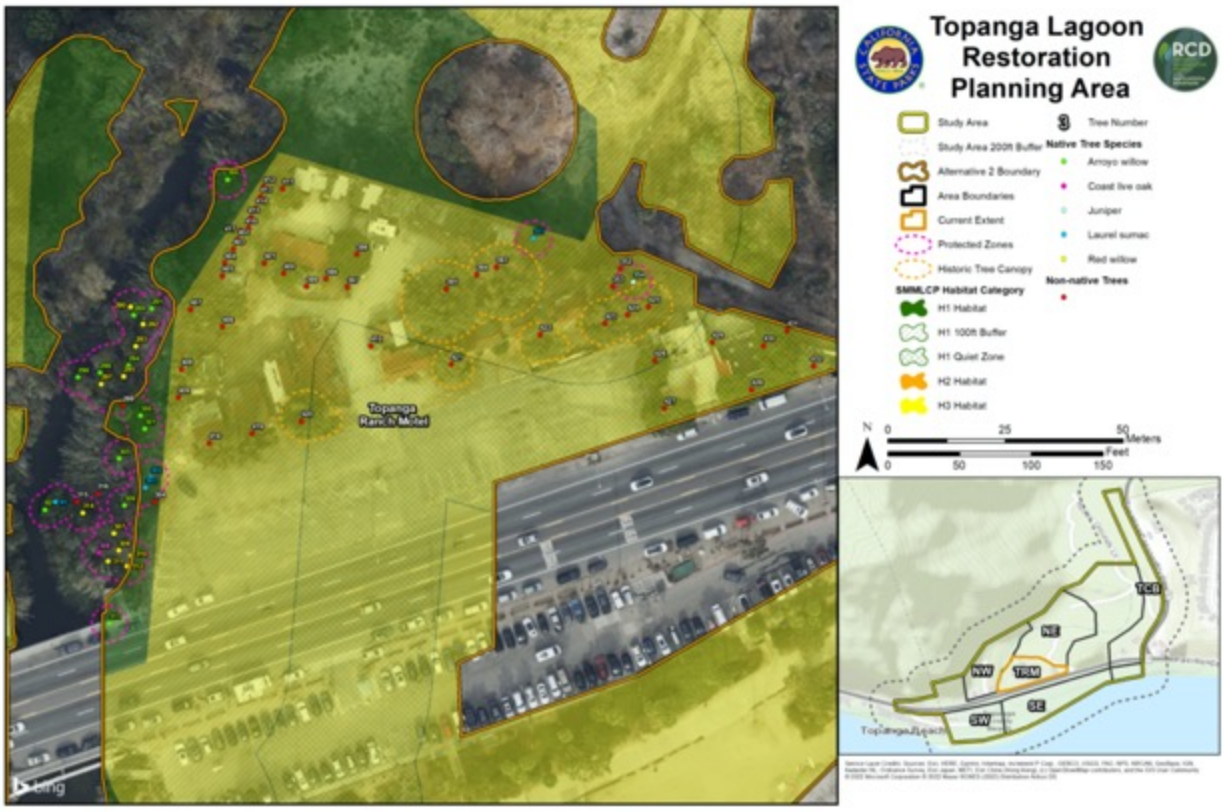
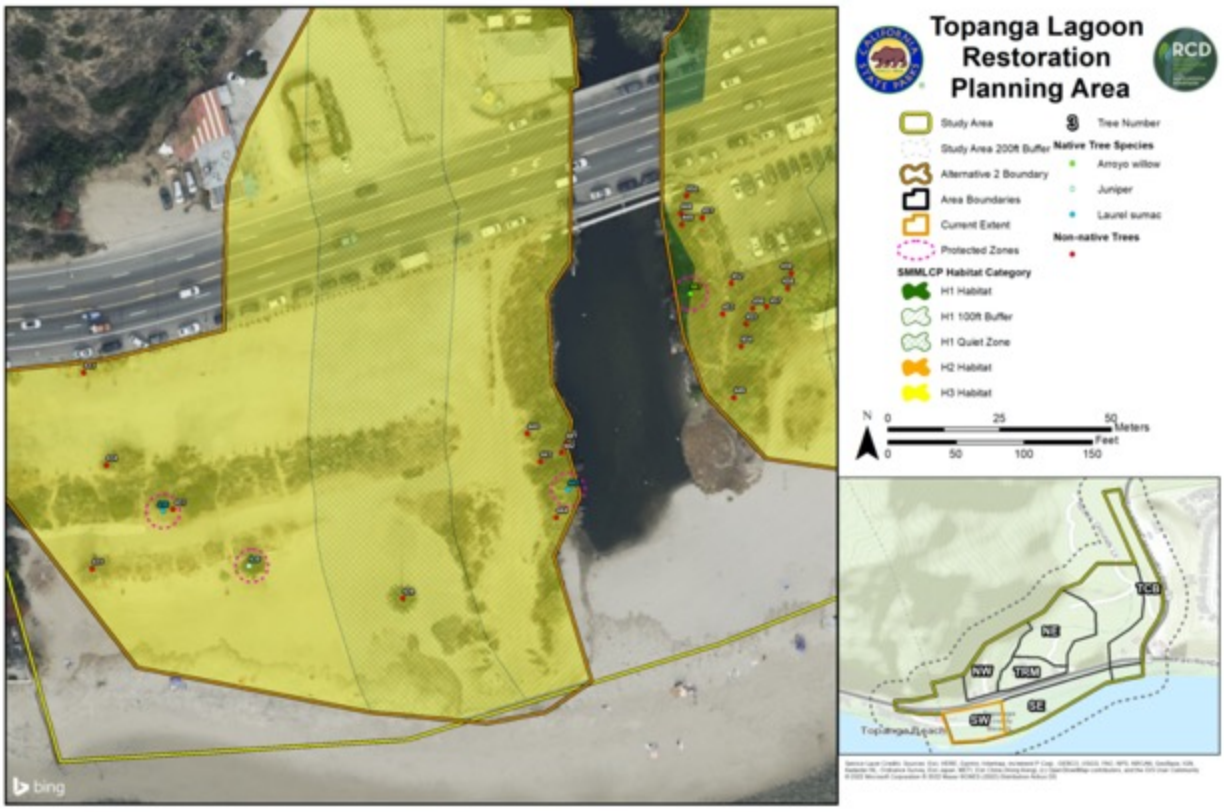


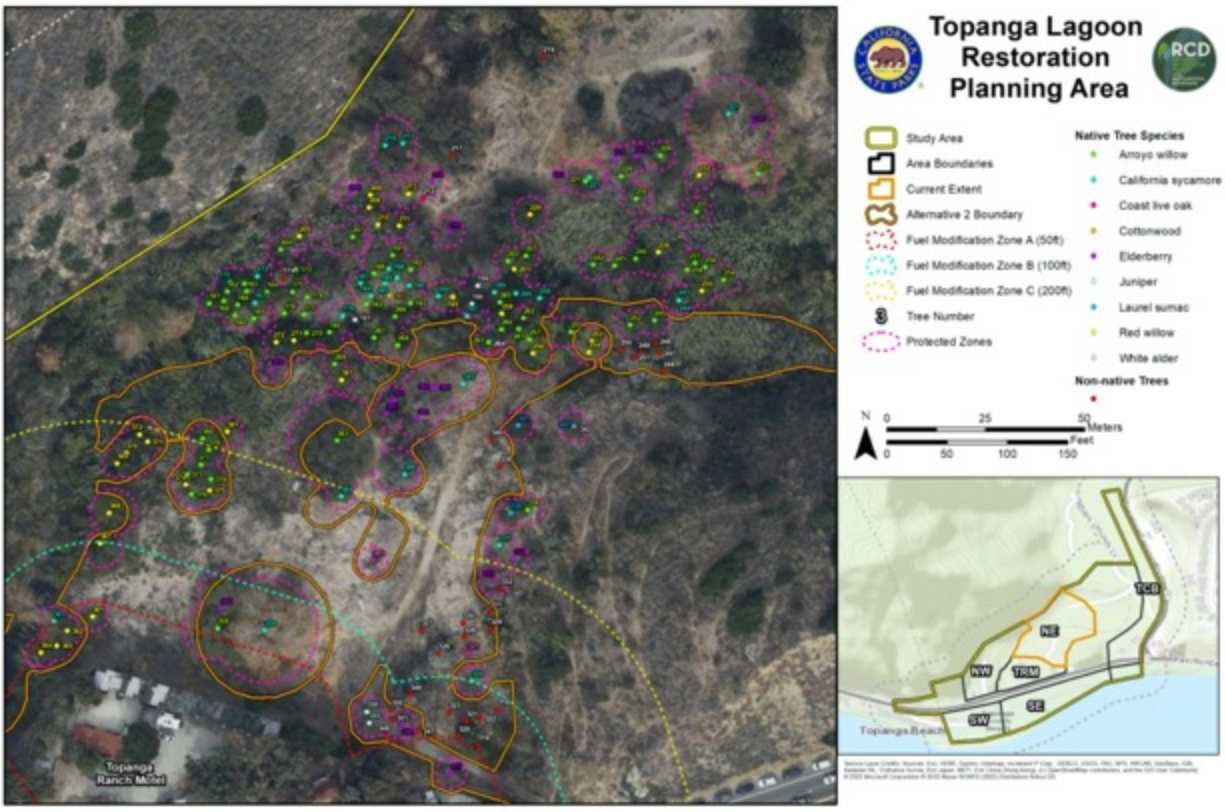
Alternative 2 Topanga Ranch Motel Section

Alternative 2 Southeast Section



Alternative 2 Southwest Section

Fuel Modification by Tree Section



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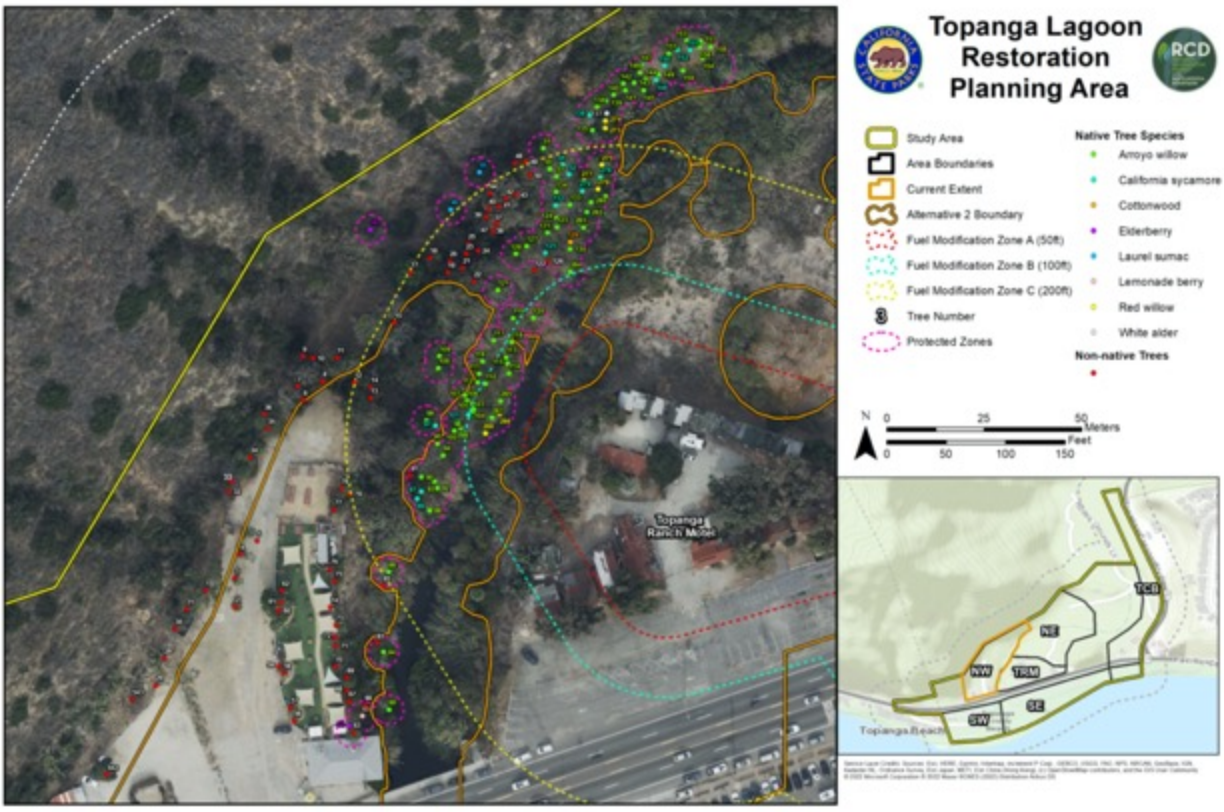

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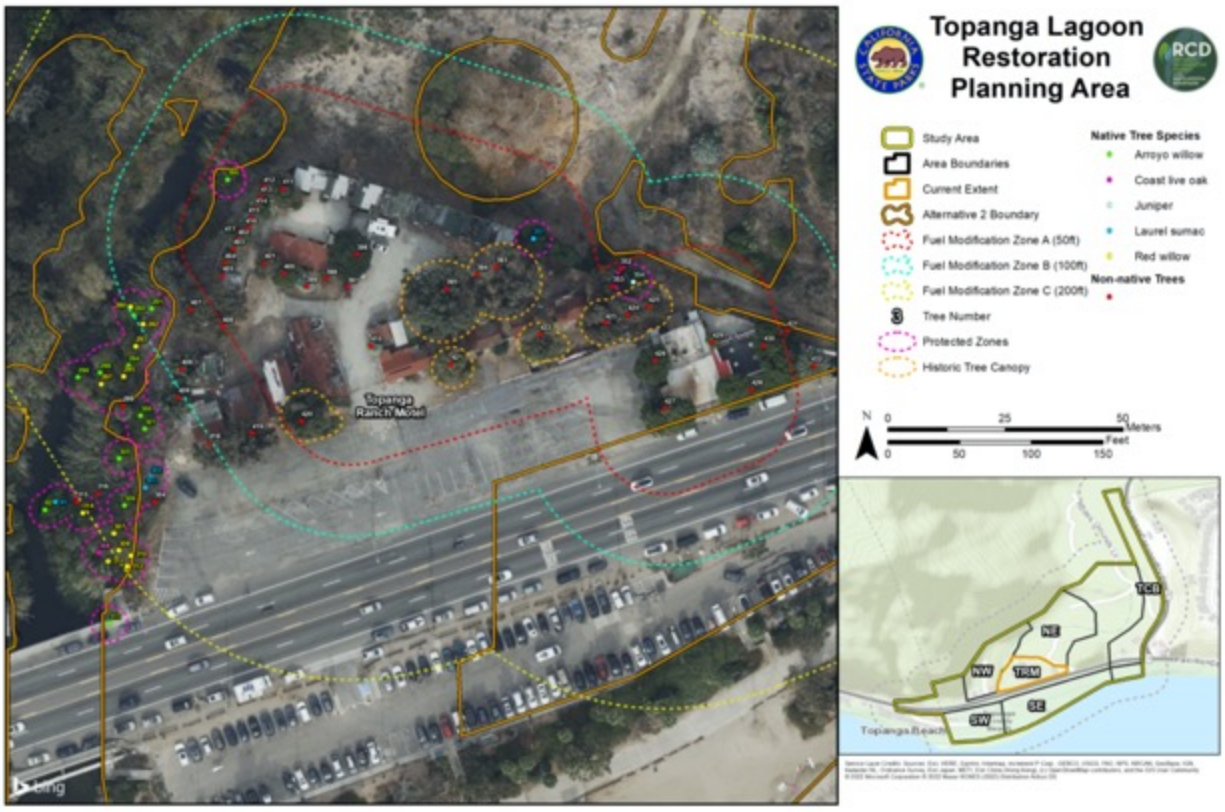


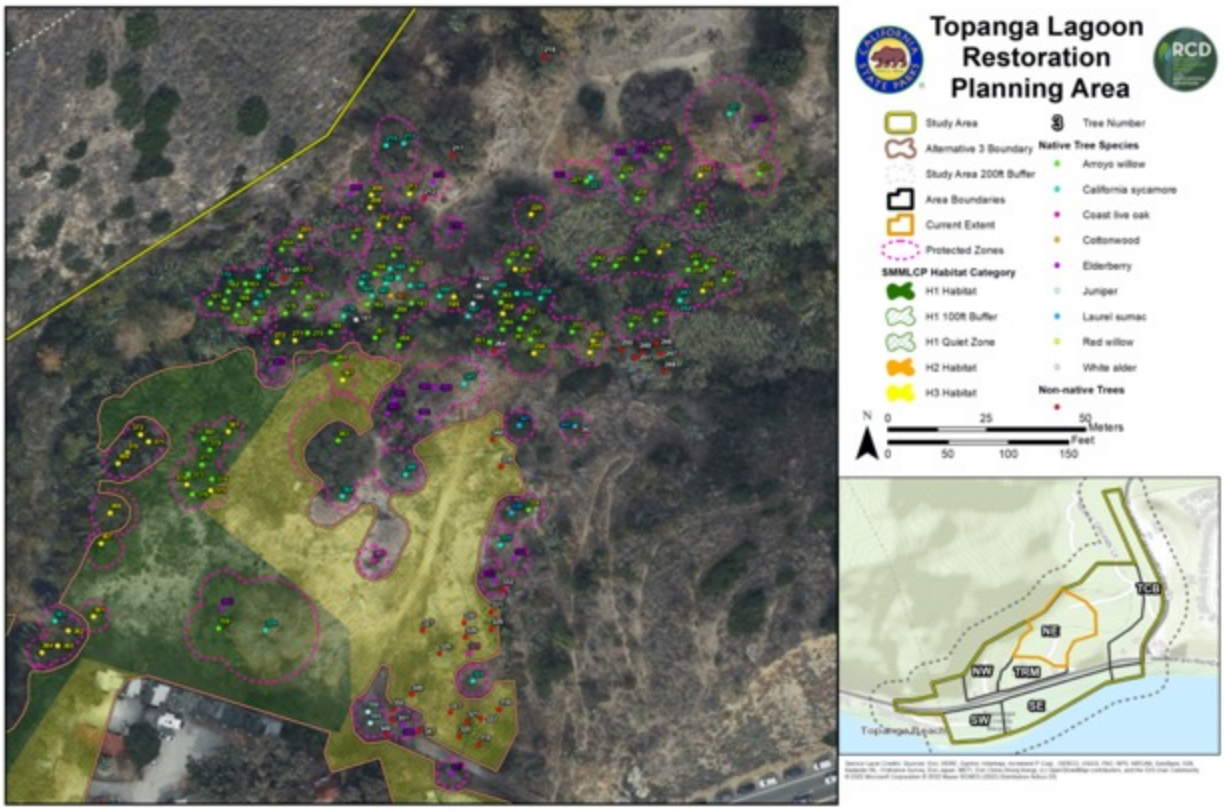
Alternative 2 Topanga Ranch Motel

Alternative 2 Southeast Section

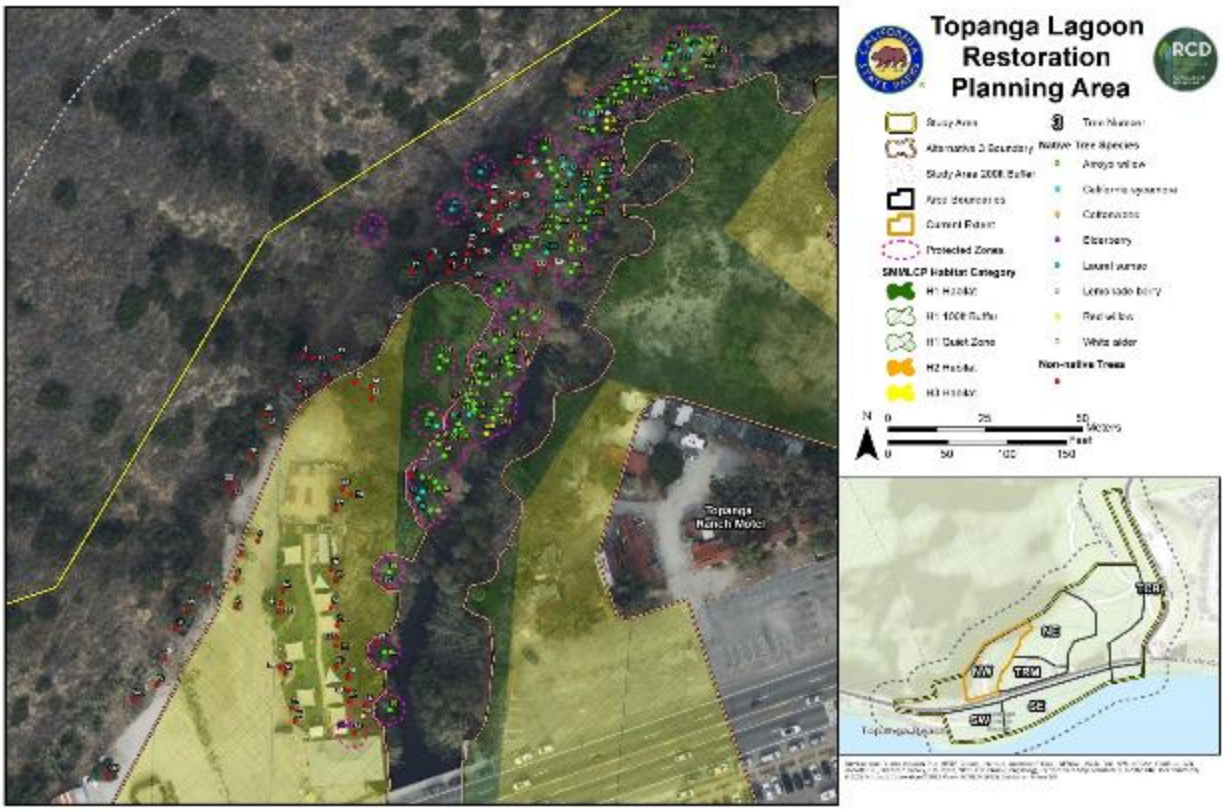
Alternative 2 Southwest Section

ALTERNATIVE 3

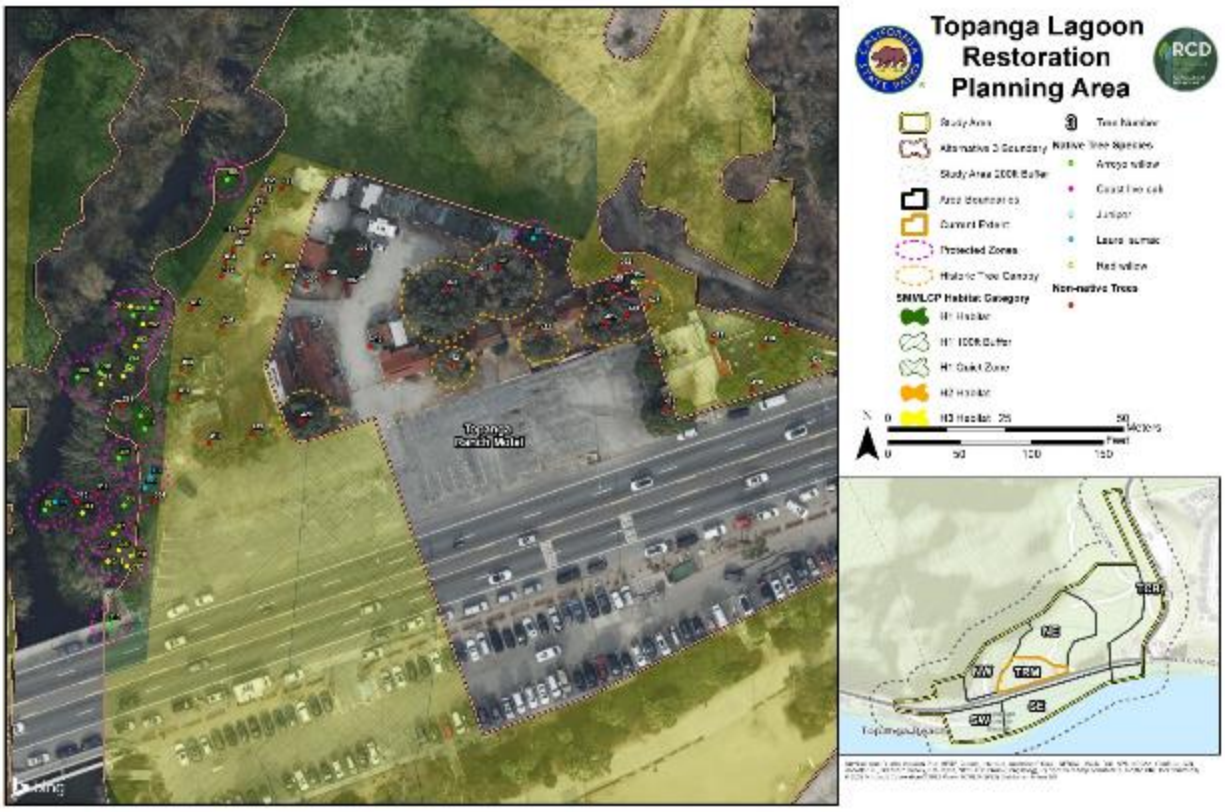
Habitat Overlays by Tree Section



Alternative 3 Northeast Section



Alternative 3 Northwest Section

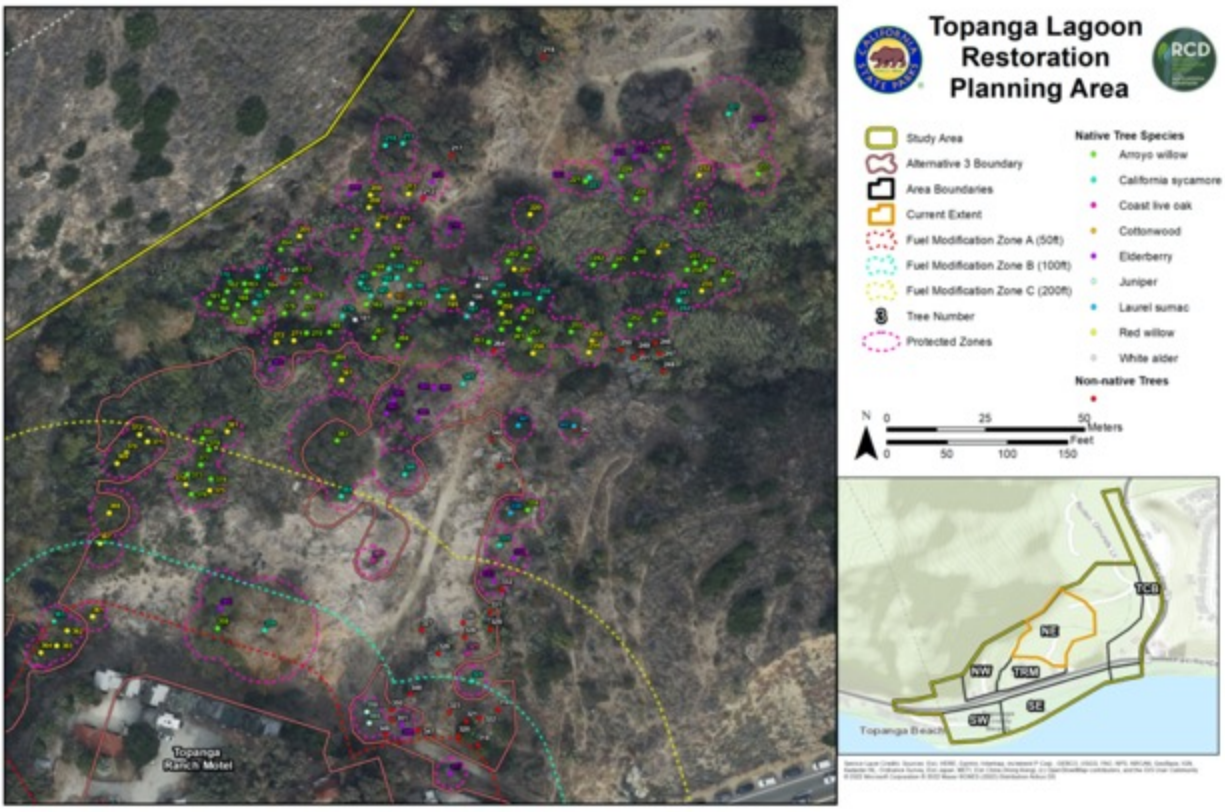


Alternative 3 Topanga Ranch Motel Section

Alternative 3 Southeast Section

Alternative 3 Southwest Section

Fuel Modification by Tree Section



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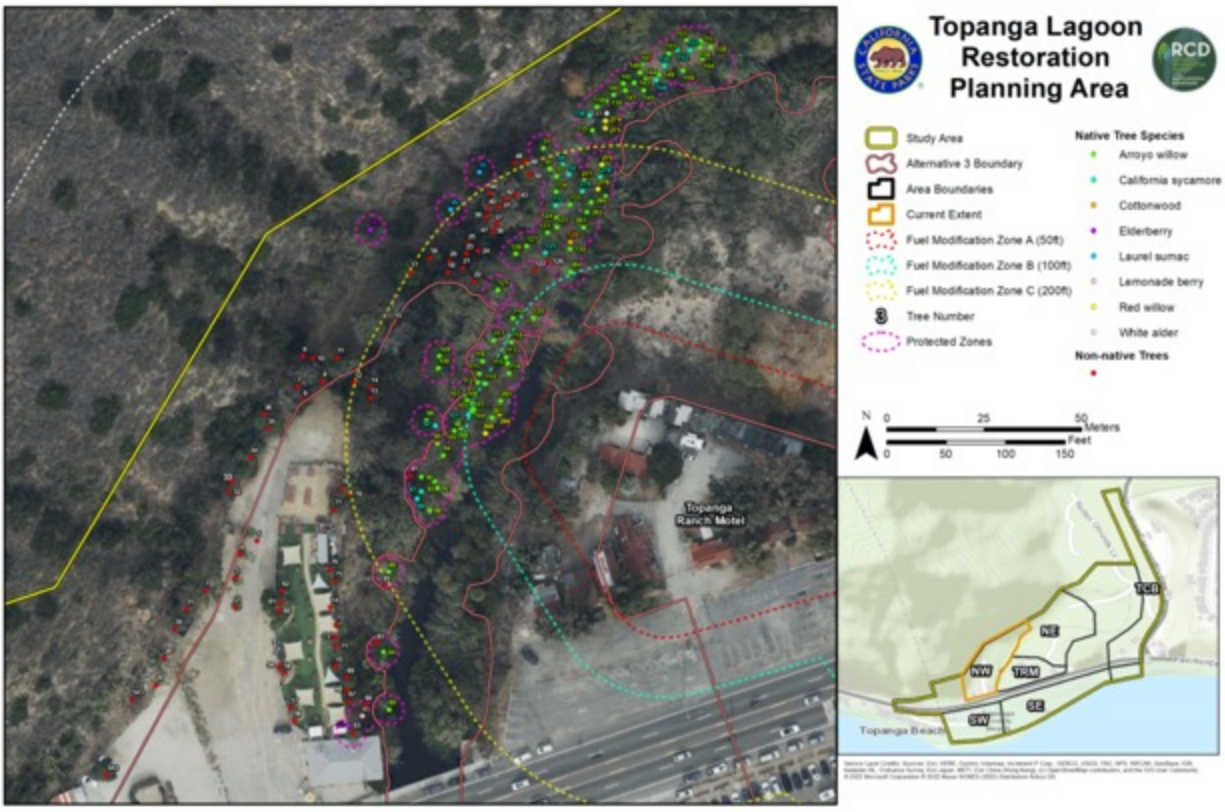

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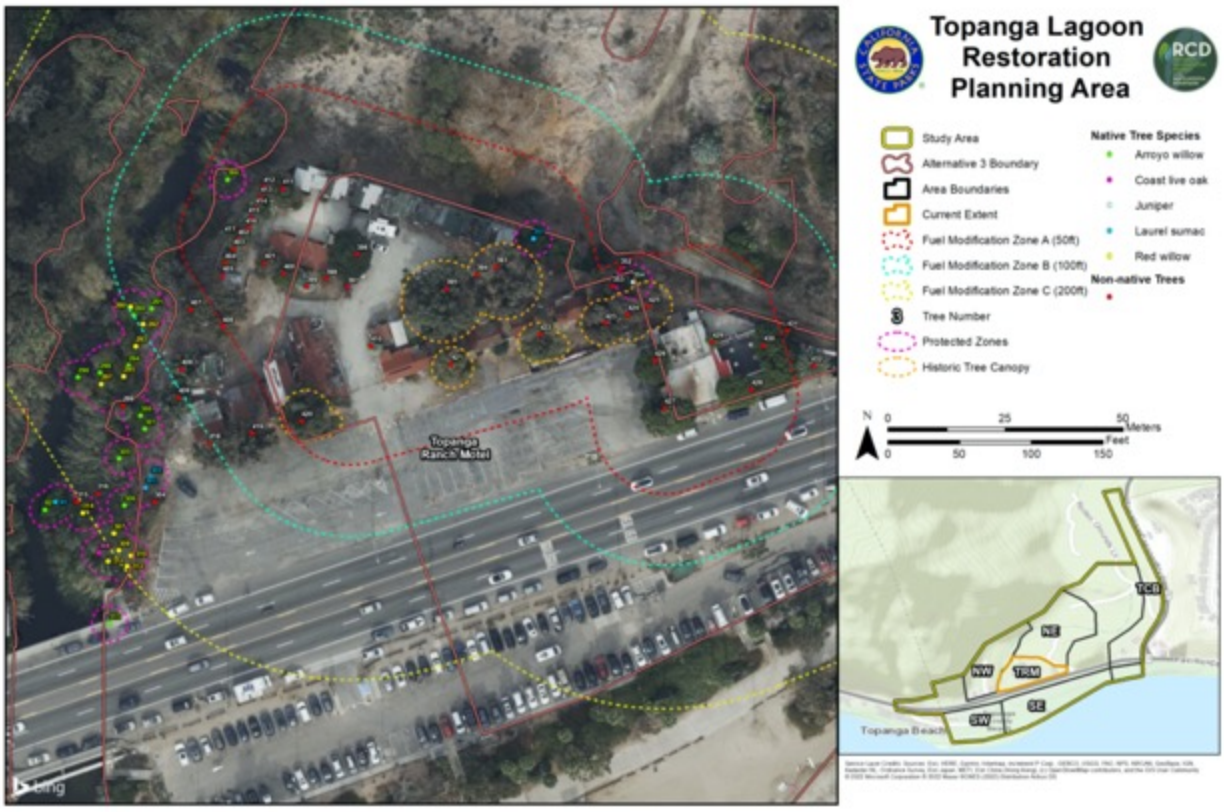


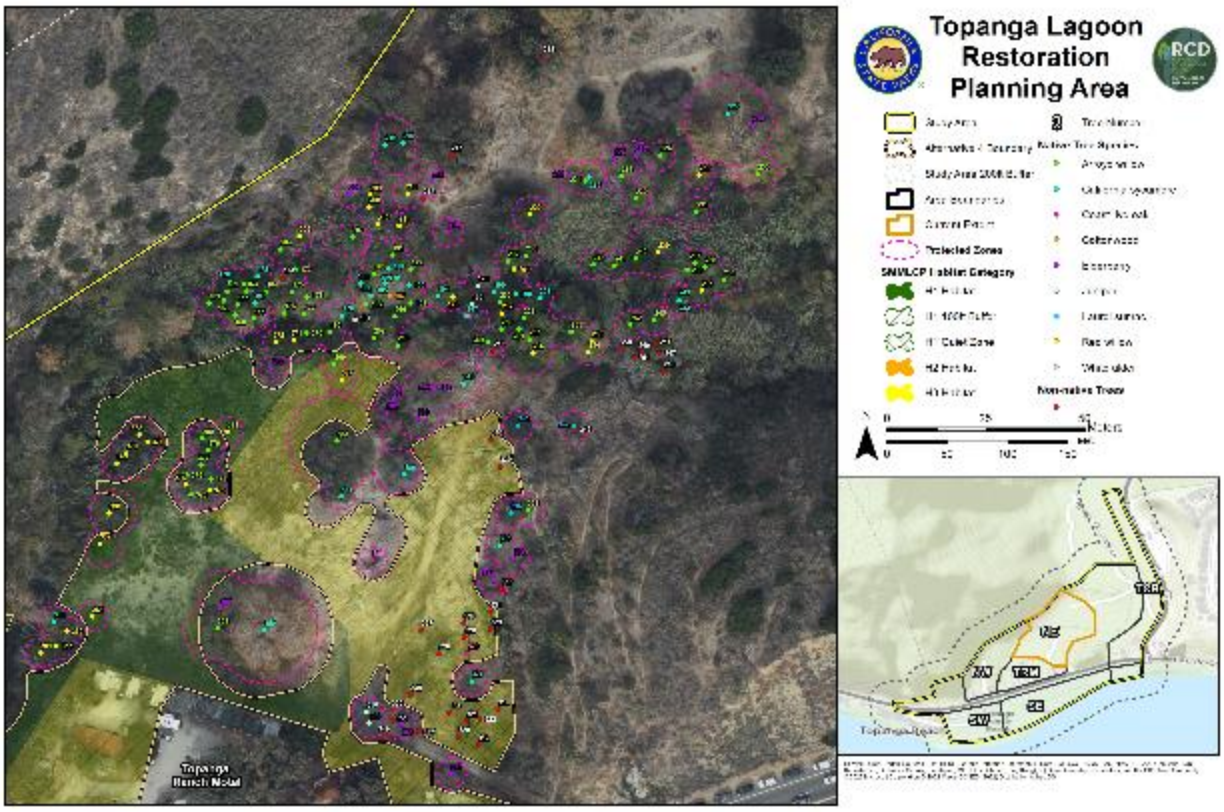
Alternative 3 Topanga Ranch Motel Section

Alternative 3 Southeast Section

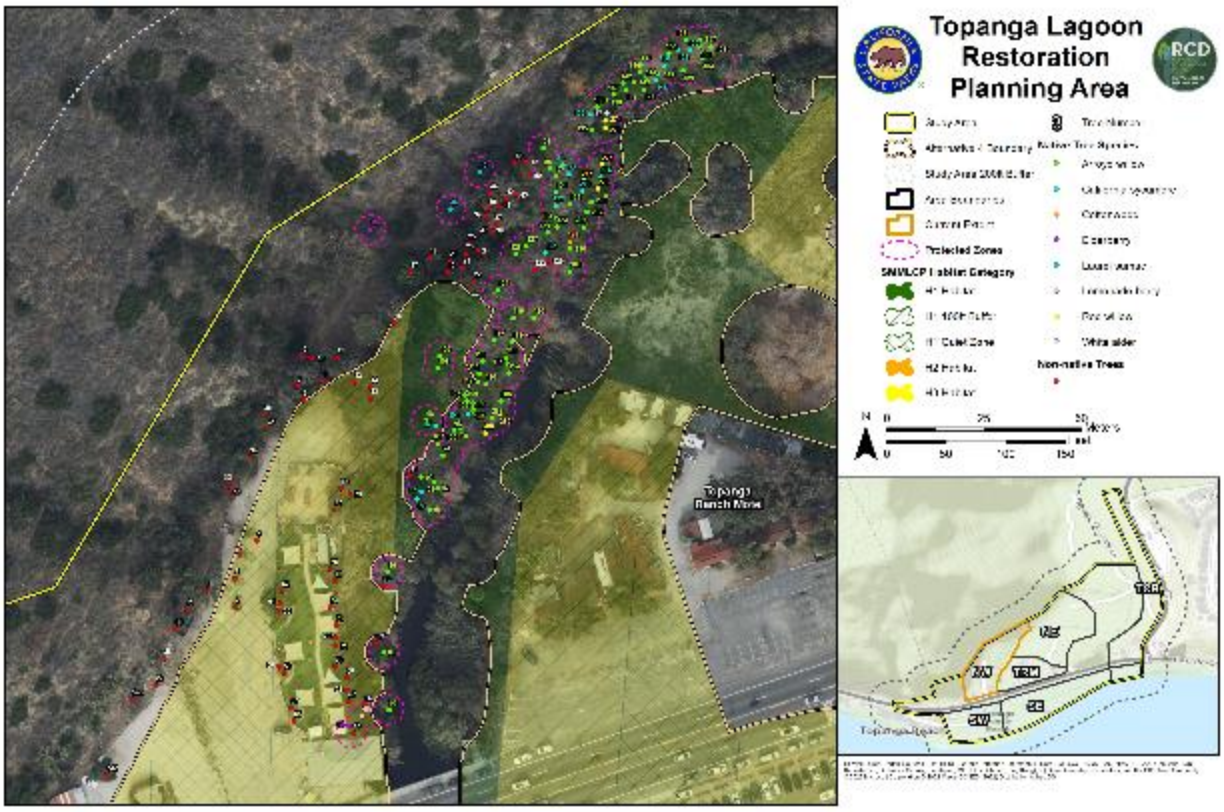
Alternative 3 Southwest Section

ALTERNATIVE 4

Habitat Overlays by Tree Section



Alternative 4 Northeast Section



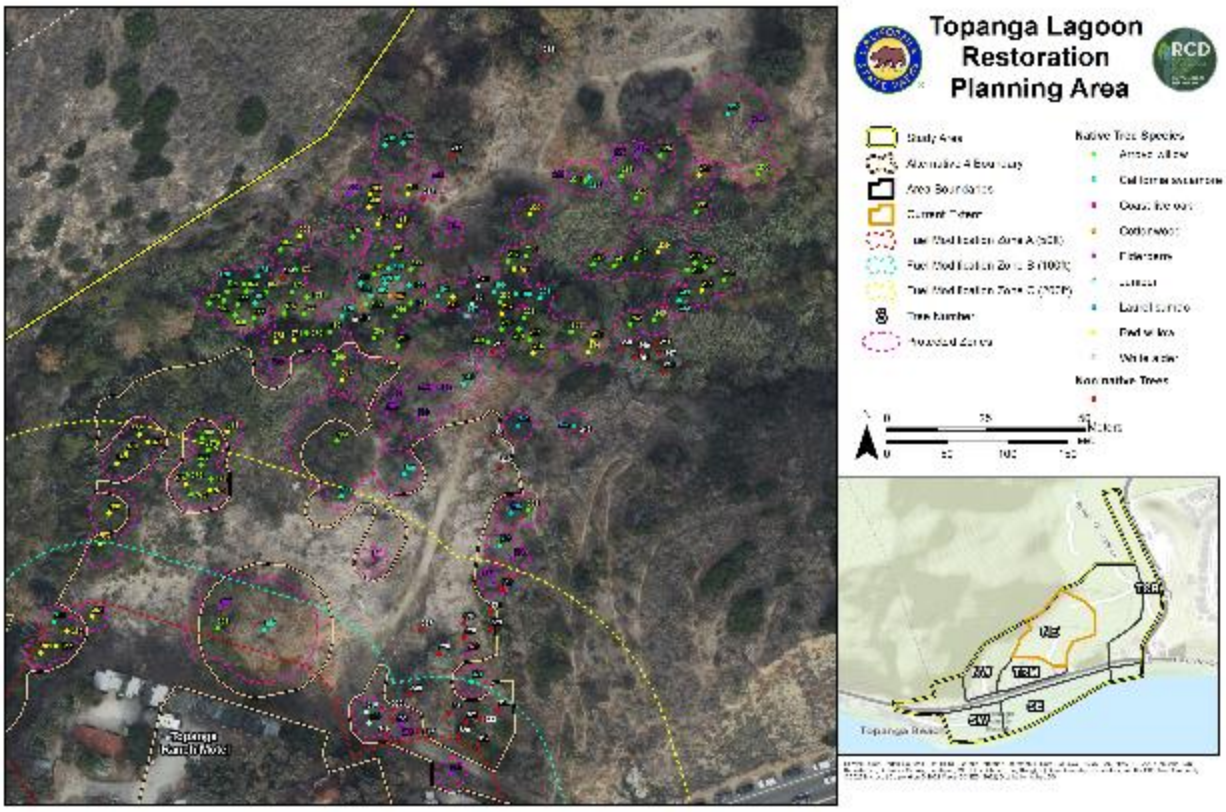
Alternative 4 Northwest Section

Alternative 4 Topanga Ranch Motel Section

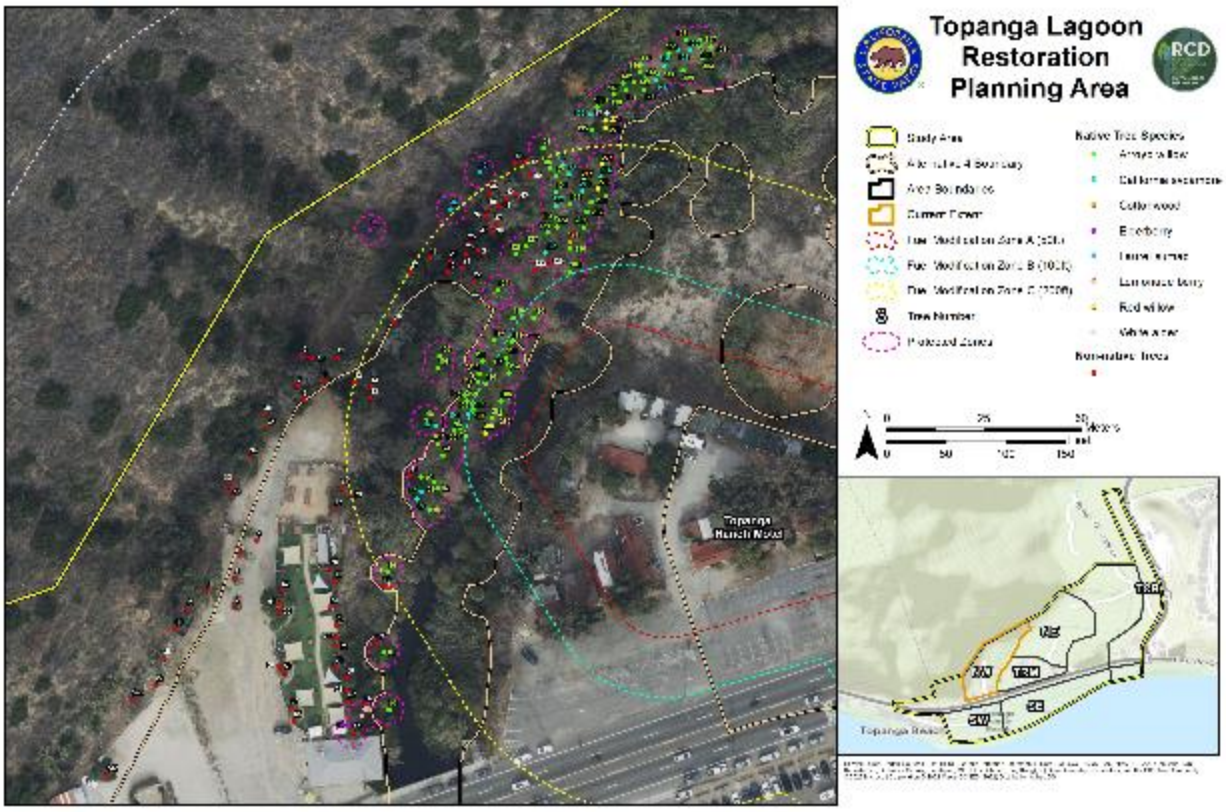
Alternative 4 Southeast Section

Alternative 4 Southwest Section

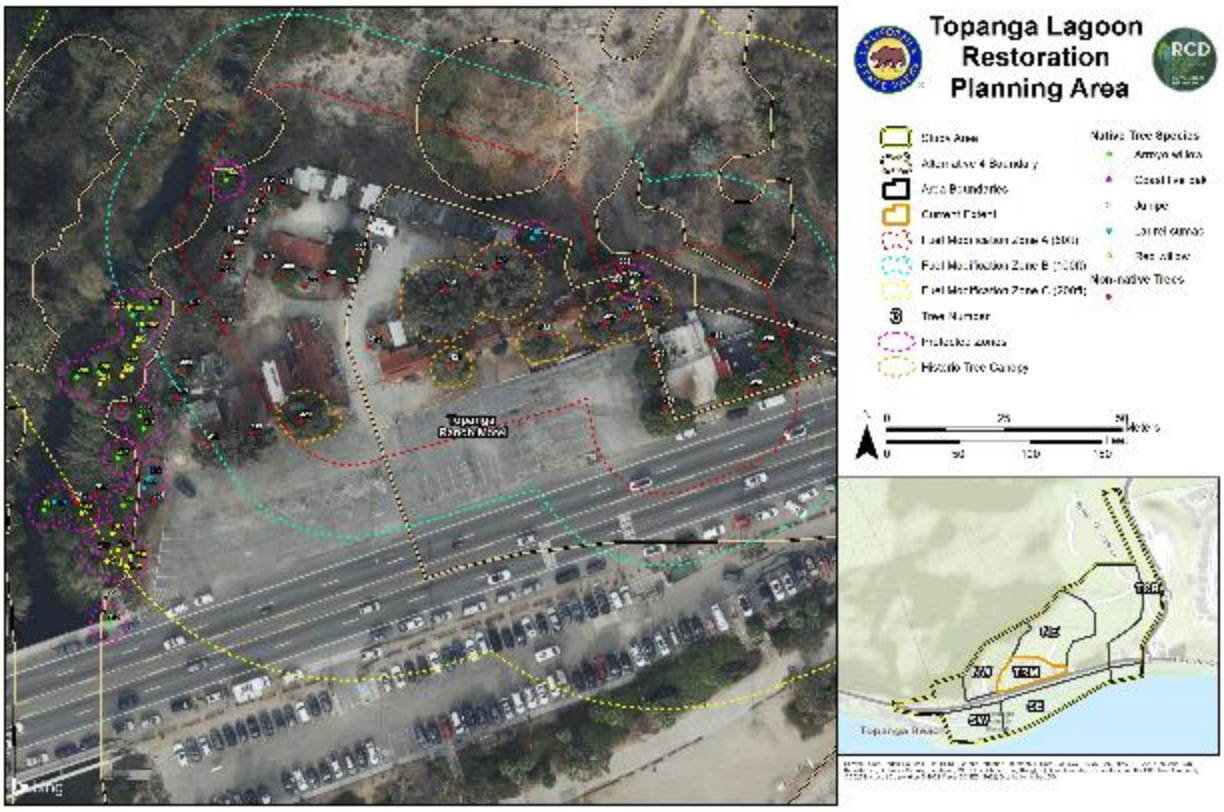
Fuel Modification by Tree Section



Alternative 4 Northeast Section



Alternative 4 Northwest Section



Alternative 4 Topanga Ranch Motel Section

Alternative 4 Southeast Section

Alternative 4 Southwest Section

APPENDIX B.

Field Data Tree Condition

Date Collected	Tree Number	Common Name	Scientific Name	Within a Fuel Modification Zone?	SMMCLP Zone	Area	Within Alternative 2	Within Alternative 3	Within Alternative 4	Latitude	Longitude	Height (ft)	Number of Trunks	DBH Sum	DBH	Canopy Percent Shade	Slope Grade	Dripline North ft	Dripline East ft	Dripline South ft	Dripline West ft	Canopy Spread ft	Total Condition	Condition Category	Structure Problems	Pests Present	Disease Present
2/22/21	1	California Pepper	Schinus molle		H1 Quiet Zone	NW	yes	yes	yes	34.03966698	-118.5836864	35	4	68.8	20.8, 17, 16, 15	45	0	20	10	15	15	35	76	Good	No	Yes	No
2/22/21	2	Fan Palm	Washingtonia sp.		H1 Quiet Zone	NW	yes	yes	yes	34.03969151	-118.5836315	60	1	18	18	5	0	4	4	4	4	8	32	Poor	No	No	No
2/22/21	3	Fan Palm	Washingtonia sp.		H1 Quiet Zone	NW	yes	yes	yes	34.03974026	-118.5836504	65	1	18	18	5	0	5	5	5	5	10	40	Poor	No	No	No
2/22/21	4	Dracaena	Dracaena draco		H1 Quiet Zone	NW	yes	yes	yes	34.03979558	-118.5836379	20	1	20	20	5	0	1	5	2	2	7	64	Good	No	No	No
2/22/21	5	Dracaena	Dracaena draco		H1 Quiet Zone	NW	yes	yes	yes	34.03982764	-118.5835908	25	1	52	52	5	0	4	3	1	3	6	32	Poor	Yes	No	No
2/22/21	6	Eucalyptus	Eucalyptus globulus		H1 100ft Buffer	NW	yes	yes	yes	34.0401545	-118.5834681	40	1	28	28	50	0	15	10	10	10	25	76	Good	No	No	No
2/22/21	7	Monterey Pine	Pinus radiata		H1 100ft Buffer	NW				34.04018557	-118.5834851	25	1	8	8	20	10	4	4	5	5	9	60	Fair	No	No	No
2/22/21	8	Eucalyptus	Eucalyptus globulus		H1 100ft Buffer	NW	yes	yes	yes	34.0401988	-118.5834156	45	1	29	29	0	15	15	10	10	15	25	76	Good	No	No	No
2/22/21	9	Eucalyptus	Eucalyptus globulus		H1 100ft Buffer	NW				34.04025655	-118.5834719	40	1	32	32	20	15	15	15	15	15	30	80	Good	No	No	No
2/22/21	10	Fan Palm	Washingtonia sp.		H1 100ft Buffer	NW				34.04025208	-118.5834449	12	1	12	12	10	10	3	3	3	3	6	72	Good	No	No	No
2/22/21	11	Eucalyptus	Eucalyptus globulus		H1 100ft Buffer	NW	yes	yes	yes	34.04028664	-118.5833488	40	1	19.4	19.4	0	5	0	0	0	0	0	44	Fair	No	No	No
2/22/21	12	Eucalyptus	Eucalyptus globulus		H1 100ft Buffer	NW	yes	yes	yes	34.04019773	-118.5833271	0	1	26	26	45	10	5	10	10	10	20	80	Good	No	No	No
2/22/21	13	Eucalyptus	Eucalyptus globulus	200-ft fuelmodzone	H1 100ft Buffer	NW	yes	yes	yes	34.04016148	-118.5832815	55	1	29.5	29.5	30	10	10	10	10	10	20	96	Excellent	No	No	No
2/22/21	14	Eucalyptus	Eucalyptus globulus	200-ft fuelmodzone	H1 100ft Buffer	NW	yes	yes	yes	34.04018696	-118.5832824	50	1	25	25	30	25	10	10	10	10	20	92	Excellent	No	No	No
2/22/21	15	Eucalyptus	Eucalyptus globulus	200-ft fuelmodzone	H1 100ft Buffer	NW	yes	yes	yes	34.04033724	-118.583219	65	9	62	15, 10, 8.5, 6.5, 4.5, 7, 3.5, 4.5	70	0	30	25	30	20	60	96	Excellent	No	No	No
2/22/21	16	Elderberry	Sambucus nigra		H1 100ft Buffer	NW				34.04054009	-118.58327	20	4	24.4	8.5, 7.5, 5.4, 3	5	0	5	10	10	0	15	64	Good	No	No	No
2/22/21	17	Podocarpus	Podocarpus sp.	200-ft fuelmodzone	H1 100ft Buffer	NW	yes	yes	yes	34.04045354	-118.5831545	50	1	17.3	17.3	0	0	15	20	15	10	30	88	Excellent	No	No	No
2/22/21	18	Ficus	Ficus benjamina	200-ft fuelmodzone	H1 100ft Buffer	NW	yes	yes	yes	34.04048807	-118.5831226	40	2	13.8	12, 1.8	45	0	10	10	10	10	20	96	Excellent	No	No	No
2/22/21	19	Ficus	Ficus benjamina	200-ft fuelmodzone	H1	NW	yes	yes	yes	34.04045555	-118.5830727	35	9	29.7	7.5, 3.5, 4.5, 3.5, 2.5, 1.5, 1.5, 1.5, 1.2	0	0	10	10	10	10	20	48	Fair	Yes	No	No
2/22/21	20	Ficus	Ficus benjamina	200-ft fuelmodzone	H1	NW	yes	yes	yes	34.0404816	-118.583068	35	2	9.3	7.5, 1.8	0	0	0	0	0	0	0	64	Good	Yes	No	No
2/22/21	21	Eucalyptus	Eucalyptus globulus	200-ft fuelmodzone	H1	NW	yes	yes	yes	34.040466	-118.5830309	65	1	58	58	50	0	40	20	20	10	60	88	Excellent	No	No	No
2/22/21	22	Eucalyptus	Eucalyptus globulus	200-ft fuelmodzone	H1	NW	yes	yes	yes	34.0404358	-118.5829994	0	1	28	28	25	0	20	15	10	5	30	84	Excellent	No	No	No
2/22/21	23	Ficus	Ficus benjamina	200-ft fuelmodzone	H1	NW	yes	yes	yes	34.0404989	-118.5830225	15	3	12	5, 4, 3	20	0	5	5	5	5	10	96	Excellent	No	Yes	No
2/22/21	24	Ficus	Ficus benjamina	200-ft fuelmodzone	H1	NW	yes	yes	yes	34.0405065	-118.5829906	20	5	25.6	7.5, 4, 4, 4, 4, 4, 4, 3	20	0	5	5	5	10	15	84	Excellent	Yes	Yes	No
2/22/21	25	Ficus	Ficus benjamina	200-ft fuelmodzone	H1	NW	yes	yes	yes	34.04052276	-118.5830176	30	3	14	6, 4.5, 3.5	20	0	5	5	5	5	10	56	Fair	Yes	Yes	No
2/22/21	28	Dracaena	Dracaena draco		H1 Quiet Zone	NW				34.03955298	-118.5838433	0	5	41.3	16.8, 11, 5, 4.5, 4	5	15	5	0	15	0	20	68	Good	Yes	No	No
2/22/21	29	Dracaena	Dracaena draco		H1 Quiet Zone	NW				34.03949025	-118.5838659	20	3	26	13, 8, 5	0	15	0	10	5	5	15	84	Excellent	Yes	No	No
2/22/21	30	Canary Island Pine	Pinus canariensis		H1 Quiet Zone	NW				34.03960871	-118.5838206	35	1	19.2	19.2	10	10	10	10	10	10	20	76	Good	No	Yes	No
2/22/21	31	Ficus	Ficus benjamina		H1 Quiet Zone	NW				34.03965469	-118.5837895	30	1	11.2	11.2	0	0	10	10	10	10	20	84	Excellent	No	No	No
2/22/21	32	Eucalyptus	Eucalyptus globulus		H1 Quiet Zone	NW				34.03994073	-118.5836725	25	3	25	11.5, 9, 4.5	25	25	5	10	5	5	15	72	Good	Yes	No	No
2/22/21	33	Elm	Ulmus sp.		H1 Quiet Zone	NW				34.03996435	-118.5836644	25	3	12	5, 4, 3	60	25	15	15	15	10	30	100	Excellent	No	No	No
2/22/21	34	Brazilian Pepper	Schinusterebinthifolia		H1 Quiet Zone	NW	yes	yes	yes	34.03998489	-118.5835593	20	5	24.5	7, 6.5, 5, 4, 2	50	10	10	10	10	10	20	100	Excellent	No	No	No
2/22/21	35	California Pepper	Schinus molle		H1 Quiet Zone	NW				34.04005666	-118.5835596	25	1	16	16	50	10	5	15	20	10	25	100	Excellent	No	No	No
2/22/21	36	Monterey Pine	Pinus radiata		H1 Quiet Zone	NW				34.04008924	-118.5835691	30	1	16.5	16.5	60	10	20	20	15	10	35	100	Excellent	No	No	No
2/23/21	37	Ficus	Ficus sp.	200-ft fuelmodzone	H1	NW	yes	yes	yes	34.04056782	-118.5829401	35	8	23.5	10.3, 3.8, 2.6, 3, 1.3, 1.2, 0.8	20	30	5	5	5	5	10	100	Excellent	Yes	No	No
2/23/21	38	Ficus	Ficus sp.	200-ft fuelmodzone	H1	NW	yes	yes	yes	34.04057127	-118.5829401	25	9	25.1	7.4, 3.6, 3.7, 3, 1.7, 2.4, 3.2, 1.3	25	25	5	5	5	5	10	84	Excellent	Yes	No	No
2/23/21	39	Ficus	Ficus sp.	200-ft fuelmodzone	H1	NW	yes	yes	yes	34.04058571	-118.582969	20	10	19.6	4.5, 4.2, 7.6, 2.1, 1.9, 1.2, 1.7, 1.7, 1.2	30	0	5	5	5	5	10	72	Good	Yes	No	No
2/23/21	40	Ficus	Ficus sp.	200-ft fuelmodzone	H1	NW	yes	yes	yes	34.0406046	-118.5829625	25	6	25.4	10, 5, 5, 2.7, 2.7, 2.5, 2.2	20	0	5	10	5	10	20	68	Good	Yes	No	No
2/23/21	41	Ficus	Ficus sp.	200-ft fuelmodzone	H1	NW	yes	yes	yes	34.04060872	-118.5829338	0	6	8.2	2, 1.8, 1.5, 0.8, 0.4, 0.5	25	0	5	20	5	15	35	68	Good	Yes	No	No
2/23/21	42	Ficus	Ficus sp.	200-ft fuelmodzone	H1	NW	yes	yes	yes	34.04062781	-118.5829135	35	6	14.2	9.8, 3.4, 0.8, 2.4, 2.9, 3.9	25	15	15	5	5	20	25	76	Good	Yes	Yes	No
2/23/21	43	Eucalyptus	Eucalyptus globulus	200-ft fuelmodzone	H1	NW	yes	yes	yes	34.04063691	-118.5828869	40	2	31.3	22, 9.3	15	15	5	25	5	10	35	88	Excellent	No	No	No
2/23/21	44	Eucalyptus	Eucalyptus globulus	200-ft fuelmodzone	H1	NW	yes	yes	yes	34.04063976	-118.5829588	70	1	46	46	40	0	25	15	20	15	45	72	Good	Yes	No	No
2/23/21	45	Laurel sumac	Malosma laurina		H1 100ft Buffer	NW				34.04068837	-118.5829889	15	11	10.9	----------	5	0	0	5	5	5	10	72	Good	No	No	No
2/23/21	46	Laurel sumac	Malosma laurina		H1 100ft Buffer	NW	yes	yes	yes	34.04060105	-118.583067	20	5	14	3.4, 3.3, 2.3, 3, 2	10	0	5	5	5	5	10	80	Good	No	No	No
2/23/21	47	Eucalyptus	Eucalyptus globulus	200-ft fuelmodzone	H1	NW	yes	yes	yes	34.04055097	-118.5829501	15	1	12	12	10	0	20	5	5	5	25	80	Good	No	No	No
2/23/21	48	Eucalyptus	Eucalyptus globulus		H1	NW	yes			34.0407106	-118.5828902	40	2	18	11, 7	25	0	25	15	10	10	35	92	Excellent	No	No	No
2/23/21	49	Eucalyptus	Eucalyptus globulus		H1	NW	yes	yes	yes	34.0407146	-118.5828622	50	2	32	20, 12	25	10	25	20	5	5	30	84	Excellent	No	No	No
2/23/21	50	Ficus	Ficus sp.	200-ft fuelmodzone	H1	NW	yes	yes	yes	34.04068287	-118.5828494	15	3	8.6	3.8, 3, 1.8	0	20	5	5	5	5	10	72	Good	No	No	No
2/23/21	51	Arroyo Willow	Salix lasiolepsis		H1	NW	yes			34.04074577	-118.582813	15	20	70.2	2.5, 2, 1.5, 0.5, 3.5, 3, 5, 5, 5, 5, 3, 2, 2.5, 0.2, 1, 1.5, 1.5, 3, 2, 2, 2, 2, 2, 2, 2	10	0	15	15	15	15	30	68	Good	No	No	No
2/23/21	52	California sycamore	Platanus racemosa	200-ft fuelmodzone	H1	NW				34.04068602	-118.5827406	25	1	7.6	7.6	10	20	20	5	5	5	25	76	Good	No	No	No
2/23/21	53	Arroyo Willow	Salix lasiolepsis	200-ft fuelmodzone	H1	NW	yes	yes	yes	34.04068177	-118.5827749	10	1	4.8	4.8	5	20	15	5	5	5	20	52	Fair	No	No	No
2/23/21	54	California sycamore	Platanus racemosa	200-ft fuelmodzone	H1	NW	yes			34.04070873	-118.5827569	15	1	4.8	4.8	5	20	15	5	5	5	20	64	Good	No	No	No
2/23/21	55	Arroyo Willow	Salix lasiolepsis	200-ft fuelmodzone	H1	NW	yes			34.0406983	-118.5827934	15	5	18.5	4.5, 3.5, 4.5, 3, 3	10	0	15	10	10	5	25	64	Good	No	Yes	No
2/23/21	56	Dracaena	Dracaena sp.		H1 100ft Buffer	NW	yes	yes	yes	34.03941476	-118.5834725	15	7	26.7	9.8, 3.8, 2.8, 4, 2, 1.8, 3.3	5	0	3	3	5	3	8	80	Good	No	No	No
2/23/21	57	Dracaena	Dracaena sp.		H1 100ft Buffer	NW	yes	yes	yes	34.03945331	-118.5834671	15	5	33.6	14, 8, 3.6, 3, 5	0	0	3	3	3	3	6	80	Good	No	No	No
2/23/21	58	Dracaena	Dracaena sp.		H1 100ft Buffer	NW	yes	yes	yes	34.03952487	-118.5834841	15	1	9.4	9.4	5	0	3	3	3	3	6	80	Good	No	No	No
2/23/21	59	Dracaena	Dracaena sp.		H1 100ft Buffer	NW	yes	yes	yes	34.03953936	-118.5834981	15	1	11.7	11.7	5	0	4	4	5	5	9	80	Good	No	No	No
2/23/21	60	Fan Palm	Washingtonia sp.		H1 100ft Buffer	NW	yes	yes	yes	34.03966701	-118.5835277	60	1	23	23	5	0	5	5	5	5	10	88	Excellent	No	No	No

Date Collected	Tree Number	Common Name	Scientific Name	Within a Fuel Modification Zone?	SMMCLP Zone	Area	Within Alternative 2	Within Alternative 3	Within Alternative 4	Latitude	Longitude	Height (ft)	Number of Trunks	DBH Sum	DBH	Canopy Percent Shade	Slope Grade	Dripline North ft	Dripline East ft	Dripline South ft	Dripline West ft	Canopy Spread ft	Total Condition	Condition Category	Structure Problems	Pests Present	Disease Present
2/23/21	61	Rubber Fig	Ficus elastica		H1 100ft Buffer	NW	yes	yes	yes	34.03968447	-118.5835237	30	4	57.3	17.4, 5.1, 11.8, 23	30	0	15	15	15	15	30	88	Excellent	No	No	No
2/23/21	62	Fan Palm	Washingtonia sp.		H1 100ft Buffer	NW	yes	yes	yes	34.03971304	-118.5835201	55	1	24.6	24.6	5	0	5	5	5	5	10	92	Excellent	No	No	No
2/23/21	63	Myoporum	Myoporum sp.		H1 100ft Buffer	NW	yes	yes	yes	34.03941591	-118.5833217	20	1	9.5	9.5	20	0	5	10	10	5	15	84	Excellent	No	No	No
2/23/21	64	Elderberry	Sambucus nigra		H1 100ft Buffer	NW	yes	yes	yes	34.03943139	-118.5833343	20	3	24.5	8.9, 8.4, 7.2	5	0	5	5	15	10	20	60	Fair	Yes	No	No
2/23/21	65	Lemonade Berry	Rhus integrifolia		H1 100ft Buffer	NW	yes	yes	yes	34.03942173	-118.5832907	10	2	8.9	5.5, 3.4	10	50	5	20	5	5	25	84	Excellent	No	No	No
2/23/21	66	Dracaena	Dracaena sp.		H1 100ft Buffer	NW	yes	yes	yes	34.03945147	-118.5832849	10	4	13.1	3.6, 3.2, 3.3, 3	0	50	3	3	3	3	6	52	Fair	No	Yes	No
2/23/21	67	Rubber fig	Ficus elastica		H1 100ft Buffer	NW	yes	yes	yes	34.03945469	-118.5833532	20	3	28.1	13.2, 10.7, 4.2	0	0	15	10	10	5	25	76	Good	No	No	No
2/23/21	68	Dracaena	Dracaena sp.		H1 100ft Buffer	NW	yes	yes	yes	34.03947892	-118.5833582	15	1	6.3	6.3	5	0	5	5	5	5	10	72	Good	Yes	No	No
2/23/21	69	Monkey Puzzle	Araucaria sp.		H1 100ft Buffer	NW	yes	yes	yes	34.03951416	-118.5833361	35	1	11.2	11.2	10	0	5	5	5	5	10	84	Excellent	No	No	No
2/23/21	70	Dracaena	Dracaena sp.		H1 100ft Buffer	NW	yes	yes	yes	34.03953942	-118.5833685	20	8	49.9	14, 14, 7.5, 5.4, 3.3, 3.2, 1.8, 4.2	5	45	3	3	5	5	8	76	Good	No	No	No
2/23/21	71	Dracaena	Dracaena sp.		H1 100ft Buffer	NW	yes	yes	yes	34.0395877	-118.583368	15	9	20.2	2.5, 3.4, 2.6, 2.3, 2.4, 2.8, 1.4	5	40	3	3	5	3	8	72	Good	No	No	No
2/23/21	72	Myoporum	Myoporum sp.		H1 100ft Buffer	NW	yes	yes	yes	34.03960737	-118.5833691	20	4	27.8	23, 1.4, 2.1, 1.3	50	35	5	20	5	5	25	88	Excellent	No	No	No
2/23/21	73	Dracaena	Dracaena sp.		H1 100ft Buffer	NW	yes	yes	yes	34.0396354	-118.5833679	15	12	50	6.4, 2.8, 4.8, 2.2, 1.9, 2.1, 1.8, 2, 1.7, 2.4, 2.1, 1.3	5	35	3	3	3	3	6	60	Fair	No	No	No
2/23/21	74	Fan Palm	Washingtonia sp.		H1 100ft Buffer	NW	yes	yes	yes	34.03967627	-118.5833839	45	1	16	16	5	0	5	5	5	5	10	88	Excellent	No	No	No
2/23/21	75	Dracaena	Dracaena sp.		H1 100ft Buffer	NW	yes	yes	yes	34.03973743	-118.5833725	10	5	16.5	3.5, 3.4, 3.6, 3, 3	5	0	3	3	5	3	8	80	Good	No	No	No
2/23/21	76	Dracaena	Dracaena sp.		H1 100ft Buffer	NW	yes	yes	yes	34.03976567	-118.5833859	20	9	51.7	7.7, 4.8, 3.8, 4.9, 6.3, 3.3, 4.1, 3.6, 4.4	5	0	10	5	10	3	20	72	Good	No	No	No
2/23/21	77	Black Acacia	Acacia melanoxylon		H1 100ft Buffer	NW	yes	yes	yes	34.03990205	-118.5833773	15	6	20.8	4.7, 2.9, 3, 3, 3, 2.9	50	0	10	10	10	10	20	80	Good	No	Yes	No
2/23/21	78	Brazilian Pepper	Schinusterebinthifolia		H1 100ft Buffer	NW	yes	yes	yes	34.03995161	-118.5833593	15	8	22	5.8, 2.3, 3.6, 1, 2, 1.6, 1.2, 2.4	45	25	5	5	10	10	15	84	Excellent	No	No	No
2/23/21	79	Brazilian Pepper	Schinusterebinthifolia		H1 100ft Buffer	NW	yes	yes	yes	34.03993975	-118.5833353	20	11	30.5	----------	50	60	15	15	10	10	25	80	Good	No	No	No
3/1/21	80	Arroyo Willow	Salix lasiolepsis		H1	TRM				34.03944531	-118.5831765	20	5	24.7	9.2, 3.7, 3.5, 5, 4.2, 3	20	45	5	10	5	5	15	88	Excellent	No	No	No
3/1/21	81	Laurel Sumac	Malosma laurina		H1	TRM				34.03953796	-118.5831522	15	6	22	7, 1, 1.5, 5, 2.5, 5, 1.4, 5	15	30	5	10	5	5	15	60	Fair	Yes	No	No
3/1/21	82	Arroyo Willow	Salix lasiolepsis		H1	TRM				34.03952251	-118.5831756	15	4	17.5	6.5, 3.5, 1, 6.5	10	30	0	5	5	5	10	48	Fair	Yes	No	No
3/1/21	83	Dracaena	Dracaena sp.		H1 100ft Buffer	NW	yes	yes	yes	34.03959467	-118.5832536	25	14	79.7	11.5, 2, 14, 3.5, 1.4, 6.4, 4.3, 10, 4, 4, 2, 2.6, 2, 8, 10.5	25	25	5	10	5	5	15	92	Excellent	No	No	No
3/1/21	84	Arroyo Willow	Salix lasiolepsis		H1 100ft Buffer	NW	yes	yes	yes	34.03957499	-118.5832354	20	4	14.3	4.5, 2.5, 4, 3.3	5	15	3	10	5	10	20	48	Fair	No	Yes	No
3/1/21	85	Eucalyptus	Eucalyptus globulus		H1 100ft Buffer	NW	yes	yes	yes	34.03972843	-118.5832384	30	1	20	20	20	30	3	15	0	15	30	84	Excellent	No	No	No
3/1/21	86	Arroyo Willow	Salix lasiolepsis		H1 100ft Buffer	NW	yes	yes	yes	34.03976018	-118.5832236	30	2	20	12, 8	20	30	5	5	5	5	10	64	Good	No	Yes	No
3/1/21	87	California sycamore	Platanus racemosa		200-ft fuel modzone	H1	NW	yes	yes	yes	34.03994783	-118.583137	30	2	9	6, 3	15	0	5	10	5	5	15	96	Excellent	No	No	No
3/1/21	88	Arroyo Willow	Salix lasiolepsis		200-ft fuel modzone	H1	NW	yes	yes	yes	34.03990396	-118.5831132	20	5	13	5.8, 4, 1.8, 0.6, 0.8	15	0	0	0	0	0	0	84	Excellent	No	Yes	No
3/1/21	89	California sycamore	Platanus racemosa		200-ft fuel modzone	H1	NW	yes	yes	yes	34.03993059	-118.5831484	15	2	4	2, 2	0	15	0	0	0	0	0	72	Good	No	No	No
3/1/21	90	Arroyo Willow	Salix lasiolepsis		200-ft fuel modzone	H1	NW	yes	yes	yes	34.03998105	-118.5831377	15	4	10	2.5, 0.7, 3.2, 3.6	0	0	3	3	3	3	6	56	Fair	No	No	No
3/1/21	91	Eucalyptus	Eucalyptus globulus		200-ft fuel modzone	H1	NW	yes	yes	yes	34.03998369	-118.5831674	50	3	56	24, 17, 15	50	0	10	20	15	15	35	96	Excellent	No	No	No
3/1/21	92	Arroyo Willow	Salix lasiolepsis		200-ft fuel modzone	H1	NW	yes	yes	yes	34.03995604	-118.5830932	25	11	20.9	----------	0	15	0	0	0	0	0	48	Fair	No	No	No
3/1/21	93	Arroyo Willow	Salix lasiolepsis		200-ft fuel modzone	H1	NW	yes	yes	yes	34.03997119	-118.583101	45	1	12	12	15	15	20	15	20	15	40	76	Good	No	No	No
3/1/21	94	Arroyo Willow	Salix lasiolepsis		200-ft fuel modzone	H1	NW	yes	yes	yes	34.04003159	-118.5830781	20	3	11	6, 3, 2	15	0	10	20	10	10	30	80	Good	Yes	Yes	No
3/1/21	95	Arroyo Willow	Salix lasiolepsis		200-ft fuel modzone	H1	NW	yes	yes	yes	34.04005868	-118.5830941	15	1	3.5	3.5	30	0	0	5	5	5	10	76	Good	No	No	No
3/1/21	96	Arroyo Willow	Salix lasiolepsis		200-ft fuel modzone	H1	NW	yes	yes	yes	34.04008859	-118.5830479	20	1	4	4	20	0	0	5	10	5	10	72	Good	No	No	No
3/1/21	97	California sycamore	Platanus racemosa		200-ft fuel modzone	H1	NW	yes	yes	yes	34.04009992	-118.5831002	25	1	1	1	20	0	5	10	5	10	20	92	Excellent	No	No	No
3/1/21	98	Arroyo Willow	Salix lasiolepsis		200-ft fuel modzone	H1	NW	yes	yes	yes	34.04011232	-118.5831252	25	2	14.3	8.8, 5.5	20	0	5	15	5	5	20	60	Fair	No	Yes	No
3/1/21	99	Arroyo Willow	Salix lasiolepsis		200-ft fuel modzone	H1	NW	yes	yes	yes	34.04009634	-118.5830299	20	4	8.7	2.7, 1.5, 4, 0.5	15	10	3	5	3	0	6	92	Excellent	No	No	No
3/1/21	100	Arroyo Willow	Salix lasiolepsis		200-ft fuel modzone	H1	NW	yes	yes	yes	34.04007989	-118.5830274	25	4	19	6, 6, 4, 3	15	0	3	10	5	5	15	84	Excellent	No	No	No
3/1/21	101	California sycamore	Platanus racemosa		200-ft fuel modzone	H1	NW	yes	yes	yes	34.04010916	-118.583034	30	1	5.5	5.5	0	0	0	0	0	0	0	88	Excellent	No	No	No
3/1/21	102	California sycamore	Platanus racemosa		200-ft fuel modzone	H1	NW	yes	yes	yes	34.04012708	-118.5830097	25	1	8	8	15	0	10	10	10	10	20	96	Excellent	No	No	No
3/1/21	103	Arroyo Willow	Salix lasiolepsis		100-ft fuel modzone	H1	NW	yes	yes	yes	34.04013518	-118.5829956	20	4	7.2	4, 2, 0.5, 0.7	20	0	10	5	10	5	20	88	Excellent	No	No	No
3/1/21	104	Arroyo Willow	Salix lasiolepsis		100-ft fuel modzone	H1	NW	yes	yes	yes	34.04014198	-118.582994	15	8	12.7	2.8, 1, 2.7, 0.9, 2.8, 1, 0.9, 0.4	20	5	5	5	5	5	10	72	Good	Yes	Yes	No
3/1/21	105	Arroyo Willow	Salix lasiolepsis		100-ft fuel modzone	H1	NW	yes	yes	yes	34.04015396	-118.582997	20	13	27.4	4.1, 2, 1.3, 0.5, 1, 1, 1.2, 2.1, 2, 1.2, 4.3, 1.1, 1.5	10	0	5	5	5	5	10	76	Good	No	No	No
3/1/21	106	Arroyo Willow	Salix lasiolepsis		200-ft fuel modzone	H1	NW	yes	yes	yes	34.04015924	-118.5830138	15	3	4.5	2, 1.2, 1.3	15	0	5	5	5	5	10	88	Excellent	No	No	No
3/1/21	107	Arroyo Willow	Salix lasiolepsis		200-ft fuel modzone	H1	NW	yes	yes	yes	34.0401715	-118.5830194	20	7	23	3.7, 3.4, 4.4, 3.8, 3.9, 2.2	10	0	10	10	5	5	15	72	Good	No	No	No
3/1/21	108	Arroyo Willow	Salix lasiolepsis		200-ft fuel modzone	H1	NW	yes	yes	yes	34.04023361	-118.5830952	25	2	11.2	7.2, 4	10	0	5	5	10	5	15	80	Good	No	No	No
3/1/21	109	Arroyo Willow	Salix lasiolepsis		200-ft fuel modzone	H1	NW	yes	yes	yes	34.04026141	-118.5830925	25	2	7.4	6, 1.4	5	0	3	3	3	3	6	64	Good	No	No	No
3/1/21	110	Arroyo Willow	Salix lasiolepsis		100-ft fuel modzone	H1	NW	yes	yes	yes	34.04019867	-118.5829637	15	7	18.7	3.1, 4.4, 2.6, 2.2, 3.3, 3.4	15	0	10	10	10	0	20	88	Excellent	No	No	No
3/1/21	111	Arroyo Willow	Salix lasiolepsis		200-ft fuel modzone	H1	NW	yes	yes	yes	34.04022204	-118.582981	15	5	13.7	3.3, 3, 2.1, 3, 2.3	20	0	3	5	3	3	8	80	Good	No	No	No
3/1/21	112	Arroyo Willow	Salix lasiolepsis		200-ft fuel modzone	H1	NW	yes	yes	yes	34.04020182	-118.582985	15	12	26.5	----------	15	0	10	5	10	5	20	76	Good	No	No	No
3/3/21	113	Arroyo Willow	Salix lasiolepsis		100-ft fuel modzone	H1	NW	yes	yes	yes	34.0402607	-118.582907	15	9	12.2	2.6, 1, 1.4, 1, 0.8, 0.6, 1, 1.1, 1.6	20	5	5	5	3	3	8	72	Good	No	No	No
3/3/21	114	Arroyo Willow	Salix lasiolepsis		100-ft fuel modzone	H1	NW	yes	yes	yes	34.0402241	-118.5828989	20	2	8.5	4.5, 4	20	10	3	10	5	3	13	68	Good	No	No	No
3/3/21	115	Arroyo Willow	Salix lasiolepsis		100-ft fuel modzone	H1	NW	yes	yes	yes	34.0402472	-118.5829025	20	4	11.5	3, 1.5, 3.5, 3.5	20	10	3	5	3	3	8	72	Good	No	No	No
3/3/21	116	Arroyo Willow	Salix lasiolepsis		200-ft fuel modzone	H1	NW	yes	yes	yes	34.04025085	-118.5829722	15	17	41.1	3, 2, 1.5, 1.5, 1, 1.2, 2, 4.2, 2, 1.5, 1, 1, 1.2, 2, 4.2, 2, 1.5, 1, 1, 1, 2, 2	15	0	5	5	5	5	10	76	Good	Yes	Yes	No
3/3/21	117	Arroyo Willow	Salix lasiolepsis		200-ft fuel modzone	H1	NW	yes	yes	yes	34.04029913	-118.5829419	15	3	15	5, 4, 6	20	5	4	3	3	3	7	80	Good	No	No	No
3/3/21	118	Arroyo Willow	Salix lasiolepsis		100-ft fuel modzone	H1	NW	yes	yes	yes	34.04029644	-118.582892	20	5	12.6	3, 2.8, 2, 2.3, 2.5	15	0	5	10	5	3	13	76	Good	Yes	Yes	No
3/3/21	119	Arroyo Willow	Salix lasiolepsis		200-ft fuel modzone	H1	NW	yes	yes	yes	34.04035161	-118.5828896	20	5	26.5	6.5, 6, 5, 5.5, 3.5	15	0	5	5	5	5	10	72	Good	Yes	No	No
3/3/21	120	Arroyo Willow	Salix lasiolepsis		100-ft fuel modzone	H1	NW	yes	yes	yes	34.04035292	-118.5828337	15	3	11.2	4, 3.7, 3.5	15	10	5	5	5	5	10	76	Good	No	No	No

Date Collected	Tree Number	Common Name	Scientific Name	Within a Fuel Modification Zone?	SMMCLP Zone	Area	Within Alternative 2	Within Alternative 3	Within Alternative 4	Latitude	Longitude	Height (ft)	Number of Trunks	DBH Sum	DBH	Canopy Percent Shade	Slope Grade	Dripline North ft	Dripline East ft	Dripline South ft	Dripline West ft	Canopy Spread ft	Total Condition	Condition Category	Structure Problems	Pests Present	Disease Present
3/3/21	121	Arroyo Willow	Salix lasiolepsis	200-ft fuel mod zone	H1	NW	yes	yes	yes	34.04041601	-118.582933	30	5	24.6	5, 3.6, 5, 6.4, 4.6	5	0	0	0	0	0	0	60	Fair	Yes	Yes	No
3/3/21	122	Eucalyptus	Eucalyptus globulus	200-ft fuel mod zone	H1	NW	yes	yes	yes	34.0404634	-118.5828317	35	4	12.4	0.5, 0.4, 5, 6.5	10	0	5	5	5	5	10	84	Excellent	No	No	No
3/3/21	123	Arroyo Willow	Salix lasiolepsis	200-ft fuel mod zone	H1	NW	yes	yes	yes	34.04056396	-118.5827716	15	1	4.5	4.5	20	90	10	15	10	5	20	56	Fair	No	No	No
3/3/21	124	Arroyo Willow	Salix lasiolepsis	200-ft fuel mod zone	H1	NW	yes	yes	yes	34.04058584	-118.5827718	15	11	11.3	1.8, 1.6, 1.2, 0.3, 0.4, 1.9, 1.2, 0.7, 0.4, 0.3, 1.5	10	0	5	10	5	5	15	68	Good	No	No	No
3/3/21	125	California sycamore	Platanus racemosa	200-ft fuel mod zone	H1	NW	yes	yes	yes	34.04050407	-118.5828028	15	4	11.5	5, 3.5, 1, 2	15	0	0	5	10	0	10	72	Good	No	No	No
3/3/21	126	Eucalyptus	Eucalyptus globulus	200-ft fuel mod zone	H1	NW	yes	yes	yes	34.04048549	-118.5827959	30	1	4	4	10	0	3	5	5	5	10	84	Excellent	No	No	No
3/3/21	127	Arroyo Willow	Salix lasiolepsis	200-ft fuel mod zone	H1	NW	yes	yes	yes	34.04051908	-118.5828549	15	5	8.2	2.3, 1.8, 1.7, 1.4, 1	5	0	3	3	3	3	6	72	Good	No	No	No
3/3/21	128	Arroyo Willow	Salix lasiolepsis	200-ft fuel mod zone	H1	NW	yes	yes	yes	34.04050062	-118.5828843	15	5	10.3	3, 1.6, 1.8, 1.4, 2.5	5	0	5	5	5	0	10	76	Good	No	No	No
3/3/21	129	Cottonwood	Populus fremontii	200-ft fuel mod zone	H1	NW	yes	yes	yes	34.04053018	-118.5827341	15	5	8	2.3, 0.5, 1.6, 1.8, 1.8	5	0	3	3	3	3	6	60	Fair	No	No	No
3/3/21	130	Arroyo Willow	Salix lasiolepsis	200-ft fuel mod zone	H1	NW	yes	yes	yes	34.04051403	-118.5827339	20	19	33.2	1.8, 1.6, 0.7, 1.3, 1.8, 1.5, 1.7, 1.5, 1.6, 1.2, 1.3, 1.1, 1.1, 0.6, 0.4, 0.7, 1.3, 0.7, 0.4, 0.7	15	0	5	5	5	5	10	68	Good	No	Yes	No
3/3/21	131	Arroyo Willow	Salix lasiolepsis	200-ft fuel mod zone	H1	NW	yes	yes	yes	34.04055032	-118.5827979	15	6	11	6, 0.5, 1, 0.5, 1.1, 1.5	5	0	3	3	3	3	6	64	Good	No	Yes	No
3/3/21	132	California sycamore	Platanus racemosa	200-ft fuel mod zone	H1	NW	yes	yes	yes	34.04061403	-118.5827755	20	5	11.2	4, 1.8, 1.7, 1.7, 2	20	0	5	0	5	5	10	76	Good	No	No	No
3/3/21	133	Arroyo Willow	Salix lasiolepsis	200-ft fuel mod zone	H1	NW	yes	yes	yes	34.04061659	-118.5827358	15	10	14.4	2.5, 1.5, 1.2, 0.9, 1.5, 1.3, 0.5, 1, 0.9, 1.1	15	0	3	3	3	3	6	60	Fair	No	No	No
3/3/21	134	Arroyo Willow	Salix lasiolepsis	200-ft fuel mod zone	H1	NW	yes	yes	yes	34.04064543	-118.5827753	30	5	15.8	9, 2.1, 2.4, 1.8, 0.5	15	5	5	10	5	0	10	80	Good	No	No	No
3/3/21	135	Arroyo Willow	Salix lasiolepsis		H1	NW				34.04078973	-118.5826773	25	5	14.6	4.5, 4, 2.5, 2.4, 1.2	5	5	5	5	5	5	10	80	Good	No	No	No
3/3/21	136	California sycamore	Platanus racemosa		H1	NW				34.0408249	-118.5826846	30	1	10	10	15	5	10	10	10	10	20	88	Excellent	No	No	No
3/3/21	137	White Alder	Alnus rhombifolia		H1	NW				34.04082921	-118.5826377	25	2	7.6	6, 1.6	5	5	5	5	5	5	10	72	Good	No	No	No
3/3/21	138	Arroyo Willow	Salix lasiolepsis		H1	NW				34.04084302	-118.5826658	15	5	11.7	4.8, 2.3, 2, 1, 1.6	5	5	5	5	5	5	10	68	Good	No	No	No
3/3/21	139	Arroyo Willow	Salix lasiolepsis		H1	NW				34.0408579	-118.5826406	15	8	19.5	3, 2.2, 1, 1.8, 3, 2, 2.1, 3.8, 0	5	5	10	10	0	0	10	80	Good	No	No	No
3/3/21	140	Arroyo Willow	Salix lasiolepsis		H1	NW				34.04087181	-118.5826199	25	10	30.4	6, 4.5, 1.6, 4, 2, 1, 4, 1.8, 1, 1.5, 3.3	10	0	5	5	5	5	10	76	Good	No	No	No
3/3/21	141	Arroyo Willow	Salix lasiolepsis		H1	NW				34.04088294	-118.5825874	20	2	6.1	4.5, 1.6	10	0	5	5	3	10	15	84	Excellent	No	No	No
3/3/21	142	Arroyo Willow	Salix lasiolepsis		H1	NW				34.04089862	-118.5825931	20	3	8.3	3, 2.8, 2.5	0	5	0	0	0	3	3	56	Fair	No	No	No
3/3/21	143	Arroyo Willow	Salix lasiolepsis		H1	NW				34.04090085	-118.5825632	0	5	14.2	6, 3.3, 0.5, 1, 3.4	0	0	0	0	0	0	0	56	Fair	No	No	No
3/3/21	144	Arroyo Willow	Salix lasiolepsis		H1	NW				34.04090912	-118.5825313	20	9	17.2	2.5, 1.6, 1.6, 0.5, 1, 1.6, 1.3, 3.3	15	0	15	5	5	10	20	96	Excellent	No	No	No
3/3/21	145	Arroyo Willow	Salix lasiolepsis		H1	NW				34.04088375	-118.582536	25	6	8.1	0.5, 0.4, 2, 0.5, 1, 2, 3.5	20	5	5	5	10	10	15	88	Excellent	No	No	No
3/3/21	146	Arroyo Willow	Salix lasiolepsis		H1	NW				34.04092458	-118.5825477	25	5	8.3	2.6, 1, 1.8, 1.4, 1.5	20	5	5	5	5	5	10	92	Excellent	No	No	No
3/3/21	147	Arroyo Willow	Salix lasiolepsis		H1	NW				34.04094199	-118.5825455	20	1	4	4	0	5	0	0	0	0	0	64	Good	No	No	No
3/3/21	148	California sycamore	Platanus racemosa		H1	NW				34.04090769	-118.5825022	35	2	9	8.6, 0.4	30	5	5	15	15	15	30	96	Excellent	No	No	No
3/3/21	149	Arroyo Willow	Salix lasiolepsis		H1	NW				34.04092084	-118.5824962	10	1	6.4	6.4	0	5	0	3	0	3	6	72	Good	No	No	No
3/3/21	150	California sycamore	Platanus racemosa		H1	NW				34.04094088	-118.5824796	40	1	14.7	14.7	20	5	10	10	15	15	25	100	Excellent	No	No	No
3/3/21	151	Arroyo Willow	Salix lasiolepsis		H1	NW				34.04096948	-118.5824684	20	1	8.3	8.3	15	10	15	0	0	15	15	96	Excellent	No	No	No
3/3/21	152	California sycamore	Platanus racemosa		H1	NW				34.04097834	-118.5824444	20	5	30.6	7, 5.5, 6.5, 5.6, 6	10	5	0	5	10	15	20	92	Excellent	No	No	No
3/3/21	153	Arroyo Willow	Salix lasiolepsis		H1	NW				34.04100014	-118.5824191	30	10	62.8	7.5, 6.7, 7, 5.5, 6.1, 7, 6.3	15	0	15	15	15	15	30	88	Excellent	No	No	No
3/3/21	154	Arroyo Willow	Salix lasiolepsis		H1	NW				34.04095924	-118.5823737	28	1	9.5	9.5	15	5	0	30	20	0	30	88	Excellent	No	No	No
3/3/21	155	California sycamore	Platanus racemosa		H1	NW				34.04097798	-118.582409	40	1	11.6	11.6	5	5	15	15	15	15	30	92	Excellent	No	No	No
3/3/21	156	Arroyo Willow	Salix lasiolepsis		H1	NW				34.04098544	-118.5823826	25	2	8	5, 3	5	0	10	15	5	5	20	80	Good	No	No	No
3/3/21	157	Arroyo Willow	Salix lasiolepsis		H1	NW				34.04100027	-118.5823815	20	1	10	10	5	0	10	10	0	0	10	72	Good	No	No	No
3/3/21	158	Arroyo Willow	Salix lasiolepsis		H1	NW				34.04098584	-118.5823519	15	1	4.3	4.3	0	5	0	0	0	0	0	76	Good	No	No	No
3/11/21	159	Arroyo Willow	Salix lasiolepsis		H1	NW				34.04093102	-118.5824286	30	5	14.3	5.5, 2.5, 1.5, 3, 1.8	30	15	3	5	10	0	13	84	Excellent	No	No	No
3/11/21	160	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04100206	-118.5822224	25	3	17.5	8, 5, 4.5	20	0	5	5	5	5	10	84	Excellent	No		No
3/11/21	161	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04102833	-118.5822933	1	2	16.7	9.4, 7.3	20	5	5	5	5	5	10	84	Excellent	No	No	No
3/11/21	162	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04105546	-118.5822448	30	5	16.1	4.3, 4, 3.2, 1, 3.6	25	0	5	5	10	5	15	92	Excellent	No	No	No
3/11/21	163	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04105698	-118.5821911	25	5	25.9	7.5, 5.3, 7.7, 2, 3.4	20	0	10	5	10	10	20	80	Good	Yes	No	No
3/11/21	164	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04105607	-118.5821366	25	2	8.5	4.5, 4	10	0	5	5	5	0	10	84	Excellent	Yes	No	No
3/11/21	165	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04099457	-118.58217	30	1	9	9	30	0	5	5	5	5	10	76	Good	No	No	No
3/11/21	166	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04102552	-118.5822154	20	1	6	6	0	0	0	0	0	0	0	80	Good	No	No	No
3/11/21	167	California sycamore	Platanus racemosa		H1	NE				34.04103043	-118.5821684	30	1	13.4	13.4	0	0	10	10	10	10	20	100	Excellent	No	No	No
3/11/21	168	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04103414	-118.5822537	20	3	13.8	4.5, 3.8, 5.5	0	0	0	0	0	0	0	52	Fair	Yes	No	No
3/11/21	170	California sycamore	Platanus racemosa		H1	NE				34.04107777	-118.5822373	40	1	10	10	30	15	10	10	10	15	25	100	Excellent	No	No	No
3/15/21	171	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04107396	-118.5821979	20	7	44.5	9, 5, 9, 5, 6, 5.5, 5	30	0	5	10	10	5	15	84	Excellent	No	No	No
3/15/21	172	California sycamore	Platanus racemosa		H1	NE				34.04109143	-118.5821626	25	1	6.8	6.8	15	5	5	5	5	5	10	76	Good	No	No	No
3/15/21	173	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04110877	-118.5820586	20	2	11.2	6.8, 4.4	15	0	5	5	10	3	15	76	Good	No	No	No
3/15/21	174	Fan Palm	Washingtonia sp.		H1	NE				34.04108713	-118.5820693	40	4	23.4	20, 1, 0.8, 1.6	5	0	5	5	5	5	10	96	Excellent	Yes	No	No
3/15/21	175	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04105697	-118.582066	15	5	8.5	1.8, 1.8, 1, 1.6, 2.3	20	10	5	5	5	5	10	88	Excellent	No	No	No
3/15/21	176	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04100832	-118.5820869	10	3	10.6	6.2, 1, 3.4	0	10	0	0	3	0	3	72	Good	No	No	No
3/15/21	177	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04100565	-118.5820325	25	5	15.6	4, 1.8, 2.8, 3, 4	15	0	10	5	5	5	15	84	Excellent	Yes	No	No
3/15/21	178	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04104603	-118.5820249	25	4	22	6, 3, 6, 7	15	5	5	5	3	5	10	96	Excellent	No	No	No
3/15/21	179	California sycamore	Platanus racemosa		H1	NE				34.04100453	-118.581928	35	1	13.4	13.4	40	5	10	10	10	15	25	100	Excellent	No	No	No
3/15/21	180	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04096642	-118.5819629	25	4	9	3.2, 1.8, 1.4, 2.6	5	5	3	3	3	3	6	84	Excellent	Yes	No	No

Date Collected	Tree Number	Common Name	Scientific Name	Within a Fuel Modification Zone?	SMMCLP Zone	Area	Within Alternative 2	Within Alternative 3	Within Alternative 4	Latitude	Longitude	Height (ft)	Number of Trunks	DBH Sum	DBH	Canopy Percent Shade	Slope Grade	Dripline North ft	Dripline East ft	Dripline South ft	Dripline West ft	Canopy Spread ft	Total Condition	Condition Category	Structure Problems	Pests Present	Disease Present
3/15/21	181	White Alder	Alnus rhombifolia		H1	NE				34.04099564	-118.5818937	40	6	48.6	10.5, 8.5, 8.5, 6, 8.7, 6.6	20	5	15	15	10	10	25	100	Excellent	No	No	No
3/15/21	182	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04103166	-118.5818621	25	2	16.2	10.7, 5.5	5	5	5	5	5	5	10	68	Good	Yes	No	No
3/15/21	183	California sycamore	Platanus racemosa		H1	NE				34.04107896	-118.5818797	45	1	5.2	5.2	5	15	5	10	10	15	25	76	Good	No	No	No
3/15/21	184	California sycamore	Platanus racemosa		H1	NE				34.04105135	-118.5818508	45	2	15	8, 7	10	15	5	10	15	5	20	100	Excellent	No	No	No
3/15/21	185	California sycamore	Platanus racemosa		H1	NE				34.04108036	-118.5818131	48	1	7.9	7.9	20	0	5	10	15	10	20	100	Excellent	No	No	No
3/15/21	186	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04110137	-118.5818433	45	1	5.4	5.4	60	5	20	15	15	5	35	100	Excellent	No	No	No
3/15/21	187	Cottonwood	Populus fremontii		H1	NE				34.04105237	-118.5818002	50	1	17.2	17.2	40	0	15	15	15	15	30	92	Excellent	No	No	No
3/15/21	188	California sycamore	Platanus racemosa		H1	NE				34.04111364	-118.5818036	30	1	7.2	7.2	25	0	5	10	10	10	20	100	Excellent	No	No	No
3/15/21	189	California sycamore	Platanus racemosa		H1	NE				34.04109324	-118.5817805	25	1	4.7	4.7	5	0	5	5	5	10	15	100	Excellent	No	No	No
3/15/21	190	California sycamore	Platanus racemosa		H1	NE				34.04107611	-118.581747	35	1	7.4	7.4	5	0	15	15	5	5	20	100	Excellent	No	No	No
3/15/21	191	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04114406	-118.5817939	20	1	6.5	6.5	3	0	3	3	3	3	6	56	Fair	No	No	No
3/15/21	192	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04111217	-118.5817421	20	4	9.2	3, 2.7, 3, 0.5	2	0	3	0	0	0	3	100	Excellent	No	No	No
3/15/21	193	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04103582	-118.5817421	25	7	13.9	3.5, 3.2, 0.5, 0.3, 1, 1.6, 2	15	0	3	3	5	5	8	84	Excellent	No	No	No
3/15/21	194	California sycamore	Platanus racemosa		H1	NE				34.04105254	-118.5816667	35	1	10.2	10.2	5	10	10	10	15	15	25	100	Excellent	No	No	No
3/15/21	195	Red Willow	Salix laevigata		H1	NE				34.04105144	-118.5816264	35	7	33.5	8.5, 6.2, 7.3, 1.2, 2.3, 3.2, 9.6	30	0	20	15	15	10	35	96	Excellent	No	No	No
3/15/21	196	White Alder	Alnus rhombifolia		H1	NE				34.04103622	-118.5815737	25	1	6.1	6.1	20	5	15	15	15	15	30	92	Excellent	No	No	No
3/15/21	197	California sycamore	Platanus racemosa		H1	NE		yes	yes	34.04100816	-118.5815868	25	1	4.2	4.2	5	0	10	10	10	10	20	96	Excellent	No	No	No
3/15/21	198	White Alder	Alnus rhombifolia		H1	NE				34.04107784	-118.5815583	45	6	55.1	13.8, 11.5, 5.8, 5.12.8, 3	20	15	15	15	15	15	30	84	Excellent	No	No	No
3/15/21	199	California sycamore	Platanus racemosa		H1	NE				34.04106326	-118.5815129	40	1	6.2	6.2	15	0	5	10	15	10	20	88	Excellent	Yes	No	No
3/15/21	200	California sycamore	Platanus racemosa		H1	NE				34.04106144	-118.5814536	30	1	10.1	10.1	20	5	10	10	5	5	15	88	Excellent	No	No	No
3/16/21	201	Red Willow	Salix laevigata		H1	NE				34.04111671	-118.5814601	35	6	29.6	7.4, 5, 6, 8.8, 3, 6.4, 5	25	5	20	10	10	10	30	88	Excellent	Yes	No	No
3/16/21	202	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04113514	-118.5814775	28	4	26	11, 8, 4, 3	10	10	3	0	3	3	6	56	Fair	Yes	No	No
3/16/21	203	Arroyo Willow	Salix lasiolepsis		H1	NE				34.0411477	-118.5814277	15	5	17.8	10.6, 3, 1, 1, 2.2	10	0	3	3	5	3	8	80	Good	No	No	No
3/16/21	204	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04115362	-118.5821001	25	11	39	6, 5, 4.5, 10, 5, 5.2, 4.5, 3.5, 4.6, 4	10	0	5	5	5	5	10	80	Good	Yes	No	No
3/16/21	205	Red Willow	Salix laevigata		H1	NE				34.04118435	-118.5820492	30	7	46.7	10, 8.6, 6.8, 4.2, 7.8, 4, 3.3	30	0	10	10	15	5	25	80	Good	Yes	No	No
3/16/21	206	Elderberry	Sambucus nigra		H1	NE				34.04128157	-118.5819146	15	13	22.9	3.8, 3, 4, 0.8, 1, 1.5, 2, 1.5, 0.7, 1.8, 0.3, 1.6, 0.5, 0.4, 1, 0.5, 0.4	5	0	5	10	10	10	20	92	Excellent	No	No	No
3/16/21	207	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04118501	-118.5819032	25	9	46.8	9, 7, 7.8, 4.2, 3.5, 3, 3, 4.8, 0.5	15	5	5	5	10	20	25	76	Good	Yes	No	No
3/16/21	208	Red Willow	Salix laevigata		H1	NE				34.04125276	-118.5818599	20	3	10.6	4.6, 4, 2	0	5	0	0	0	0	0	40	Poor	Yes	No	No
3/16/21	209	Red Willow	Salix laevigata		H1	NE				34.04128071	-118.5818563	20	8	37.6	10.6, 5.2, 5.1, 3.9, 3.6, 1.8, 5.5, 4.4	25	0	10	5	5	10	15	68	Good	Yes	No	No
3/16/21	210	Red Willow	Salix laevigata		H1	NE				34.0412133	-118.5818347	20	5	15.8	5.2, 2.1, 3, 3.5, 2	20	0	10	3	3	3	13	88	Excellent	No	No	No
3/16/21	211	Red Willow	Salix laevigata		H1	NE				34.04121155	-118.5817766	20	16	56.1	----------	0	0	5	15	15	5	20	36	Poor	No		
3/16/21	212	Eucalyptus	Eucalyptus globulus		H1	NE				34.04127429	-118.5817119	55	1	35.5	35.5	30	0	20	20	10	15	35	100	Excellent	No	No	No
3/16/21	213	Red Willow	Salix laevigata		H1	NE				34.04128492	-118.5817527	20	5	15.6	6, 2.6, 3, 1.5, 2.5	3	0	3	5	5	5	10	92	Excellent	No	Yes	No
3/16/21	214	Elderberry	Sambucus nigra		H1	NE				34.04131309	-118.5816886	15	16	17.6	1.2, 0.5, 1, 2, 1.5, 1, 1.5, 1.5, 2, 0.5, 1, 0.8, 0.5, 0.6, 0.6, 0.4, 0.4, 0.4	5	0	10	10	10	15	25	100	Excellent	No	No	No
3/16/21	215	California sycamore	Platanus racemosa		H1 100ft Buffer	NE				34.0140008	-118.58177	30	1	10.8	10.8	30	0	15	5	20	20	35	100	Excellent	No	No	No
3/16/21	216	California sycamore	Platanus racemosa		H1	NE				34.04139447	-118.5818183	40	2	14.3	11.8, 2.5	35	0	20	20	15	5	35	100	Excellent	No	No	No
3/16/21	217	Eucalyptus	Eucalyptus globulus		H1	NE				34.04133266	-118.5816474	60	1	62.4	62.4	40	0	25	25	25	25	50	100	Excellent	No	No	No
3/16/21	218	Eucalyptus	Eucalyptus globulus		H1 100ft Buffer	NE				34.04160265	-118.581389	40	5	46.8	40, 1.8, 1, 0.3, 1.7, 1.5	65	0	25	25	25	25	50	100	Excellent	No	No	No
3/16/21	219	Elderberry	Sambucus nigra		H1	NE				34.04119987	-118.5816411	12	15	75.6	----------	25	0	10	5	5	5	15	100	Excellent	No	No	No
3/16/21	220	Red Willow	Salix laevigata		H1	NE				34.04124216	-118.5814187	20	19	106.9	6, 6, 7, 4.6, 6, 4.2, 4.6, 4.5, 4.3, 4.9, 5, 5.8, 4.2, 4.5, 4.3, 4.9, 5, 5.7, 5.5, 4.3, 4.7	5	0	15	20	20	20	40	68	Good	Yes	Yes	No
3/16/21	221	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04131993	-118.5812678	20	6	18.9	4.2, 3.3, 3.1, 2.3, 3.8, 1.7	15	0	5	5	5	5	10	76	Good	No	No	No
3/16/21	222	Elderberry	Sambucus nigra		H1	NE				34.04133152	-118.5813138	12	12	18.9	1.6, 1.6, 1, 1.5, 1.2, 1.1, 1, 1.1, 1, 1	20	0	5	5	5	5	10	100	Excellent	No	No	No
3/16/21	223	California sycamore	Platanus racemosa		H1	NE				34.04132887	-118.5812579	35	2	25	19, 6	30	0	15	20	15	20	40	88	Excellent	No	No	No
3/16/21	224	Elderberry	Sambucus nigra		H1	NE				34.04137091	-118.5811904	20	1	15	15	20	0	5	10	15	10	20	84	Excellent	Yes	No	No
3/16/21	225	Elderberry	Sambucus nigra		H1	NE				34.041378	-118.5811331	25	4	38.5	2.5, 2, 18, 16	35	0	15	15	10	15	30	84	Excellent	Yes	Yes	No
3/16/21	226	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04138126	-118.5810644	25	8	38.5	13.5, 4, 3, 2, 6, 2.5, 3.5, 2	35	0	15	15	10	15	30	76	Good	No	No	No
3/16/21	227	California sycamore	Platanus racemosa		H1	NE				34.04147877	-118.5808798	55	5	74.5	34, 24, 10, 5.2, 4, 3.6	50	0	25	25	30	25	55	100	Excellent	No	No	No
3/16/21	228	Elderberry	Sambucus nigra		H1	NE				34.04145207	-118.5808123	15	7	31.1	7, 1, 6, 4, 4, 4, 5, 5, 5	25	0	5	10	10	5	15	92	Excellent	No	No	No
3/16/21	229	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04133275	-118.5817705	20	5	14	4.2, 4, 3.8, 1, 1	15	0	10	10	10	10	20	72	Good	Yes	Yes	No
3/16/21	230	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04128173	-118.5811287	20	5	36.1	24, 2, 3.3, 3.7, 3.1	5	0	10	5	5	5	15	76	Good	No	No	No
3/16/21	231	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04125425	-118.5809632	15	5	12	3.4, 2.5, 2.2, 1.1, 2.4	20	0	10	5	3	3	13	88	Excellent	No	No	No
3/22/21	232	Red Willow	Salix laevigata		H1	NE				34.04133787	-118.5809569	20	1	12	12	25	0	5	15	15	5	20	80	Good	Yes	Yes	No
3/22/21	233	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04134256	-118.5807957	30	5	31.5	15, 7, 2, 3.5, 4	25	0	5	15	20	10	25	80	Good	Yes	No	No
3/22/21	234	Arroyo Willow	Salix lasiolepsis		H1	NE				34.0411002	-118.5808857	30	3	20.3	12.8, 2.5, 5	10	5	10	10	15	10	25	88	Excellent	No	No	No
3/22/21	235	Red Willow	Salix laevigata		H1	NE				34.04107357	-118.5809452	20	2	7	4, 3	5	5	10	10	5	10	20	88	Excellent	No	No	No
3/22/21	236	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04112833	-118.5809368	30	3	23.8	10.3, 6.5, 7	20	5	10	10	10	10	20	84	Excellent	Yes	No	No
3/22/21	237	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04113733	-118.5809644	25	5	24.8	7, 4.5, 2.3, 6, 5	25	5	10	5	5	10	15	84	Excellent	No	No	No
3/22/21	238	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04112129	-118.5809863	30	3	14.4	8.3, 1.3, 4.8	15	0	10	15	5	5	20	84	Excellent	No	No	No
3/22/21	239	Red Willow	Salix laevigata		H1	NE				34.04116064	-118.5810661	40	3	41.5	16.5, 13.5, 11.5	30	0	25	20	15	20	40	84	Excellent	Yes	No	No

Date Collected	Tree Number	Common Name	Scientific Name	Within a Fuel Modification Zone?	SMMCLP Zone	Area	Within Alternative 2	Within Alternative 3	Within Alternative 4	Latitude	Longitude	Height (ft)	Number of Trunks	DBH Sum	DBH	Canopy Percent Shade	Slope Grade	Dripline North ft	Dripline East ft	Dripline South ft	Dripline West ft	Canopy Spread ft	Total Condition	Condition Category	Structure Problems	Pests Present	Disease Present
3/22/21	240	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04114526	-118.5811269	20	1	5.5	5.5	5	0	5	5	5	5	10	60	Fair	Yes	No	No
3/22/21	241	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04112829	-118.5811847	30	3	15.8	6.3, 5, 4.5	15	5	5	5	10	5	15	96	Excellent	No	No	No
3/22/21	242	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04112989	-118.5812433	30	2	9.3	6, 3.3	15	5	5	5	10	5	15	92	Excellent	No	No	No
3/22/21	243	California sycamore	Platanus racemosa		H1	NE				34.04105344	-118.5810077	25	2	6	4, 2	15	0	8	5	10	10	18	96	Excellent	No	No	No
3/22/21	244	California sycamore	Platanus racemosa		H1	NE				34.04105106	-118.5810065	30	1	4	4	15	0	5	5	5	5	10	100	Excellent	No	No	No
3/22/21	245	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04100522	-118.5810736	25	2	25.3	12.8, 12.5	15	5	10	3	5	10	15	88	Excellent	Yes	No	No
3/22/21	246	Fan Palm	Washingtonia sp.		H1 100ft Buffer	NE				34.04095251	-118.5810698	50	1	20	20	5	0	5	5	5	5	10	100	Excellent	No	No	No
3/22/21	247	Fan Palm	Washingtonia sp.		H1 100ft Buffer	NE				34.04091919	-118.5810636	50	1	17	17	5	0	5	5	5	5	10	100	Excellent	No	No	No
3/22/21	248	Fan Palm	Washingtonia sp.		H1 100ft Buffer	NE				34.04088885	-118.5810463	50	1	19.4	19.4	5	0	5	5	5	5	10	100	Excellent	No	No	No
3/22/21	249	Pittosporum	Pittosporum sp.		H1 100ft Buffer	NE				34.04093106	-118.581108	25	4	17	13, 1.5, 1.5, 1	15	15	15	15	15	15	30	96	Excellent	No	No	No
3/22/21	250	Fan Palm	Washingtonia sp.		H1 100ft Buffer	NE				34.04093668	-118.5811654	50	1	16	16	5	15	5	5	5	5	10	100	Excellent	No	Yes	No
3/22/21	251	Fan Palm	Washingtonia sp.		H1 100ft Buffer	NE				34.04090316	-118.5811325	50	1	16.5	16.5	5	15	5	5	5	5	10	100	Excellent	No	Yes	No
3/22/21	252	Arroyo Willow	Salix lasiolepsis		H1 100ft Buffer	NE	yes		yes	34.04099372	-118.5811399	15	1	11.5	11.5	0	10	5	0	5	0	10	72	Good	Yes	No	No
3/22/21	253	Red Willow	Salix laevigata		H1 100ft Buffer	NE	yes	yes	yes	34.04095504	-118.5812441	30	7	59.4	11.5, 11, 10.8, 11, 9.6, 6.5, 7	25	0	10	10	10	10	20	100	Excellent	No	No	No
3/22/21	254	Red Willow	Salix laevigata		H1 100ft Buffer	NE	yes	yes	yes	34.04093004	-118.5812526	15	2	8.5	4.5, 4	5	0	3	3	3	3	6	56	Fair	Yes	Yes	No
3/22/21	255	Arroyo Willow	Salix lasiolepsis		H1 100ft Buffer	NE	yes	yes	yes	34.04097562	-118.5813016	30	2	17	10.5, 6.5	10	5	10	0	10	20	20	80	Good	No	No	No
3/22/21	256	Red Willow	Salix laevigata		H1 100ft Buffer	NE	yes	yes	yes	34.04092533	-118.5814053	35	6	64.5	12.6, 12.5, 14, 12, 8, 5.4	30	0	20	15	20	20	40	96	Excellent	No	No	No
3/22/21	257	Arroyo Willow	Salix lasiolepsis		H1 100ft Buffer	NE	yes	yes	yes	34.04095723	-118.581415	25	7	33.8	6.6, 6.4, 7, 3.8, 2, 4.8, 3.2	25	0	0	3	15	15	18	80	Good	No	Yes	No
3/22/21	258	California sycamore	Platanus racemosa		H1	NE				34.04105123	-118.5813892	25	1	6.8	6.8	10	0	10	5	10	10	20	100	Excellent	No	No	No
3/22/21	259	Red Willow	Salix laevigata		H1	NE				34.04101519	-118.5814919	10	3	9.9	3.5, 2.4, 4	10	15	0	5	5	5	10	72	Good	Yes	No	No
3/22/21	260	Arroyo Willow	Salix lasiolepsis		H1 100ft Buffer	NE	yes	yes	yes	34.04097897	-118.5814928	25	1	10.6	10.6	20	10	20	0	5	5	25	100	Excellent	No	Yes	No
3/22/21	261	Arroyo Willow	Salix lasiolepsis		H1 100ft Buffer	NE	yes	yes	yes	34.04098073	-118.5814454	25	1	12.5	12.5	25	5	10	10	10	10	20	100	Excellent	No	No	No
3/22/21	262	Arroyo Willow	Salix lasiolepsis		H1	NE	yes	yes	yes	34.04100567	-118.5814324	25	1	7.9	7.9	20	5	3	20	20	5	25	88	Excellent	Yes	No	No
3/22/21	263	Arroyo Willow	Salix lasiolepsis		H1 100ft Buffer	NE	yes	yes	yes	34.04094964	-118.5815269	25	3	32	16, 12, 4	20	5	10	10	15	5	25	72	Good	Yes	No	No
3/22/21	264	Eucalyptus	Eucalyptus globulus		H1 100ft Buffer	NE	yes	yes	yes	34.04093018	-118.5815124	35	1	23	23	20	15	20	30	20	30	60	96	Excellent	Yes	No	No
3/22/21	265	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04104055	-118.5814972	25	1	6.7	6.7	0	15	0	0	0	0	0	52	Fair	Yes	No	No
3/22/21	266	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04100452	-118.5817844	35	2	31	17, 14	5	15	15	15	15	15	30	56	Fair	Yes	No	No
3/22/21	267	Arroyo Willow	Salix lasiolepsis		H1	NE	yes	yes	yes	34.04095526	-118.5818407	40	4	40.9	11, 3, 12.4, 14.5	15	10	20	20	20	20	40	72	Good	Yes	Yes	No
3/22/21	268	Arroyo Willow	Salix lasiolepsis		H1 100ft Buffer	NE	yes	yes	yes	34.04093925	-118.5817757	35	5	42	8.5, 8, 7.5, 6, 12	5	10	10	10	10	10	20	56	Fair	Yes	Yes	No
3/22/21	269	Arroyo Willow	Salix lasiolepsis		H1 100ft Buffer	NE	yes	yes	yes	34.04089384	-118.5819478	30	5	19.3	8.2, 2.3, 3.6, 2, 3.2	10	20	20	5	5	5	25	60	Fair	Yes	No	No
3/22/21	270	Arroyo Willow	Salix lasiolepsis		H1	NE				34.04096413	-118.5820251	30	18	59.1	8, 6, 4, 5, 7, 7, 4, 3, 5, 5, 4, 4, 5, 4, 3, 3, 2, 4, 3, 2, 2, 2, 2, 2, 2, 1, 1, 1, 2, 1, 2, 2, 4, 2, 3, 2, 2, 2, 2, 1, 1, 1	20	25	20	5	5	15	25	64	Good	Yes	No	No
3/22/21	271	Red Willow	Salix laevigata		H1	NE	yes	yes	yes	34.04094679	-118.5820603	30	2	15.5	8.5, 7	30	10	20	20	15	15	35	80	Good	No	No	No
3/22/21	272	Red Willow	Salix laevigata		H1	NE	yes	yes	yes	34.04094212	-118.5821082	30	16	52.8	----------	20	15	10	10	0	10	20	80	Good	No	Yes	No
3/22/21	273	Red Willow	Salix laevigata		H1	NE				34.04079506	-118.5826415	25	5	20.6	5, 4, 5, 3.6, 3	30	20	10	10	10	10	20	68	Good	No	No	No
3/22/21	274	Red Willow	Salix laevigata		H1	NW				34.04081184	-118.5826413	25	5	16.2	4, 3.8, 4, 2.4, 2	30	10	10	10	10	10	20	80	Good	No	No	No
3/22/21	275	Red Willow	Salix laevigata	200-ft fuel mod zone	H1	NW				34.04070959	-118.5826496	25	2	8.3	4.3, 4	20	0	5	0	5	5	10	60	Fair	No	No	No
3/22/21	276	California sycamore	Platanus racemosa	200-ft fuel mod zone	H1	NW				34.04068099	-118.5826531	35	2	6.1	4.1, 2	15	5	5	10	5	10	20	100	Excellent	No	No	No
3/22/21	277	Red Willow	Salix laevigata	200-ft fuel mod zone	H1	NW				34.04067206	-118.582698	35	5	27.6	8.8, 6, 3.8, 4, 5	25	5	10	10	10	10	20	84	Excellent	No	No	No
3/22/21	278	Red Willow	Salix laevigata	200-ft fuel mod zone	H1	NW				34.04065313	-118.5826585	30	7	22.2	6, 2.3, 1.8, 1.2, 3.6, 2, 3.5	30	15	5	0	10	15	15	76	Good	No	No	No
3/23/21	279	California sycamore	Platanus racemosa	200-ft fuel mod zone	H1	NW				34.04064842	-118.582702	25	2	6.4	5.2, 1.2	10	15	3	3	3	3	6	76	Good	No	No	No
3/23/21	280	Arroyo Willow	Salix lasiolepsis	200-ft fuel mod zone	H1	NW				34.04062279	-118.5826777	15	3	7.1	4.7, 2, 0.4	25	15	3	3	3	10	13	80	Good	No	No	No
3/23/21	281	Arroyo Willow	Salix lasiolepsis	200-ft fuel mod zone	H1	NW				34.04063663	-118.582637	15	1	4.5	4.5	15	15	0	0	0	3	3	68	Good	No	No	No
3/23/21	282	Arroyo Willow	Salix lasiolepsis	200-ft fuel mod zone	H1	NW				34.04060016	-118.5826889	30	2	11.5	6.5, 5	15	15	3	0	3	15	15	72	Good	No	No	No
3/23/21	283	Arroyo Willow	Salix lasiolepsis	200-ft fuel mod zone	H1	NW				34.04056434	-118.5826979	30	2	12.8	7, 5.8	25	30	10	10	10	10	20	72	Good	Yes	No	No
3/23/21	284	Arroyo Willow	Salix lasiolepsis	200-ft fuel mod zone	H1	NW				34.04046109	-118.582732	25	5	22.5	5.5, 4.2, 4.4, 3.6, 4.8	25	30	3	3	10	10	13	80	Good	No	No	No
3/23/21	285	Arroyo Willow	Salix lasiolepsis	100-ft fuel mod zone	H1	NW	yes	yes	yes	34.04015956	-118.5829203	30	6	15.2	3.2, 3.1, 2.8, 1.9, 1.8, 2.8	30	35	5	5	5	5	10	80	Good	No	No	No
3/23/21	286	Red Willow	Salix laevigata	100-ft fuel mod zone	H1	NW				34.0401218	-118.5829094	15	4	12.9	4.1, 3.3, 3.5, 2	20	45	5	5	5	5	10	60	Fair	No	No	No
3/23/21	287	Arroyo Willow	Salix lasiolepsis	100-ft fuel mod zone	H1	NW				34.04011237	-118.5829308	35	5	32.5	11.5, 5, 9, 6.5, 0.5	25	35	10	10	10	10	20	60	Fair	Yes	No	No
3/23/21	288	Red Willow	Salix laevigata	100-ft fuel mod zone	H1	NW				34.04008664	-118.582931	20	6	16.7	2.3, 1.3, 4.6, 3.4, 5, 1.2	20	30	5	15	10	0	15	60	Fair	Yes	No	No
3/23/21	289	Arroyo Willow	Salix lasiolepsis	100-ft fuel mod zone	H1	NW	yes	yes	yes	34.03989861	-118.5829567	30	5	25.3	8, 3, 4, 5.3, 5	25	35	15	0	5	3	20	80	Good	No	No	No
3/23/21	290	Red Willow	Salix laevigata	100-ft fuel mod zone	H1	TRM				34.03991468	-118.5829637	30	7	24.2	9, 3.3, 3.2, 0.8, 3.1, 1.6, 3.2	5	30	3	0	3	10	10	100	Excellent	No	No	No
3/23/21	291	Arroyo Willow	Salix lasiolepsis	100-ft fuel mod zone	H1	TRM	yes	yes	yes	34.03991183	-118.5829151	25	4	18.3	7.5, 6.5, 1.1, 3.2	5	5	3	15	5	3	18	88	Excellent	No	No	No
3/23/21	292	Red Willow	Salix laevigata	100-ft fuel mod zone	H1	TRM	yes	yes	yes	34.03988216	-118.5829349	25	5	27.4	15, 3.4, 1.8, 0.4, 5.9	5	5	5	10	10	5	15	92	Excellent	No	No	No
3/23/21	293	Red Willow	Salix laevigata	200-ft fuel mod zone	H1	TRM	yes	yes	yes	34.03983942	-118.5829508	15	6	20.1	3.2, 1.8, 0.6, 1.8, 6.3, 3.4	5	10	5	0	0	5	5	52	Fair	Yes	Yes	No
3/23/21	294	Arroyo Willow	Salix lasiolepsis	200-ft fuel mod zone	H1	TRM	yes	yes	yes	34.03980231	-118.5829666	25	2	12.4	11.4, 1	15	10	10	10	10	10	20	80	Good	No	No	No
3/23/21	295	Red Willow	Salix laevigata	200-ft fuel mod zone	H1	TRM	yes	yes	yes	34.039781	-118.5829772	25	3	20.6	6.2, 3.4, 11	15	10	10	5	10	20	25	84	Excellent	No	No	No
3/23/21	296	Arroyo Willow	Salix lasiolepsis	200-ft fuel mod zone	H1	TRM				34.0397874	-118.5830317	30	1	7.3	7.3	0	10	0	0	0	0	0	60	Fair	No	No	No
3/23/21	297	Red Willow	Salix laevigata	200-ft fuel mod zone	H1	TRM				34.03976606	-118.5830289	25	2	22.8	11.5, 11.3	5	10	3	0	3	3	6	48	Fair	Yes	Yes	No
3/23/21	298	Arroyo Willow	Salix lasiolepsis	200-ft fuel mod zone	H1	TRM				34.03977821	-118.5830824	35	2	21.3	11.3, 10	20	15	5	10	5	0	10	76	Good	Yes	No	No

Date Collected	Tree Number	Common Name	Scientific Name	Within a Fuel Modification Zone?	SMMCLP Zone	Area	Within Alternative 2	Within Alternative 3	Within Alternative 4	Latitude	Longitude	Height (ft)	Number of Trunks	DBH Sum	DBH	Canopy Percent Shade	Slope Grade	Dripline North ft	Dripline East ft	Dripline South ft	Dripline West ft	Canopy Spread ft	Total Condition	Condition Category	Structure Problems	Pests Present	Disease Present
3/23/21	299	Fan Palm	Washingtonia sp.	200-ft fuel mod zone	H1	TRM	yes	yes	yes	34.03972491	-118.5829776	40	1	19.8	19.8	5	10	5	5	5	5	10	100	Excellent	No	No	No
3/23/21	300	Arroyo Willow	Salix lasiolepsis	200-ft fuel mod zone	H1	TRM	yes	yes	yes	34.03970625	-118.5829367	15	10	33.9	~~~~~~~~~~	10	15	10	0	10	5	20	68	Good	No	No	No
3/23/21	301	Arroyo Willow	Salix lasiolepsis	200-ft fuel mod zone	H1	TRM	yes	yes	yes	34.03968108	-118.5829271	15	8	16.8	3.6, 2, 2.2, 3.6, 1.2, 0.8, 2, 1.6	10	15	3	5	15	5	18	76	Good	No	No	No
3/23/21	302	Laurel Sumac	Malosma laurina	200-ft fuel mod zone	H1	TRM	yes	yes	yes	34.03958877	-118.5829118	15	5	12.8	4.8, 2, 2, 1, 3	25	10	5	5	5	5	10	88	Excellent	No	No	No
3/23/21	303	Laurel Sumac	Malosma laurina	200-ft fuel mod zone	H1	TRM	yes	yes	yes	34.03956869	-118.5829228	10	5	8.8	2.5, 1.5, 2, 1.8, 1	25	10	3	3	3	3	6	96	Excellent	No	No	No
3/23/21	304	Tree Tobacco	Nicotiana glauca	200-ft fuel mod zone	H1	TRM	yes	yes	yes	34.03954185	-118.5829016	10	5	15.7	3.6,2.8,2.2,3.6,3.5	10	10	3	3	3	3	6	100	Excellent	No	No	No
3/23/21	305	Arroyo Willow	Salix lasiolepsis	200-ft fuel mod zone	H1	TRM	yes	yes	yes	34.03962323	-118.5829847	20	3	18	7, 6.5, 4.5	10	15	3	3	3	3	6	68	Good	Yes	Yes	No
3/23/21	306	Arroyo Willow	Salix lasiolepsis	200-ft fuel mod zone	H1	TRM	yes	yes	yes	34.03953391	-118.5829708	20	6	36.7	10.5,2.5,10.2,2.7,4.5	20	20	15	15	10	15	30	68	Good	Yes	Yes	No
3/23/21	307	Red Willow	Salix laevigata	200-ft fuel mod zone	H1	TRM	yes	yes	yes	34.03947961	-118.582994	35	1	14	14	20	5	10	20	5	5	25	80	Good	No	No	No
3/23/21	308	Coast Live Oak	Quercus agrifolia		H1	TRM	yes	yes	yes	34.03944251	-118.5830277	48	1	18	18	45	0	15	15	15	15	30	96	Excellent	No	Yes	No
3/23/21	309	Red Willow	Salix laevigata	200-ft fuel mod zone	H1	TRM	yes	yes	yes	34.03944723	-118.5829821	25	3	26.9	11.5, 2.4, 13	35	15	5	15	15	5	20	76	Good	Yes	No	No
3/23/21	310	Red Willow	Salix laevigata	200-ft fuel mod zone	H1	TRM	yes	yes	yes	34.03943768	-118.5829539	15	1	5.8	5.8	5	20	3	0	3	3	6	60	Fair	Yes	No	No
3/23/21	311	Red Willow	Salix laevigata		H1	TRM	yes	yes	yes	34.03942687	-118.5830066	20	5	12.3	9, 2, 0.7, 0.3, 0.3	5	15	3	5	5	5	10	72	Good	No	No	No
3/23/21	312	Red Willow	Salix laevigata	200-ft fuel mod zone	H1	TRM	yes	yes	yes	34.03941734	-118.5829625	10	3	10.1	5.1, 3, 2	5	15	3	3	3	3	6	64	Good	Yes	No	No
3/23/21	313	Arroyo Willow	Salix lasiolepsis		H1	TRM	yes	yes	yes	34.03930688	-118.5830011	20	4	34.8	7.2, 3.4, 8.2, 16	15	5	5	5	10	5	15	68	Good	Yes	Yes	No
3/23/21	314	Red Willow	Salix laevigata		H1	TRM	yes	yes	yes	34.03951821	-118.5830663	15	3	18	9.3, 5.4, 3.3	5	5	0	0	0	3	3	52	Fair	Yes	Yes	Yes
3/23/21	315	Brazilian Pepper	Schinusterebinthifolia		H1	TRM				34.0395395	-118.5830808	30	1	10	10	40	10	15	10	10	15	25	100	Excellent	No	No	No
3/23/21	316	Brazilian Pepper	Schinusterebinthifolia	200-ft fuel mod zone	H1	TRM	yes	yes	yes	34.03955574	-118.5830339	35	1	11.5	11.5	30	10	5	5	15	15	20	100	Excellent	No	No	No
3/29/21	317	Elderberry	Sambucus nigra	50-ft fuel mod zone	H1 100ft Buffer	TRM	yes		yes	34.04000477	-118.5816028	15	5	14.3	4.5,3.5,2.4,1.8,2.1	15	5	5	10	5	10	20	76	Good	Yes	No	No
3/29/21	318	Eucalyptus	Eucalyptus camaldulensis	100-ft fuel mod zone	H1 Quiet Zone	NE	yes	yes	yes	34.04011257	-118.5814851	35	2	33.5	28.4, 5.1	25	5	15	20	15	15	35	92	Excellent	No	No	No
3/29/21	319	Dracaena	Dracaena sp.	100-ft fuel mod zone	H1 Quiet Zone	NE	yes		yes	34.04003081	-118.5815382	10	5	24.5	11.5, 4.5, 2, 4, 2.5	10	N/a	5	5	5	5	10	88	Excellent	No	No	No
3/29/21	320	Dracaena	Dracaena sp.	100-ft fuel mod zone	H1 100ft Buffer	NE	yes		yes	34.04004921	-118.5815923	20	5	33.3	11, 9, 6, 3.8, 3.5	10	N/a	5	5	5	5	10	84	Excellent	Yes	Yes	No
3/29/21	321	Dracaena	Dracaena sp.	100-ft fuel mod zone	H1 100ft Buffer	NE	yes		yes	34.04008426	-118.5815714	15	5	20.7	6, 3.5, 7, 2.2, 2	10	N/a	3	3	3	3	6	84	Excellent	Yes	Yes	No
3/29/21	322	Ficus	Ficus sp.	100-ft fuel mod zone	H1 Quiet Zone	NE	yes		yes	34.04009053	-118.5815345	20	4	19	8, 4, 4.5, 2.5	35	N/a	15	15	15	15	30	96	Excellent	No	No	No
3/29/21	323	Dracaena	Dracaena sp.	100-ft fuel mod zone	H1 100ft Buffer	NE	yes	yes	yes	34.04010392	-118.5816182	25	4	26.2	19.4, 2.5, 2.3, 2	10	N/a	3	3	3	3	6	84	Excellent	Yes	No	No
3/29/21	324	California sycamore	Platanus racemosa	200-ft fuel mod zone	H1 Quiet Zone	NE	yes	yes	yes	34.04017644	-118.5815582	15	2	7.7	4.5, 3.2	15	N/a	5	5	5	5	10	100	Excellent	No	No	No
3/29/21	325	Coast Live Oak	Quercus agrifolia	200-ft fuel mod zone	H1 Quiet Zone	NE	yes	yes	yes	34.04024227	-118.5815537	15	1	4.7	4.7	25	N/a	3	3	5	5	8	96	Excellent	No	No	No
3/29/21	326	Date Palm	Phoenix dactylifera	200-ft fuel mod zone	H1 100ft Buffer	NE	yes	yes	yes	34.0402641	-118.5816565	20	1	38	38	85	N/a	15	15	15	15	30	96	Excellent	No	No	No
3/29/21	327	Dracaena	Dracaena sp.	200-ft fuel mod zone	H1 100ft Buffer	NE	yes	yes	yes	34.04029977	-118.5816763	15	4	31.5	15.5, 8.5, 4, 3.5	5	N/a	3	3	3	3	6	84	Excellent	Yes	No	No
3/29/21	328	Dracaena	Dracaena sp.	200-ft fuel mod zone	H1 100ft Buffer	NE	yes	yes	yes	34.04027602	-118.5815797	15	2	20.2	12.4, 7.8	10	5	3	3	5	5	8	80	Good	No	Yes	No
3/29/21	329	Dracaena	Dracaena sp.	200-ft fuel mod zone	H1 Quiet Zone	NE	yes	yes	yes	34.04030275	-118.5815405	20	4	28.4	11.6, 8.5, 4, 4.3	10	5	3	3	3	3	6	80	Good	No	No	No
3/29/21	330	Dracaena	Dracaena sp.	200-ft fuel mod zone	H1 100ft Buffer	NE	yes	yes	yes	34.04030887	-118.5815848	20	3	25.2	12.8, 7.8, 4.6	10	5	2	2	2	2	4	84	Excellent	No	No	No
3/29/21	331	Dracaena	Dracaena sp.	200-ft fuel mod zone	H1 Quiet Zone	NE	yes	yes	yes	34.04033152	-118.5815225	15	5	43.6	10.6, 8, 6.5, 8, 10.5	5	10	3	3	5	3	8	96	Excellent	No	Yes	No
3/29/21	332	Dracaena	Dracaena sp.	200-ft fuel mod zone	H1 Quiet Zone	NE				34.04038745	-118.5814818	15	5	37.6	12,2.5,3.5,8.4,8.5	10	10	0	3	3	3	6	84	Excellent	Yes	No	Yes
3/29/21	333	Elderberry	Sambucus nigra	200-ft fuel mod zone	H1 Quiet Zone	NE				34.04044732	-118.5814917	15	11	82.5	11.8,5.15,3.5,3.2,3.6, 6.5,7.5,7.5,6	40	10	10	10	10	10	20	72	Good	Yes	Yes	No
3/29/21	334	Elderberry	Sambucus nigra		H1 Quiet Zone	NE				34.04049762	-118.5814396	15	7	50	14, 9.9, 6.5, 4.9, 8.9, 5, 4	10	5	5	5	5	10	15	80	Good	Yes	Yes	No
3/29/21	335	California sycamore	Platanus racemosa		H1 Quiet Zone	NE	yes	yes	yes	34.04052813	-118.5814781	20	5	8.6	4, 2, 1.7, 0.5, 0.4	3	0	5	5	5	5	10	100	Excellent	No	No	No
3/29/21	336	Laurel Sumac	Malosma laurina		H1 Quiet Zone	NE	yes	yes	yes	34.04060177	-118.5814488	15	9	34.1	4.5, 4.3, 3, 3.7, 3.7, 4.5, 3.8, 3.8, 3.9	15	N/a	5	5	10	10	15	64	Good	Yes	Yes	No
3/29/21	338	Arroyo Willow	Salix lasiolepsis		H1 Quiet Zone	NE				34.04060931	-118.5814025	20	4	41.4	37.3, 2, 0.3, 1.8	5	10	10	5	10	3	20	60	Fair	Yes	Yes	No
3/29/21	339	Tree Tobacco	Nicotiana glauca		H1 Quiet Zone	NE				34.04066633	-118.5814891	15	5	6.9	1.4,1.2,2.2,0.8,1.3	0	N/a	5	3	3	3	8	88	Excellent	No	No	No
3/29/21	340	Dracaena	Dracaena sp.		H1 100ft Buffer	NE	yes	yes	yes	34.0407273	-118.5815151	15	6	31.9	9.9, 4.4, 3.3, 4.2, 7.9, 2.8	15	N/a	3	3	3	3	6	76	Good	Yes	No	No
3/29/21	341	Laurel Sumac	Malosma laurina		H1 100ft Buffer	NE	yes	yes	yes	34.04080318	-118.581459	15	12	34.9	4.1,3.4,3.2,3.6,3.5,3.5, 2.7,2.2,4.3,2.1,8.3,5	35	N/a	10	15	15	15	30	84	Excellent	Yes	Yes	No
3/29/21	342	Laurel Sumac	Malosma laurina		H1 100ft Buffer	NE				34.04078929	-118.581292	10	7	13	4.1,2.1,7.1,2.1,1.2	35	20	5	5	10	5	15	100	Excellent	No	No	No
3/29/21	343	Fan Palm	Washingtonia sp.		H1 100ft Buffer	NE				34.04075472	-118.5812858	30	1	25	25	5	25	10	10	10	10	20	80	Good	No	No	No
3/29/21	345	California sycamore	Platanus racemosa		H1 100ft Buffer	NE	yes	yes	yes	34.0408536	-118.5815947	60	8	70.9	27,24,3.5,1.2,6.9,2	65	N/a	15	25	25	15	40	100	Excellent	No	Yes	No
3/29/21	346	Elderberry	Sambucus nigra	100-ft fuel mod zone	H1 100ft Buffer	NE	yes		yes	34.04005351	-118.5817457	15	7	24.4	7.4,5.3,1.8,1.6,0.8,4.9	25	5	5	5	15	15	20	72	Good	Yes	Yes	No
3/29/21	347	Dracaena	Dracaena sp.	100-ft fuel mod zone	H1 100ft Buffer	NE	yes		yes	34.04006025	-118.5817019	20	1	13.1	13.1	5	N/a	1	2	5	5	7	84	Excellent	Yes	Yes	No
3/29/21	348	Olive	Olea europeans	100-ft fuel mod zone	H1 100ft Buffer	NE	yes	yes	yes	34.04014275	-118.5817256	30	3	37.9	12.6, 11.3, 14	35	N/a	10	10	20	5	30	96	Excellent	No	No	No
3/29/21	349	Dracaena	Dracaena sp.	100-ft fuel mod zone	H1 100ft Buffer	NE	yes		yes	34.04004893	-118.5817899	20	1	6.4	6.4	0	N/a	2	0	1	0	3	84	Excellent	No	No	No
3/29/21	350	Fan Palm	Washingtonia sp.	100-ft fuel mod zone	H1 100ft Buffer	NE	yes	yes	yes	34.04010744	-118.5817765	55	1	23.4	23.4	5	N/a	10	10	10	10	20	100	Excellent	No	No	No
3/29/21	351	Dracaena	Dracaena sp.	100-ft fuel mod zone	H1 100ft Buffer	NE	yes	yes	yes	34.04008437	-118.5817748	10	2	11	8, 3	5	5	1	3	3	1	4	96	Excellent	No	No	No
3/29/21	352	Banana	Musa sp.	50-ft fuel mod zone	H1 100ft Buffer	NE	yes			34.04000298	-118.5818371	20	3	14.8	5, 5, 4.8	0	25	5	5	5	5	10	84	Excellent	No	No	No
3/29/21	353	Giant Bird of Paradise	Strelitzia reginae	50-ft fuel mod zone	H1 100ft Buffer	TRM	yes			34.03996833	-118.5818542	15	1	6.5	6.5	0	25	10	1	1	1	11	92	Excellent	No	No	No
3/29/21	354	Juniper	Juniperus californica	50-ft fuel mod zone	H1 100ft Buffer	TRM	yes			34.03997742	-118.581807	15	2	7.6	4, 3.6	10	25	15	10	0	10	20	100	Excellent	No	No	No
3/29/21	355	Juniper	Juniperus californica	100-ft fuel mod zone	H1 100ft Buffer	TRM	yes		yes	34.04007072	-118.5818233	20	1	8.5	8.5	30	10	15	10	0	5	15	100	Excellent	No	No	No
3/29/21	356	Juniper	Juniperus californica	100-ft fuel mod zone	H1 100ft Buffer	NE	yes	yes	yes	34.04009638	-118.5818297	20	5	18.3	10, 2.2, 2, 2.3, 1.8	30	10	15	10	5	15	25	100	Excellent	No	No	No
3/29/21	357	Laurel Sumac	Malosma laurina	50-ft fuel mod zone	H1 100ft Buffer	NE	yes	yes		34.04008445	-118.5820735	10	12	18.4	2.5,1.8,2.2,1.1,7.0,4, 0.6,2.1,1.1,6,1.7	80	20	5	5	5	5	10	100	Excellent	No	No	No
4/7/21	358	Arroyo Willow	Salix Lasiolepsis	100-ft fuel mod zone	H1	TRM	yes	yes	yes	34.0403038	-118.5822054	60	2	51.5	38, 13.5	10	0	15	5	20	15	35	88	Excellent	No	No	No
4/7/21	359	California sycamore	Platanus racemosa	100-ft fuel mod zone	H1	NE	yes	yes	yes	34.04030318	-118.5821423	50	3	71.5	29.5, 14, 28	85	0	28	20	20	15	48	100	Excellent	No	No	No

Date Collected	Tree Number	Common Name	Scientific Name	Within a Fuel Modification Zone?	SMMCLP Zone	Area	Within Alternative 2	Within Alternative 3	Within Alternative 4	Latitude	Longitude	Height (ft)	Number of Trunks	DBH Sum	DBH	Canopy Percent Shade	Slope Grade	Dripline North ft	Dripline East ft	Dripline South ft	Dripline West ft	Canopy Spread ft	Total Condition	Condition Category	Structure Problems	Pests Present	Disease Present
4/7/21	360	Elderberry	Sambucus nigra	100-ft fuel mod zone	H1	NE	yes	yes	yes	34.04034924	-118.5821978	25	3	12.5	5.5, 4, 3	5	0	5	5	5	5	10	88	Excellent	No	No	No
4/7/21	361	Red Willow	Salix laevigata	50-ft fuel mod zone	H1	NE	yes	yes	yes	34.04030948	-118.5826	0	2	20	11, 9	0	5	10	10	5	5	15	92	Excellent	No	No	No
4/7/21	362	Red Willow	Salix laevigata	50-ft fuel mod zone	H1	NE	yes	yes	yes	34.04027634	-118.5826684	25	3	41.7	8.5, 7.7, 25.5	5	15	5	5	5	5	10	80	Good	Yes	No	No
4/7/21	363	California sycamore	Platanus racemosa	50-ft fuel mod zone	H1	NE	yes	yes	yes	34.04029769	-118.5827052	35	2	24.4	16.4, 8	20	40	10	10	10	15	25	100	Excellent	No	No	No
4/7/21	364	Red Willow	Salix laevigata	50-ft fuel mod zone	H1	NE				34.04022575	-118.5827399	35	3	43	18, 14, 11	5	90	5	5	15	15	20	84	Excellent	Yes	No	Yes
4/7/21	365	Red Willow	Salix laevigata	50-ft fuel mod zone	H1	NE	yes	yes	yes	34.04024214	-118.5826962	20	1	9.5	9.5	5	15	3	5	3	5	10	76	Good	Yes	Yes	No
4/7/21	366	Arroyo Willow	Salix Lasiolepsis	50-ft fuel mod zone	H1	NE	yes	yes	yes	34.04016137	-118.5827452	30	1	9.8	9.8	3	55	0	0	0	0	0	68	Good	Yes	No	No
4/7/21	367	Red Willow	Salix laevigata	100-ft fuel mod zone	H1	TRM	yes	yes	yes	34.04047654	-118.5825819	30	5	45.8	14, 14, 10, 2.8, 5	15	20	5	15	20	15	30	92	Excellent	Yes	No	No
4/7/21	368	Red Willow	Salix laevigata	200-ft fuel mod zone	H1	NE	yes	yes	yes	34.04054667	-118.5825587	30	10	69.5	10, 8, 9, 4.5, 10, 4.5, 12.5, 5.5, 5.5	10	0	20	20	20	15	40	88	Excellent	No	Yes	No
4/7/21	369	Red Willow	Salix laevigata	200-ft fuel mod zone	H1	NE	yes	yes	yes	34.04066003	-118.5825387	30	2	18.5	11, 7.5	5	15	3	0	5	3	8	64	Good	No	No	No
4/7/21	370	Red Willow	Salix laevigata	200-ft fuel mod zone	H1	NE	yes	yes	yes	34.04068342	-118.5825135	35	11	49.6	13.5, 11, 3.3, 2, 7.7, 2, 3.5, 4, 3.2, 0, 3.2, 4.6, 3.5	50	0	15	15	15	20	35	92	Excellent	No	No	No
4/20/21	371	Red Willow	Salix laevigata	200-ft fuel mod zone	H1	NE	yes	yes	yes	34.04071045	-118.5824569	25	4	34	9.8, 6.5, 7.7, 10	0	25	0	0	0	0	0	64	Good	Yes	No	No
4/20/21	372	Red Willow	Salix laevigata	200-ft fuel mod zone	H1	NE	yes	yes	yes	34.04072608	-118.5824786	25	3	25.6	13, 3.6, 9	32	0	10	5	20	10	30	92	Excellent	No	No	No
4/20/21	373	Arroyo Willow	Salix Lasiolepsis	200-ft fuel mod zone	H1	NE	yes	yes	yes	34.04063685	-118.5823473	15	2	15.3	7.8, 7.5	5	5	0	3	3	3	6	60	Fair	Yes	Yes	No
4/20/21	374	Red Willow	Salix laevigata	200-ft fuel mod zone	H1	NE	yes	yes	yes	34.0406138	-118.5823508	25	2	11.7	9.7, 2	20	10	3	5	3	0	6	68	Good	Yes	No	No
4/20/21	375	Red Willow	Salix laevigata	200-ft fuel mod zone	H1	NE	yes	yes	yes	34.04060157	-118.5822849	20	3	13.7	7, 3.5, 3.2	20	10	0	3	10	3	10	60	Fair	Yes	No	No
4/20/21	376	Arroyo Willow	Salix Lasiolepsis	200-ft fuel mod zone	H1	NE	yes	yes	yes	34.04059172	-118.5823345	20	2	7.6	4, 3.6	5	10	0	5	5	5	10	64	Good	Yes	Yes	No
4/20/21	377	Arroyo Willow	Salix Lasiolepsis	200-ft fuel mod zone	H1	NE	yes	yes	yes	34.04065967	-118.5823092	30	1	8.8	8.8	30	10	5	5	5	5	10	88	Excellent	No	No	No
4/20/21	378	Arroyo Willow	Salix Lasiolepsis	200-ft fuel mod zone	H1	NE	yes	yes	yes	34.04062725	-118.5822814	25	2	18	9.8, 8.2	30	10	5	10	10	5	15	76	Good	No	Yes	No
4/20/21	379	Arroyo Willow	Salix Lasiolepsis	200-ft fuel mod zone	H1	NE	yes	yes	yes	34.04069344	-118.582288	0	5	36.4	12.4, 6.8, 8.5, 3.7, 13	20	0	5	5	5	5	10	80	Good	Yes	Yes	No
4/20/21	380	Arroyo Willow	Salix Lasiolepsis		H1	NE	yes	yes	yes	34.04071942	-118.5823054	35	5	27.4	6.8, 4.5, 2, 3.5, 9.7, 9	20	10	10	10	10	10	20	84	Excellent	Yes	Yes	No
4/20/21	381	Red Willow	Salix laevigata		H1	NE	yes	yes	yes	34.04073624	-118.5822387	30	5	37.8	16, 16, 3, 2.3, 0.5	20	0	10	10	15	15	25	76	Good	Yes	Yes	No
4/20/21	382	Elderberry	Sambucus nigra		H1	NE	yes	yes	yes	34.04088083	-118.5821202	15	10	23.9	~~~~~~~~~~	20	0	3	5	10	5	13	100	Excellent	No	No	No
4/20/21	383	Arroyo Willow	Salix lasiolepsis		H1 100ft Buffer	NE	yes	yes	yes	34.04071931	-118.5819377	30	9	68.7	12.7, 11.4, 5.5, 10.1, 5.7, 5.8	40	0	20	25	20	20	45	80	Good	Yes	Yes	No
4/20/21	384	California sycamore	Platanus racemosa	200-ft fuel mod zone	H1 100ft Buffer	NE	yes	yes	yes	34.04057808	-118.5818958	25	3	11.4	8.2, 1.3, 1.9	60	0	15	15	15	10	30	100	Excellent	No	No	No
4/20/21	385	Coast Live Oak	Quercus agrifolia	200-ft fuel mod zone	H1 100ft Buffer	NE	yes	yes	yes	34.04045751	-118.5818471	10	5	9.4	3.5, 3, 2, 0.4, 0.5	40	0	5	5	5	5	10	100	Excellent	No	No	No
4/20/21	386	California sycamore	Platanus racemosa		H1 100ft Buffer	NE	yes	yes	yes	34.04052703	-118.581741	30	4	25.1	11.8, 3.5, 3.3, 6.5	60	0	20	15	15	15	35	100	Excellent	No	No	No
4/20/21	387	Red Willow	Salix laevigata		H1 100ft Buffer	NE	yes	yes	yes	34.04085832	-118.5819274	35	5	35.8	6.5, 5, 8, 9, 7.3	15	20	0	0	5	5	5	64	Good	Yes	No	No
4/20/21	388	Elderberry	Sambucus nigra		H1 100ft Buffer	NE	yes	yes	yes	34.04084533	-118.5816727	20	13	85.9	5.5, 3.8, 7.8, 3.8, 4, 4, 8, 4, 10.9, 3.3, 6.5, 3.4, 10, 4.4, 5.5	25	0	10	15	20	20	35	76	Good	Yes	Yes	No
4/20/21	389	Elderberry	Sambucus nigra		H1 100ft Buffer	NE	yes	yes	yes	34.04084328	-118.5816744	15	3	20.5	9, 6.5, 5	25	0	0	5	15	5	15	92	Excellent	No	No	No
4/20/21	390	Elderberry	Sambucus nigra		H1 100ft Buffer	NE	yes	yes	yes	34.04077152	-118.5817177	20	5	56	17, 3.3, 5.5, 13.8, 16.4	15	0	5	15	15	5	20	68	Good	Yes	Yes	No
4/20/21	391	Elderberry	Sambucus nigra		H1 100ft Buffer	NE	yes	yes	yes	34.04081347	-118.5817851	15	1	5.1	5.1	5	0	3	3	3	3	6	100	Excellent	No	No	No
4/20/21	392	Elderberry	Sambucus nigra		H1 100ft Buffer	NE	yes	yes	yes	34.04078345	-118.5818028	20	5	36.8	19, 3.2, 2, 4, 8.6	20	0	5	15	15	5	20	100	Excellent	No	No	No
4/20/21	393	Eucalyptus	Eucalyptus globulus	50-ft fuel mod zone	H1 100ft Buffer	NE	yes			34.04000184	-118.5821226	50	1	36	36	30	0	20	20	20	20	40	100	Excellent	No	No	No
4/20/21	394	Eucalyptus	Eucalyptus globulus	50-ft fuel mod zone	H1 100ft Buffer	TRM	yes			34.03998678	-118.582168	55	1	36	36	25	0	15	15	20	15	35	100	Excellent	No	No	No
4/20/21	395	Eucalyptus	Eucalyptus globulus	50-ft fuel mod zone	H1 100ft Buffer	TRM	yes			34.04001897	-118.5821818	60	1	44	44	60	0	25	25	25	25	50	100	Excellent	No	No	No
4/20/21	396	Aleppo Pine	Pinus halipensis	50-ft fuel mod zone	H1 100ft Buffer	TRM	yes		yes	34.04002209	-118.582445	30	3	37	14.6, 9.6, 12.8	55	0	15	15	15	15	30	96	Excellent	No	No	No
4/20/21	397	Aleppo Pine	Pinus halipensis	50-ft fuel mod zone	H1 100ft Buffer	TRM	yes		yes	34.03995866	-118.5824653	15	12	29.2	2.8, 2.5, 3.5, 1.6, 1.3, 2.2, 2.1, 2.2, 2.4, 1.3, 3.4	10	0	3	3	3	3	6	100	Excellent	No	No	No
4/20/21	398	Cypress	Cupressus sempervirens	50-ft fuel mod zone	H1 100ft Buffer	TRM	yes		yes	34.03997894	-118.5825281	15	1	10.2	10.2	15	0	3	3	5	3	8	76	Good	Yes	No	No
4/20/21	399	Date palm	Phoenix sp.	50-ft fuel mod zone	H1 100ft Buffer	TRM	yes		yes	34.039959	-118.5825595	20	1	20.5	20.5	60	0	5	5	5	5	10	100	Excellent	No	No	No
4/20/21	400	Ficus	Ficus sp.	50-ft fuel mod zone	H1 100ft Buffer	TRM	yes	yes	yes	34.0399835	-118.5826129	20	1	20.2	20.2	70	0	5	10	10	10	20	84	Excellent	No	No	No
4/20/21	401	Cypress	Cupressus sempervirens	50-ft fuel mod zone	H1 100ft Buffer	TRM	yes	yes	yes	34.03998207	-118.582661	20	5	34	6.9, 5.2, 9.2, 5.4, 7.3	40	0	10	10	10	15	25	88	Excellent	Yes	No	No
4/20/21	402	Fan Palm	Washingtonia sp.	50-ft fuel mod zone	H1 100ft Buffer	TRM	yes	yes	yes	34.04003612	-118.5827119	30	1	16.8	16.8	10	0	3	3	3	3	6	100	Excellent	No	No	No
4/20/21	403	Dracaena	Dracaena sp.	50-ft fuel mod zone	H1 100ft Buffer	TRM	yes	yes	yes	34.04001713	-118.5827222	20	5	22.1	4.4, 4.4, 4.5, 4.4	5	0	1	1	1	1	2	88	Excellent	Yes	No	No
4/20/21	404	Fan Palm	Washingtonia sp.	50-ft fuel mod zone	H1 100ft Buffer	TRM	yes	yes	yes	34.0400016	-118.5827652	30	1	17.3	17.3	10	0	3	3	3	3	6	96	Excellent	No	No	No
4/20/21	405	Lemon tree	Citrus arenicolid	50-ft fuel mod zone	H1 100ft Buffer	TRM	yes	yes	yes	34.03997654	-118.5827538	10	5	10.6	2.5, 2, 2.6, 1.5, 2	5	0	1	2	1	1	3	80	Good	Yes	Yes	No
4/20/21	406	Eucalyptus	Eucalyptus globulus	100-ft fuel mod zone	H1 100ft Buffer	TRM	yes	yes	yes	34.03987951	-118.5827515	65	1	45	45	50	0	20	20	30	20	50	100	Excellent	No	No	No
4/20/21	407	Eucalyptus	Eucalyptus globulus	100-ft fuel mod zone	H1 100ft Buffer	TRM	yes	yes	yes	34.03991116	-118.5828255	25	1	19	19	30	25	10	5	10	15	20	88	Excellent	No	No	No
4/20/21	408	Bird of paradise	Strelitzia reginae	100-ft fuel mod zone	H1 100ft Buffer	TRM	yes	yes	yes	34.03982815	-118.5828315	20	14	77	5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5	40	0	5	5	5	5	10	80	Good	No	No	No
4/20/21	409	Bird of paradise	Strelitzia reginae	200-ft fuel mod zone	H1 100ft Buffer	TRM	yes	yes	yes	34.03977386	-118.5828374	20	16	88	5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5	30	0	5	5	5	5	10	84	Excellent	No	No	No
4/20/21	410	Canary Island palm	Phoenix canariensis	50-ft fuel mod zone	H1 Quiet Zone	TRM	yes			34.03984697	-118.5824087	15	1	27	27	30	0	3	3	3	5	8	92	Excellent	No	No	No
4/20/21	411	Brazilian Pepper	Schinusterebinthifolia	50-ft fuel mod zone	H1 100ft Buffer	TRM	yes	yes	yes	34.04014577	-118.5826176	25	4	31.4	8, 4.4, 8, 11	65	0	10	10	10	10	20	96	Excellent	No	No	No
4/20/21	412	Dracaena	Dracaena sp.	50-ft fuel mod zone	H1 100ft Buffer	TRM	yes	yes	yes	34.04014902	-118.5826621	15	4	32	6.5, 6, 13, 6.5	15	0	3	3	3	5	8	96	Excellent	No	No	No
4/20/21	413	Fan Palm	Washingtonia sp.	50-ft fuel mod zone	H1 100ft Buffer	TRM	yes	yes	yes	34.04012977	-118.5826678	15	1	14.8	14.8	20	0	5	5	5	5	10	100	Excellent	No	No	No
4/20/21	414	Brazilian Pepper	Schinusterebinthifolia	50-ft fuel mod zone	H1 100ft Buffer	TRM	yes	yes	yes	34.04010777	-118.5826793	20	2	10.5	6, 4.5	1	0	0	0	0	0	0	80	Good	No	No	No
4/20/21	415	Dracaena	Dracaena sp.	50-ft fuel mod zone	H1 100ft Buffer	TRM	yes	yes	yes	34.04008958	-118.5826893	15	2	8	5, 3	12	0	1	1	1	1	2	92	Excellent	No	No	No
4/20/21	416	Ficus	Ficus sp.	50-ft fuel mod zone	H1 100ft Buffer	TRM	yes	yes	yes	34.04007049	-118.5826998	20	5	24.4	7.4, 4.2, 4.5, 2.3, 6	5	0	0	10	0	3	13	96	Excellent	No	No	No
4/20/21	417	Dracaena	Dracaena sp.	50-ft fuel mod zone	H1 100ft Buffer	TRM	yes	yes	yes	34.04005207	-118.5827067	20	7	41	12.6, 5.4, 2.5, 3.5, 4.4	3	0	1	1	1	1	2	96	Excellent	No	No	No
4/20/21	418	Eucalyptus	Eucalyptus globulus	200-ft fuel mod zone	H1 100ft Buffer	TRM	yes	yes	yes	34.03965554	-118.582778	45	1	25	25	40	0	10	10	10	10	20	88	Excellent	No	No	No

Date Collected	Tree Number	Common Name	Scientific Name	Within a Fuel Modification Zone?	SMMCLP Zone	Area	Within Alternative 2	Within Alternative 3	Within Alternative 4	Latitude	Longitude	Height (ft)	Number of Trunks	DBH Sum	DBH	Canopy Percent Shade	Slope Grade	Dripline North ft	Dripline East ft	Dripline South ft	Dripline West ft	Canopy Spread ft	Total Condition	Condition Category	Structure Problems	Pests Present	Disease Present
4/20/21	419	Eucalyptus	Eucalyptus globulus	100-ft fuel mod zone	H1 100ft Buffer	TRM	yes	yes	yes	34.03967573	-118.5826791	50	1	46.2	46.2	50	0	10	10	15	15	25	88	Excellent	No	No	No
4/20/21	420	Eucalyptus	Eucalyptus globulus	50-ft fuel mod zone	H1 100ft Buffer	TRM	yes		yes	34.03970093	-118.5825664	55	5	61.2	51,2,2,2,2,2,5,3,3	50	0	25	25	10	10	35	88	Excellent	No	No	No
4/20/21	421	Eucalyptus	Eucalyptus globulus	50-ft fuel mod zone	H1 Quiet Zone	TRM	yes			34.03982089	-118.5821833	45	1	30	30	40	0	15	10	15	15	30	88	Excellent	No	No	No
4/20/21	422	Eucalyptus	Eucalyptus globulus	50-ft fuel mod zone	H1 100ft Buffer	TRM	yes			34.03987386	-118.5820203	50	1	30	30	50	0	10	15	20	25	40	72	Good	No	No	No
4/20/21	423	Canary Island palm	Phoenix canariensis	50-ft fuel mod zone	H1 100ft Buffer	TRM	yes			34.0398973	-118.5818705	25	1	48	48	35	0	10	10	10	10	20	96	Excellent	No	No	No
4/20/21	424	Eucalyptus	Eucalyptus globulus	50-ft fuel mod zone	H1 100ft Buffer	TRM	yes			34.03991426	-118.5818191	65	1	53	53	45	0	25	20	20	25	45	88	Excellent	No	No	No
4/20/21	425	Euphorbia	Euphorbia sp.	50-ft fuel mod zone	H1 100ft Buffer	TRM	yes			34.03993023	-118.5817713	10	7	21.7	4.9, 4.9, 2, 4.7, 1.9, 1.1.9	15	0	10	5	5	5	15	88	Excellent	No	No	No
4/20/21	426	Ficus	Ficus sp.	50-ft fuel mod zone	H1 100ft Buffer	TRM	yes			34.03985053	-118.5817606	25	2	20.1	10.5, 9.6	35	0	15	20	15	15	35	92	Excellent	Yes	No	No
4/20/21	427	Ficus	Ficus sp.	50-ft fuel mod zone	H1 Quiet Zone	TRM				34.03973598	-118.5817308	25	2	30.5	15.3, 15.2	35	0	15	25	20	15	40	80	Good	No	No	No
4/20/21	428	Ficus	Ficus sp.	50-ft fuel mod zone	H1 Quiet Zone	TRM				34.03977453	-118.5815318	25	5	35	15, 6.2, 4, 3.8, 6	40	0	15	25	15	15	40	92	Excellent	Yes	No	No
4/20/21	429	Ficus	Ficus sp.	50-ft fuel mod zone	H1 Quiet Zone	TRM				34.03987371	-118.5816055	15	1	4.5	4.5	30	0	5	5	5	5	10	92	Excellent	No	No	No
4/20/21	430	Ficus	Ficus sp.	50-ft fuel mod zone	H1 Quiet Zone	TRM				34.03985934	-118.5815054	20	2	23.7	12, 11.7	35	0	15	15	15	15	30	80	Good	No	No	No
4/20/21	431	Ficus	Ficus sp.	100-ft fuel mod zone	H1 Quiet Zone	TRM				34.03988862	-118.5814518	25	4	34	7, 5.2, 10.8, 11	45	0	15	20	15	15	35	84	Excellent	Yes	No	No
4/20/21	432	Fan Palm	Washingtonia sp.	100-ft fuel mod zone	H1 Quiet Zone	TRM				34.03979112	-118.5814179	45	1	28	28	60	0	15	15	15	15	30	100	Excellent	No	No	No
4/27/21	433	Eucalyptus	Eucalyptus globulus		H3	TRM				34.03868521	-118.5843564	20	1	23	23	0	0	0	15	0	0	15	32	Poor	Yes	No	No
4/27/21	434	Eucalyptus	Eucalyptus globulus		H3	SW	yes	yes	yes	34.03849515	-118.5843282	30	1	21.6	21.6	80	0	15	20	3	0	20	96	Excellent	No	No	No
4/27/21	435	Eucalyptus	Eucalyptus globulus		H3	SW	yes			34.03828295	-118.5843933	35	1	22	22	50	0	5	20	10	10	30	84	Excellent	No	No	No
4/27/21	436	Laurel Sumac	Malosma laurina		H3	SW	yes	yes	yes	34.03839573	-118.5841806	15	6	17.9	4, 3.4, 2.8, 2.6, 2.6, 2.5	80	15	10	15	10	10	25	96	Excellent	No	No	No
4/27/21	437	Eucalyptus	Eucalyptus globulus		H3	SW	yes	yes	yes	34.03837303	-118.5842142	25	1	20	20	50	0	10	15	5	0	15	84	Excellent	No	No	No
4/27/21	438	Juniper	Juniperus californica		H3	SW	yes	yes	yes	34.03828231	-118.5839961	15	2	19.2	9.7, 9.5	80	0	10	10	5	3	15	96	Excellent	No	No	No
4/27/21	439	Mexican Fan Palm	Washingtonia robusta		H1 Quiet Zone	SW	yes	yes	yes	34.03825811	-118.5836214	45	1	36	36	20	0	10	10	10	10	20	96	Excellent	No	No	No
4/27/21	440	Eucalyptus	Eucalyptus globulus		H1 100ft Buffer	SW	yes	yes	yes	34.03855874	-118.5833272	40	1	25.8	25.8	3	0	0	10	0	0	10	48	Fair	Yes	No	No
4/27/21	441	Myoporum	Myoporum laetum		H1 100ft Buffer	SW	yes	yes	yes	34.03854111	-118.5832333	15	4	19	6.1, 3.6, 4.3, 5	40	50	10	10	5	5	15	92	Excellent	No	No	No
4/27/21	442	Myoporum	Myoporum laetum		H1 100ft Buffer	SW	yes	yes	yes	34.03852122	-118.5832437	15	6	19.1	3.7, 3.2, 4, 3.2, 4, 2.6	1	40	5	10	5	5	15	64	Good	No	No	No
4/27/21	443	Eucalyptus	Eucalyptus globulus		H1 100ft Buffer	SW	yes	yes	yes	34.03850195	-118.583295	40	5	36.6	18, 1.4, 14, 1.1, 6, 1.5	60	60	0	20	5	0	20	76	Good	Yes	No	No
4/27/21	444	Eucalyptus	Eucalyptus globulus		H1 100ft Buffer	SW	yes	yes	yes	34.03838636	-118.5832466	20	2	16.4	9.5, 6.9	80	20	5	15	5	5	20	80	Good	No	Yes	No
4/27/21	445	Laurel Sumac	Malosma laurina		H1 100ft Buffer	SW	yes	yes	yes	34.03844617	-118.5832269	10	14	32.8	4, 4, 2, 4.3, 3.7, 3.6, 4, 2, 3, 3, 3, 3, 2.9, 2.6, 2.8, 1.4, 4, 2, 3, 5, 1, 3, 3, 1	80	40	5	10	5	5	15	84	Excellent	No	No	No
4/27/21	446	Tamarisk	Tamarix ramosissima		H1 100ft Buffer	SW	yes	yes	yes	34.03863727	-118.5828475	40	1	23.3	23.3	20	5	5	20	25	0	30	92	Excellent	No	No	No
4/27/21	447	Arroyo Willow	Salix lasiolepsis		H1	SE	yes			34.03884542	-118.5829377	20	6	24.4	3.7, 3.4, 4.7, 5, 2.2, 3, 3	80	10	5	3	5	5	10	100	Excellent	No	No	No
4/27/21	448	Myoporum	Myoporum laetum		H1 100ft Buffer	SE	yes	yes	yes	34.0390165	-118.5829632	10	4	13.1	4.3, 3.6, 2.9, 2.3	50	10	5	10	5	10	20	84	Excellent	No	No	No
4/27/21	449	Myoporum	Myoporum laetum		H1 100ft Buffer	SE	yes	yes	yes	34.03899432	-118.5829602	10	2	6.9	4.7, 2.2	20	50	3	5	5	5	10	72	Good	Yes	No	No
4/27/21	450	Myoporum	Myoporum laetum		H1 100ft Buffer	SE	yes	yes	yes	34.03905227	-118.5829492	15	6	20.9	6.4, 3.4, 3.4, 2.2, 2, 3, 2.5	20	30	5	10	5	5	15	68	Good	No	Yes	No
4/27/21	451	Canary Island Pine	Pinus canariensis		H1 100ft Buffer	SE	yes	yes	yes	34.03900832	-118.5829104	13	5	14.9	4.5, 4.5, 2, 1.9, 2	5	0	5	10	0	0	10	88	Excellent	No	No	No
4/27/21	452	Eucalyptus	Eucalyptus globulus		H1 100ft Buffer	SE	yes	yes	yes	34.03886821	-118.5828394	45	1	8.6	8.6	2	3	0	20	0	0	20	72	Good	No	No	No
4/27/21	453	Fan Palm	Washingtonia sp.		H1 100ft Buffer	SE	yes	yes	yes	34.0388056	-118.582859	8	1	11.2	11.2	100	0	3	3	3	3	6	100	Excellent	No	No	No
4/27/21	454	Tamarisk	Tamarix ramosissima		H1 100ft Buffer	SE	yes	yes	yes	34.03874972	-118.5828265	40	3	38.6	13.4, 12.7, 12.5	100	15	5	5	10	10	15	100	Excellent	No	No	No
4/27/21	455	Tamarisk	Tamarix ramosissima		H1 100ft Buffer	SE	yes	yes	yes	34.03878633	-118.5828027	35	3	38.6	12.2, 11, 15.4	80	20	0	3	5	3	6	100	Excellent	No	No	No
4/27/21	456	Tamarisk	Tamarix ramosissima		H1 100ft Buffer	SE	yes	yes	yes	34.03881808	-118.5827858	35	2	27.1	16, 11.1	80	20	5	5	5	15	20	100	Excellent	No	No	No
4/27/21	457	Tamarisk	Tamarix ramosissima		H1 100ft Buffer	SE	yes	yes	yes	34.03881975	-118.582727	15	1	6	6	20	20	3	1	1	3	4	88	Excellent	No	No	No
5/25/21	458	Tamarisk	Tamarix ramosissima		H1 100ft Buffer	SE	yes	yes	yes	34.03885992	-118.5827019	35	2	21.3	12.3, 9	80	20	3	3	20	5	23	100	Excellent	No	No	No
5/25/21	459	Myoporum	Myoporum laetum		H1 100ft Buffer	SE	yes	yes	yes	34.03888981	-118.5826946	15	3	12.1	4.7, 3, 4.4	75	0	7	7	7	7	14	100	Excellent	No	No	No
5/25/21	460	Tamarisk	Tamarix ramosissima		H1 100ft Buffer	SE	yes	yes	yes	34.03887199	-118.5826607	40	35	50.4	30.4, 20	80	20	15	25	20	5	35	96	Excellent	No	No	No
5/25/21	461	Eucalyptus	Eucalyptus polyanthemos		H1 Quiet Zone	SE		yes	yes	34.03874437	-118.5824118	45	1	29.3	29.3	20	0	15	25	20	20	45	96	Excellent	No	No	No
5/25/21	462	Fan Palm	Washingtonia sp.		H1 Quiet Zone	SE	yes	yes	yes	34.03885407	-118.5825515	40	1	11.3	11.3	80	20	3	3	3	3	6	100	Excellent	No	No	No
5/25/21	463	Eucalyptus	Eucalyptus globulus		H1 Quiet Zone	SE	yes	yes	yes	34.03888001	-118.5824431	35	2	13.3	8.8, 4.5	50	10	5	10	5	10	20	100	Excellent	No	No	No
5/25/21	464	Fan Palm	Washingtonia sp.		H1 Quiet Zone	SE	yes	yes	yes	34.03892183	-118.5824341	35	1	11.1	11.1	100	10	5	5	5	5	10	100	Excellent	No	No	No
5/25/21	465	Fan Palm	Washingtonia sp.		H1 Quiet Zone	SE	yes	yes	yes	34.03890065	-118.5824206	40	1	13.3	13.3	50	5	5	3	5	3	10	100	Excellent	No	No	No
5/25/21	466	Spineless Yucca	Yucca gigantea		H1 Quiet Zone	SE	yes	yes	yes	34.03891286	-118.5823545	25	1	22	22	100	5	6	10	5	3	13	100	Excellent	No	No	No
5/25/21	467	Fan Palm	Washingtonia sp.		H3	SE		yes	yes	34.03873888	-118.5822243	15	2	27	19.1, 7.9	100	0	3	3	3	3	6	100	Excellent	No	No	No
5/25/21	468	Fan Palm	Washingtonia sp.		H3	SE		yes	yes	34.03868358	-118.5821529	10	1	20.2	20.2	100	0	2	2	2	2	4	100	Excellent	No	No	No
5/26/21	469	Fan Palm	Washingtonia sp.		H3	SE		yes	yes	34.03872535	-118.5820041	20	1	18	18	50	0	3	3	3	3	6	100	Excellent	No	No	No
5/25/21	470	Fan Palm	Washingtonia sp.		H3	SE		yes	yes	34.03876865	-118.5819986	10	1	21.8	21.8	70	0	5	5	5	5	10	100	Excellent	No	No	No
5/25/21	471	Fan Palm	Washingtonia sp.		H3	SE		yes	yes	34.03876501	-118.5818826	12	1	18.6	18.6	80	0	5	5	5	5	10	100	Excellent	No	No	No
5/25/21	472	Chinese Elm	Ulmus parvifolia		H1 Quiet Zone	SE	yes		yes	34.03902491	-118.582317	30	1	14.4	14.4	75	10	15	15	10	10	25	96	Excellent	No	No	No
5/25/21	473	Spineless Yucca	Yucca gigantea		H1 Quiet Zone	SE	yes	yes	yes	34.03893873	-118.5822984	20	2	13.8	8.1, 5.7	100	10	3	3	3	2	6	96	Excellent	No	No	No
5/25/21	474	Chinese Elm	Ulmus parvifolia		H3	SE	yes		yes	34.03899982	-118.5822531	25	1	6.9	6.9	75	10	15	15	10	5	25	96	Excellent	No	No	No
5/25/21	475	Eucalyptus	Eucalyptus globulus		H3	SE	yes		yes	34.03903328	-118.5821602	45	1	22	22	80	10	15	20	20	20	40	88	Excellent	No	No	No
5/25/21	476	Eucalyptus	Eucalyptus globulus		H3	SE		yes	yes	34.03898572	-118.582084	35	4	19.2	10.5, 3.7, 2.5, 2.5	60	10	0	10	5	0	10	76	Good	No	No	No
5/25/21	477	Fan Palm	Washingtonia sp.		H3	SE	yes		yes	34.03904335	-118.5820912	45	1	13.4	13.4	10	20	3	3	3	3	6	96	Excellent	No	No	No

Date Collected	Tree Number	Common Name	Scientific Name	Within a Fuel Modification Zone?	SMMCLP Zone	Area	Within Alternative 2	Within Alternative 3	Within Alternative 4	Latitude	Longitude	Height (ft)	Number of Trunks	DBH Sum	DBH	Canopy Percent Shade	Slope Grade	Dripline North ft	Dripline East ft	Dripline South ft	Dripline West ft	Canopy Spread ft	Total Condition	Condition Category	Structure Problems	Pests Present	Disease Present
5/25/21	478	Fan Palm	Washingtonia sp.		H3	SE			yes	34.03902977	-118.5820439	40	1	11.1	11.1	10	20	3	3	3	3	6	92	Excellent	No	No	No
5/25/21	479	Fan Palm	Washingtonia sp.		H3	SE	yes		yes	34.03906079	-118.5820317	45	1	15.2	15.2	20	20	3	3	3	3	6	96	Excellent	No	No	No
5/25/21	480	Fan Palm	Washingtonia sp.		H3	SE			yes	34.03904259	-118.5819853	10	1	15.2	15.2	50	5	3	3	3	3	6	100	Excellent	No	No	No
5/25/21	481	Fan Palm	Washingtonia sp.		H3	SE		yes	yes	34.03902324	-118.5819871	30	1	16.2	16.2	80	0	5	5	5	5	10	100	Excellent	No	No	No
5/25/21	482	Fan Palm	Washingtonia sp.		H3	SE			yes	34.03906261	-118.5819702	25	1	16.8	16.8	50	5	3	3	3	3	6	96	Excellent	No	No	No
5/25/21	483	Eucalyptus	Eucalyptus globulus		H3	SE			yes	34.03907012	-118.5819168	50	1	16.6	16.6	40	5	15	20	20	20	40	100	Excellent	No	No	No
5/25/21	484	Fan Palm	Washingtonia sp.		H3	SE		yes	yes	34.03905215	-118.581929	50	1	21.3	21.3	20	2	3	0	3	0	6	92	Excellent	No	No	No
5/25/21	485	Fan Palm	Washingtonia sp.		H3	SE		yes	yes	34.03904486	-118.58189	45	1	19	19	20	5	2	2	2	2	4	100	Excellent	No	No	No
5/25/21	486	Eucalyptus	Eucalyptus globulus		H3	SE			yes	34.0390904	-118.5818845	45	1	9.9	9.9	30	10	10	20	15	3	25	96	Excellent	No	No	No
5/25/21	487	Eucalyptus	Eucalyptus globulus		H3	SE		yes	yes	34.0390643	-118.5818526	35	1	7.2	7.2	40	5	0	15	10	0	15	88	Excellent	No	No	No
5/25/21	488	Fan Palm	Washingtonia sp.		H3	SE	yes		yes	34.0391007	-118.5819332	45	1	19.3	19.3	20	20	3	3	3	3	6	100	Excellent	No	No	No
5/25/21	489	Fan Palm	Washingtonia sp.		H3	SE	yes		yes	34.03912165	-118.5819588	10	1	16.8	16.8	20	0	2	2	2	2	4	100	Excellent	No	No	No
5/25/21	490	Elm	Ulmus sp.	200-ftfuelmodzone	H3	SE	yes		yes	34.03917597	-118.5818865	20	1	9.5	9.5	50	5	10	10	0	0	10	92	Excellent	No	No	No
5/25/21	491	Fan Palm	Washingtonia sp.		H3	SE	yes		yes	34.03914689	-118.5818549	40	1	14.9	14.9	20	20	5	10	10	5	15	100	Excellent	No	No	No
5/25/21	492	Fan Palm	Washingtonia sp.	200ft of Reel Inn	H3	SE	yes		yes	34.03917375	-118.5818383	40	1	10.7	10.7	50	20	5	5	5	5	10	100	Excellent	No	No	No
5/25/21	493	Elm	Ulmus sp.		H3	SE			yes	34.03912391	-118.581776	35	1	15.7	15.7	50	10	6	15	10	10	25	100	Excellent	No	No	No
5/25/21	494	Fan Palm	Washingtonia sp.		H3	SE		yes	yes	34.03909412	-118.5817603	20	1	33	33	100	5	10	10	10	10	20	100	Excellent	No	No	No
6/16/21	495	Fan Palm	Washingtonia sp.		H3	SE		yes	yes	34.03912827	-118.581681	60	1	16.2	16.2	20	30	3	3	3	3	6	100	Excellent	No	No	No
6/16/21	496	Fan Palm	Washingtonia sp.	200-ftfuelmodzone	H3	SE			yes	34.03914585	-118.5817143	55	1	17.1	17.1	20	20	3	3	3	3	6	100	Excellent	No	No	No
6/16/21	497	Fan Palm	Washingtonia sp.	200-ftfuelmodzone	H3	SE	yes		yes	34.03916693	-118.5817055	50	1	12.1	12.1	20	20	3	3	3	3	6	100	Excellent	No	No	No
6/16/21	498	Fan Palm	Washingtonia sp.	200-ftfuelmodzone	H3	SE	yes		yes	34.03921462	-118.5815794	60	1	14.5	14.5	40	20	5	3	5	5	10	100	Excellent	No	No	No
6/16/21	499	Fan Palm	Washingtonia sp.	200-ftfuelmodzone	H3	SE	yes		yes	34.03921326	-118.5816242	60	1	14.6	14.6	50	20	5	5	5	5	10	100	Excellent	No	No	No
6/16/21	500	Fan Palm	Washingtonia sp.	200-ftfuelmodzone	H3	SE	yes		yes	34.03932034	-118.5815219	35	1	20	20	40	40	5	5	5	5	10	100	Excellent	No	No	No
6/16/21	501	Laurel Sumac	Malosma laurina	200-ftfuelmodzone	H3	SE	yes		yes	34.03929903	-118.5814393	15	6	15.8	3.5, 3, 2, 1, 3.3, 3	95	10	7	7	7	7	14	84	Excellent	No	No	No
6/16/21	502	Eucalyptus	Eucalyptus sp.		H3	SE		yes	yes	34.03921791	-118.5813912	25	2	14.8	7.5, 7.3	75	0	10	5	0	10	15	92	Excellent	No	No	No
6/16/21	503	Eucalyptus	Eucalyptus sp.		H3	SE			yes	34.03919799	-118.5813858	25	3	24.4	8, 2, 14.4	75	0	5	5	20	15	25	96	Excellent	No	No	No
6/16/21	504	Eucalyptus	Eucalyptus sp.		H3	SE			yes	34.03919884	-118.5813849	30	1	7.6	7.6	80	0	3	15	2	0	15	96	Excellent	No	No	No
6/16/21	505	Eucalyptus	Eucalyptus sp.		H3	SE			yes	34.03919844	-118.5813851	30	1	6.5	6.5	70	0	0	15	15	0	15	92	Excellent	No	No	No
6/16/21	506	Eucalyptus	Eucalyptus sp.	200-ftfuelmodzone	H3	SE	yes		yes	34.03929771	-118.5813863	40	1	14.1	14.1	75	5	5	10	15	15	25	92	Excellent	No	No	No
6/16/21	508	Fan Palm	Washingtonia sp.	200-ftfuelmodzone	H3	SE	yes		yes	34.0393289	-118.5813875	35	1	17	17	80	10	5	5	5	5	10	100	Excellent	No	No	No
6/16/21	509	Eucalyptus	Eucalyptus globulus	200-ftfuelmodzone	H3	SE	yes		yes	34.03931842	-118.581352	25	7	14.1	7,2,0.4,0.8,3,2.8,3	40	10	1	10	12	3	13	100	Excellent	No	No	No
6/16/21	510	Fan Palm	Washingtonia sp.	200-ftfuelmodzone	H3	SE	yes		yes	34.03935044	-118.5813635	45	1	14.4	14.4	70	10	5	5	5	5	10	100	Excellent	No	No	No
6/16/21	511	Fan Palm	Washingtonia sp.		H3	SE		yes	yes	34.03923172	-118.5812954	20	1	10.6	10.6	60	5	3	3	3	3	6	100	Excellent	No	No	No
6/16/21	512	Eucalyptus	Eucalyptus globulus		H3	SE		yes	yes	34.03927948	-118.5812622	35	1	28	28	80	0	15	20	20	5	35	72	Good	Yes	No	No
6/16/21	513	Acacia	Acacia sp.	200-ftfuelmodzone	H3	SE	yes		yes	34.03940598	-118.5812653	25	7	27.5	5.2, 4.3, 4.6, 2.2, 4.3, 4.4	100	10	10	10	10	10	20	100	Excellent	No	No	No
6/16/21	514	Fan Palm	Washingtonia sp.	200-ftfuelmodzone	H3	SE	yes			34.03940443	-118.5812029	40	1	19.3	19.3	70	5	3	3	3	3	6	100	Excellent	No	No	No
6/16/21	515	Brazilian Pepper	Schinusterebinthifolia	200-ftfuelmodzone	H3	SE	yes			34.03942552	-118.5812214	25	1	12.3	12.3	70	10	2	2	2	2	4	96	Excellent	No	No	No
6/16/21	516	Lemonade Berry	Rhus integrifolia	200-ftfuelmodzone	H3	SE	yes			34.03943497	-118.5811129	15	4	13.5	4.5, 4, 3.5, 1.5	100	5	3	3	5	3	8	96	Excellent	No	No	No
6/16/21	517	Lemonade Berry	Rhus integrifolia	200-ftfuelmodzone	H3	SE	yes			34.03945124	-118.5811222	15	2	7.3	4.3, 3	100	5	0	5	5	0	5	100	Excellent	No	No	No
6/16/21	518	Fan Palm	Washingtonia sp.		H3	SE		yes	yes	34.03936996	-118.5810788	35	1	16.7	16.7	60	10	3	3	3	3	6	100	Excellent	No	No	No
6/16/21	519	Fan Palm	Washingtonia sp.		H3	SE			yes	34.0393689	-118.581083	30	1	12.5	12.5	50	10	1	2	0	0	2	92	Excellent	No	No	No
6/16/21	520	Eucalyptus	Eucalyptus globulus		H3	SE	yes		yes	34.03941679	-118.5810324	25	1	6.6	6.6	50	0	3	5	5	10	15	76	Good	No	No	No
6/16/21	521	Fan Palm	Washingtonia sp.	200-ftfuelmodzone	H3	SE	yes			34.03950654	-118.5810879	30	1	14.8	14.8	90	20	5	5	5	5	10	100	Excellent	No	No	No
6/16/21	522	Fan Palm	Washingtonia sp.	200-ftfuelmodzone	H3	SE				34.03952986	-118.5810389	30	1	14	14	90	40	5	5	5	5	10	100	Excellent	No	No	No
6/16/21	523	Fan Palm	Washingtonia sp.	200-ftfuelmodzone	H3	SE				34.03949323	-118.5810299	45	1	12.5	12.5	90	35	5	5	5	5	10	100	Excellent	No	No	No
6/16/21	524	Eucalyptus	Eucalyptus globulus		H3	SE	yes		yes	34.03942883	-118.5809969	15	1	6.1	6.1	70	0	0	2	5	5	7	80	Good	No	No	No
6/16/21	525	Eucalyptus	Eucalyptus globulus		H3	SE	yes		yes	34.03947724	-118.5809306	25	1	8	8	10	0	0	0	0	10	10	60	Fair	No	Yes	No
6/16/21	526	Eucalyptus	Eucalyptus globulus		H3	SE	yes		yes	34.03946175	-118.5809207	35	1	5.7	5.7	5	0	0	0	20	0	20	76	Good	No	No	No
6/16/21	528	Fan Palm	Washingtonia sp.		H3	SE	yes		yes	34.03947517	-118.5808774	35	1	14.3	14.3	80	50	5	5	5	5	10	100	Excellent	No	No	No
6/16/21	529	Fan Palm	Washingtonia sp.		H3	SE	yes	yes	yes	34.03946464	-118.5808582	20	1	14	14	60	60	2	2	2	1	4	100	Excellent	No	No	No
6/16/21	530	Fan Palm	Washingtonia sp.		H3	SE		yes	yes	34.03946646	-118.5808216	15	1	14.2	14.2	5	0	0	0	0	0	0	88	Excellent	No	No	No
6/16/21	531	Brazilian Pepper	Schinusterebinthifolia		H3	SE			yes	34.03954672	-118.5809209	15	3	13.5	6, 3, 4.5	90	25	10	10	5	10	20	92	Excellent	No	No	No
6/16/21	532	Fan Palm	Washingtonia sp.		H3	SE				34.03957474	-118.5808989	35	1	18.4	18.4	80	20	5	5	5	5	10	100	Excellent	No	No	No
6/16/21	533	Acacia	Acacia sp.		H3	SE				34.03960426	-118.5808812	15	2	7.5	4, 3.5	90	30	10	10	10	10	20	100	Excellent	No	No	No
6/16/21	534	Eucalyptus	Eucalyptus globulus		H3	SE			yes	34.03945533	-118.580744	35	1	8.8	8.8	80	10	10	15	10	10	25	80	Good	No	No	No
6/16/21	535	Brazilian Pepper	Schinusterebinthifolia		H3	SE		yes	yes	34.03950353	-118.5807454	20	4	21.3	5.5, 4.5, 4.5, 6.8	40	50	10	10	10	10	20	80	Good	No	No	No
6/16/21	536	Eucalyptus	Eucalyptus globulus		H3	SE	yes	yes	yes	34.03954188	-118.5807053	30	1	18.2	18.2	90	50	5	15	10	10	25	92	Excellent	No	Yes	No
6/16/21	537	Mountain mahogany	Cercocarpus sp.		H3	SE			yes	34.03968983	-118.5806932	10	6	10.5	2.5, 1, 1, 2.5, 2, 1.5	80	25	3	3	3	5	8	84	Excellent	No	No	No
6/16/21	538	Fan Palm	Washingtonia sp.		H3	SE			yes	34.03969919	-118.580618	15	1	15.8	15.8	95	15	5	5	5	5	10	100	Excellent	No	No	No
6/16/21	539	Eucalyptus	Eucalyptus globulus		H3	SE	yes	yes	yes	34.03959533	-118.5805804	30	5	61.1	15.5, 15.2, 10.1, 9.3, 11	50	60	10	15	10	15	30	84	Excellent	No	No	no
6/16/21	540	Aleppo pine	Pinus halipensis		H3	SE			yes	34.03979005	-118.5804854	20	1	11.6	11.6	2	0	10	10	10	10	20	68	Good	No	No	No
6/16/21	541	Aleppo pine	Pinus halipensis		H3	SE			yes	34.03981025	-118.5804257	30	1	11.8	11.8	40	0	5	10	5	5	15	72	Good	No	No	No
2/22/21	542	Canary Island Pine	Pinus canariensis		H3	NW				34.0392812	-118.5839978	30	1	16	16	40	0	15	20	10	10	30	80	Good	No	No	No
2/23/21	543	Eucalyptus	Eucalyptus sp.		H4	NW				34.03945641	-118.583931		2	30.5	20.5, 10	40	0	15	15	0	5	20	76	Good	yes	No	No

Date Collected	Tree Number	Common Name	Scientific Name	Native?	Protected	Longitude	Latitude	Height (ft)	Number of Trunks	DBH	Canopy Percent	Dripline North	Dripline East	Dripline South	Dripline West	Growth Cracks	Root Condition	Trunk Condition	Scaffold Branch Condition	Twig Condition	Foliage Condition	Structure Problems	Pests Present	Diseeae Present	Comments
11/9/21	544	Eucalytpus	Eucalytpus globulus	no	no	-118.58002	34.0446097	35	1	31	40	20	20	10	9	No	3	4	4	4	4	No	Yes	No	Good
11/9/21	545	Pine		no	no	-118.58003	34.0446049	30	1	20.9	0	8	10	12	14	Yes	2	3	4	3	2	Yes	Yes	No	Fair
11/9/21	546	Eucalytpus	Eucalytpus	no	no	-118.58008	34.0446386	20	1	10	40	10	5	5	10	No	3	3	4	4	4	No	Yes	No	Fair
11/9/21	547	Cypress	Cupressus sempervirens	no	no	-118.58025	34.0446114	20	1	20	80	10	8	12	15	Yes	4	3	4	4	4	No	No	No	Cypress. Good
11/9/21	548	Eucalytpus	Eucalytpus	no	no	-118.58023	34.0445605	40	1	41.3	55	10	20	20	15	No	3	4	3	4	4	No	No	No	Good
11/9/21	549	Eucalytpus	Eucalytpus	no	no	-118.58017	34.0445743	30	1	27.3	55	25	10	15	10	No	3	4	4	4	4	No	Yes	No	Good
11/9/21	550	Eucalytpus	Eucalytpus	no	no	-118.58017	34.0445164	25	1	36	40	5	20	20	10	No	3	4	4	4	4	No	Yes	No	Good
11/9/21	551	Brazilian Pepper	Schinus terebinthifolia	no	no	-118.58022	34.0444594	15	3	12.4, 11.8, 9.5	70	20	20	12	12	Yes	2	4	4	4	4	No	Yes	No	Good
11/9/21	552	Eucalytpus	Eucalytpus	no	no	-118.57998	34.0445488	25	1	30	65	20	8	15	15	No	4	4	4	4	4	No	Yes	No	Good
11/9/21	553	Eucalytpus	Eucalytpus	no	no	-118.57995	34.0445433	20	4	10, 13.6, 12.8, 14.8	35	5	20	30	8	No	4	4	4	4	3	No	Yes	No	Good.
11/9/21	554	Eucalytpus	Eucalytpus	no	no	-118.57996	34.044392	25	1	28.5	65	20	15	15	25	No	3	3	4	4	4	No	Yes	No	Good
11/9/21	555	Toyon	Heteromeles arbutifolia	no	no	-118.57997	34.0442219	10	3	6, 6.2, 4.3	40	8	6	6	8	No	3	3	2	2	1	No	Yes	Yes	Good. Toyon
11/9/21	556	Eucalytpus	Eucalytpus	no	no	-118.57987	34.0441342	20	3	28.7, 9.1, 20.2	65	20	22	15	17	No	4	5	4	4	3	No	Yes	No	Good - next to gate
11/9/21	557	Eucalytpus	Eucalytpus	no	no	-118.57994	34.0440830	25	1	15	65	15	20	25	22	No	2	4	4	4	4	No	Yes	No	Good. On slope
11/9/21	558	Mexican Fan Palm		no	no	-118.57976	34.0437858	25	1	22.1	35	5	5	4	4	No	4	4	4	4	2	No	Yes	No	Good. Mexican fan palm
11/9/21	559	Elderberry	Sambucus nigra	yes	yes	-118.57978	34.0436144	15	3	15.5, 13.6, 11.2	40	10	12	12	20	Yes	4	4	3	2	2	No	No	No	Good
11/9/21	560	Monkey Puzzle		no	no	-118.57966	34.0435541	25	1	12.6	95	4	10	10	8	No	5	5	4	4	4	No	No	No	Monkey puzzle. Good
11/9/21	561	Cherry		no	no	-118.57975	34.0434923	15	4	8.5, 4.9, 3, 6	65	11	8	5	15	No	4	4	4	4	4	No	Yes	No	Cherry species. Fair
11/9/21	562	Ficus	Ficus sp.	no	no	-118.5796	34.0436207	20	1	15.2	40	20	15	9	9	No	4	4	3	3	3	No	Yes	No	Weeping fig. Good
11/9/21	563	Ficus	Ficus sp.	no	no	-118.57956	34.0436423	20	3	6.7, 8.7, 5.2	20	5	15	9	8	No	4	4	4	4	4	No	No	No	Weeping fig. Good
11/9/21	564	Mexican Fan Palm		no	no	-118.57954	34.043633	30	1	15.7	0	2	2	2	2	No	3	3	1	1	1	Yes	No	No	Mexican fan Palm, dead?
11/9/21	565	Ficus	Ficus sp.	no	no	-118.57951	34.0435885	20	5	14, 8.4, 6.6, 8.4, 8.8	70	10	7	9	12	No	4	4	4	4	4	No	Yes	No	Weeping fig good
11/9/21	566	Mexican Fan Palm		no	no	-118.5797	34.0434369	30	1	20	50	4	4	4	4	No	3	3	4	4	3	No	Yes	No	Fan palm, good
11/9/21	567	Canary Island Palm		no	no	-118.57964	34.0434232	35	1	32.5	95	9	9	9	9	No	4	5	4	4	4	No	No	No	Canary island palm good.
11/9/21	568	Eucalytpus	Eucalytpus	no	no	-118.5794	34.043357	20	1	18	80	17	10	9	7	No	4	4	4	4	4	No	Yes	No	Good
11/9/21	569	Eucalytpus	Eucalytpus	no	no	-118.57938	34.0433215	20	3	13.8, 2.4, 4.2	80	5	8	8	15	No	4	4	4	4	5	No	Yes	No	Good
11/9/21	570	Eucalytpus	Eucalytpus	no	no	-118.57937	34.0433036	20	1	10.2	90	2	10	5	15	No	4	4	4	4	4	No	No	No	Good
11/9/21	571	Eucalytpus	Eucalytpus	no	no	-118.57935	34.0432752	20	1	18	90	7	7	7	7	No	4	4	4	4	4	No	Yes	No	Good
11/9/21	572	Velvet Ash		no	no	-118.57943	34.0433089	15	2	12, 3.3	10	5	10	5	7	Yes	4	4	4	4	3	No	Yes	No	Velvet ash. Good
11/9/21	573	Eucalytpus	Eucalytpus	no	no	-118.57944	34.043224	25	1	24.3	80	15	25	15	10	No	4	4	4	4	4	No	Yes	No	Fair
11/9/21	574	Cherry		no	no	-118.5793	34.0431675	15	4	9.3, 6.3, 9.8, 1.1	78	15	5	5	10	No	4	3	3	4	5	No	Yes	No	Cherry species. Fair
11/9/21	575	Elderberry	Sambucus nigra	yes	yes	-118.57953	34.0430756	20	1	10	0	0	0	0	0		0	0	0	0	0				Good. Growing down the slope
11/9/21	575	Eucalytpus	Eucalytpus	no	no	-118.57955	34.0431101	20	1	12	0	0	0	0	0		0	0	0	0	0				Good
11/9/21	577	Cherry		no	no	-118.57939	34.0429673	30	1	20	0	0	0	0	0		0	0	0	0	0				Cherry species. Good
11/9/21	578	Pine		no	no	-118.57933	34.0430156	30	1	20	75	10	15	5	5	Yes	4	4	4	4	4	No	Yes	No	Good
11/9/21	579	Pine		no	no	-118.57927	34.0429997	20	1	12	80	5	5	15	10	Yes	2	3	4	4	4	No	Yes	No	Fair
11/9/21	580	Dracaena	Dracaena sp.	no	no	-118.57931	34.0429577	15	5	12, 5.6, 6.1, 4.4, 4.6	70	2	2	6	4	No	4	4	4	4	3	No	Yes	No	Good
11/9/21	581	Rubber Plant		no	no	-118.57929	34.0429325	15	3	7.5, 7.6, 9.8	75	18	10	10	7	No	4	5	5	4	5	No	Yes	No	Rubber plant good
11/9/21	582	Sweet Pittosporum		no	no	-118.57931	34.0427943	10	1	5.5	38	5	10	8	8	No	4	4	4	4	4	No	No	No	Pittosporum, fair
11/9/21	583	Brazilian Pepper	Schinus terebinthifolia	no	no	-118.57938	34.0427456	25	1	19.5	20	15	20	8	8	Yes	4	4	4	4	4	No	Yes	No	Good
11/9/21	585	Pomegranate		no	no	-118.57913	34.0427157	10	1	5, 1, 1, 1, 1, 1+	60	15	7	10	8	No	4	4	4	4	4	No	Yes	No	Good, many trunks ~ 1 in. pomegranate
11/9/21	586	Pine		no	no	-118.57914	34.0427225	20	2	17.7, 8	40	10	10	10	10	Yes	4	4	4	4	4	No	Yes	No	Fair
11/9/21	587	Cherry		no	no	-118.57906	34.0426174	20	4	9.5, 4.3, 2.4, 2.6	85	10	5	5	10	Yes	4	4	4	4	4	No	Yes	No	Island cherry. Good
11/9/21	588	Cherry		no	no	-118.57904	34.042579	20	1	7	65	4	9	8	9	Yes	4	4	4	4	4	No	Yes	No	Island cherry, good
11/9/21	589	Blue Jacaranda		no	no	-118.57912	34.0425855	20	5	12.5, 0.7, 2.2, 4.1, 0.8	40	10	15	15	7	No	4	4	4	4	5	No	Yes	No	Blue jacaranda good
11/9/21	590	Eucalytpus	Eucalytpus	no	no	-118.57924	34.0423845	25	1	43.9	60	10	25	15	10	No	4	4	5	4	4	No	Yes	No	Fair
11/9/21	591	Ficus	Ficus sp.	no	no	-118.57918	34.0423893	15	2	6, 5.7	5	8	10	10	5	Yes	4	4	3	3	3	No	Yes	No	Fair
11/9/21	592	Ficus	Ficus sp.	no	no	-118.57917	34.0423854	0	1	6.6	0	8	10	5	5	Yes	4	3	3	2	3	No	Yes	No	Poor
11/9/21	593	Ficus	Ficus sp.	no	no	-118.57916	34.0423841	20	1	8	5	5	10	5	5	Yes	4	4	3	3	2	No	Yes	No	Poor
11/9/21	594	Ficus	Ficus sp.	no	no	-118.57916	34.0423858	20	2	3.5, 6.5	3	3	8	2	2	Yes	4	4	3	3	3	Yes	Yes	No	Poor
11/9/21	595	Ficus	Ficus sp.	no	no	-118.57915	34.0423654	20	3	6.6, 2.5, 3.8	2	10	5	5	2	Yes	4	4	3	3	3	No	Yes	No	Poor
11/9/21	596	Toyon		no	no	-118.57897	34.042361	20	5	7, 3, 3.5, 4, 3.5	10	6	8	10	8	Yes	4	1	2	1	2	Yes	Yes	No	Toyon fair - many dead trunks
11/9/21	597	California Pepper	Schinus molle	no	no	-118.57891	34.0422676	20	2	15.3, 21.3	80	15	8	20	20	Yes	4	5	4	5	5	No	No	No	Good
11/9/21	598	Hibiscus		no	no	-118.57888	34.0421458	20	1	8.5	80	10	5	5	7	No	4	4	5	5	5	No	Yes	No	Hibiscus. Good
11/9/21	599	Eucalytpus	Eucalytpus	no	no	-118.57888	34.0421333	25	1	29	80	25	10	10	15	No	4	4	4	4	3	No	Yes	No	Good
11/9/21	600	Sweet Pittosporum		no	no	-118.57886	34.0420387	10	5	5.5, 5, 4.5, 2, 3	35	8	3	20	20	No	3	2	3	3	3	Yes	Yes	No	Pittosporum good tag facing west
11/9/21	601	California Pepper	Schinus molle	no	no	-118.57887	34.0419125	20	1	15.5	25	5	20	10	5	Yes	4	4	4	4	3		Yes	No	Good
11/9/21	602	Fire Thorn		no	no	-118.57887	34.0419112	10	5	5, 4.7, 2.2, 2.5, 0.8	5	5	6	8	5	No	4	4	4	4	3	No	Yes	No	Fire thorn fair, can't find it
11/9/21	603	Eucalytpus	Eucalytpus	no	no	-118.5789	34.0419255	50	1	44	80	15	10	17	20	No	4	4	4	4	4	No	Yes	No	Good
11/9/21	604	Eucalytpus	Eucalytpus	no	no	-118.57898	34.0419214	30	1	27.5	25	5	9	12	6	No	4	4	4	5	5	No	Yes	No	Fair
11/9/21	605	Eucalytpus	Eucalytpus	no	no	-118.57903	34.041898	35	1	36	85	12	12	15	13	No	4	5	5	4	5	No	No	No	Good
11/9/21	606	Eucalytpus	Eucalytpus	no	no	-118.57903	34.0418973	30	1	13	0	13	5	10	14	No	4	4	2	1	1	Yes	No	No	Poor - almost dead
11/9/21	607	Dracaena	Dracaena sp.	no	no	-118.57905	34.0419034	15	1	5	60	2	4	2	4	No	4	4	4	4	4	No	Yes	No	Poor
11/9/21	608	Eucalytpus	Eucalytpus	no	no	-118.57906	34.0418828	30	6	12, 14, 12, 17.6, 6.9, 7.4	65	20	10	12	12	No	3	4	4	4	4	No	Yes	No	Fair
11/9/21	609	Pine		no	no	-118.57904	34.0417768	15	1	16	0	10	14	20	14	Yes	3	4	4	4	2	No	Yes	No	Good
11/9/21	610	Dracaena	Dracaena sp.	no	no	-118.57905	34.0417394	10	1	14	45	0	5	5	7	No	3	3	3	4	3	No	Yes	No	Fair
11/9/21	611	Jacaranda		no	no	-118.57893	34.0417883	20	1	8	0	0	0	0	0		0	0	0	0	0				Jacaranda good
11/9/21	612	Brazilian Pepper	Schinus terebinthifolia	no	no	-118.57893	34.0417656	15	2	8.9, 6.5	18	6	10	20	5	Yes	4	4	4	4	3	No	Yes	No	Fair
11/9/21	613	Cherry		no	no	-118.57902	34.041577	20	1	11	85	5	4	5	5	No	4	4	4	4	3	No	Yes	No	Start of line of cherries. Good
11/9/21	614	Cherry		no	no	-118.57902	34.0415769	20	2	5.5, 6.5	85	10	4	13	4	No	4	4	4	4	4	No	Yes	No	Cherry good
11/9/21	615	Cherry		no	no	-118.57901	34.0415776	20	2	8.1, 5.4	85	7	5	12	5	No	4	4	4	4	4	No	Yes	No	Cherry good
11/9/21	616	Cherry		no	no	-118.579	34.0415767	20	2	4.5, 7.4	85	15	5	14	5	No	4	4	4	4	4	No	No	No	Cherry good
11/9/21	617	Cherry		no	no	-118.57899	34.0415766	20	1	7.1	0	7	5	5	5	No	4	3	3	4	4	No	Yes	No	Cherry good
11/9/21	618	Cherry		no	no	-118.57898	34.0415762	20	2	7, 6.3	85	6	5	10	5	No	4	4	4	4	4	No	Yes	No	Cherry good
11/9/21	619	Cherry		no	no	-118.57898	34.0415763	20	1	10.2	85	5	5	10	5	No	4	2	3	4	4	No	Yes	No	Cherry good tag is on grapevine DBH includes vine
11/9/21	620	Cherry		no	no	-118.57897	34.0415752	20	1	7	85	6	5	10	5	No	4	4	4	4	5	No	Yes	No	Cherry good
11/9/21	621	Cherry		no	no	-118.57896	34.0415761	20	1	7.6	0	10	5	10	5	No	4	4	4	4	5	No	Yes	No	Cherry good
11/9/21	622	Cherry		no	no	-118.57896	34.0415777	20	2	10, 7.2	0	5	4	5	3	No	4	1	1	1	1	Yes	No	No	Cherry good, dead? covered in grape
11/9/21	623	Cherry		no	no	-118.57895	34.0415782	20	4	8, 3, 8.5, 6.5	15	8	4	6	4	No	4	1	1	1	1	Yes	Yes	No	Cherry good
11/9/21	624	Cherry		no	no	-118.57894	34.0415795	20	1	5.4	0	4	5	5	5	No	4	2	2	2	1	Yes	Yes	No	Cherry good
11/9/21	625	Cherry		no	no	-118.57893	34.041582	20	1	4.4	10	5	1	1	2	No	4	3	1	1	1	No	Yes	No	Cherry good
11/9/21	626	Cherry		no	no	-118.57892	34.0415844	20	1	28.1	65	8	15	20	4	No	4	2	2	1	1	Yes	Yes	No	Cherry good
11/9/21	627	Laurel Sumac	Malosma laurina	yes	yes	-118.57878	34.0415236	20	8	7, 6.2, 2.5, 4, 3.8, 2.7, 3.5, 2.7	0	15	8	20	6	No	3	2	3	3	4	Yes	Yes	No	Sumac good
11/9/21	628	Pine		no	no	-118.57905	34.0414884	20	1	11.3	80	8	10	9	6	Yes	0	4	3	2	2	No	Yes	No	Good
11/9/21	629	Pine		no	no	-118.57905	34.0414633	20	1	8.9	80	5	5	6	5	No	4	3	4	5	4	No	Yes	No	Good
11/9/21	630	Sweet Pittosporum		no	no	-118.579	34.0413876	15	1	8	5	5	5	7	5	No	4	1	4	3	3	No	Yes	No	Pittosporum good, by crew search - have been cu
11/9/21	631	Cherry		no	no	-118.57897	34.0413074	20	1	9.2	85	5	4	10	5	No	4	4	4	4	5	No	Yes	No	Good cherry, ID
11/9/21	632	Eucalytpus	Eucalytpus	no	no	-118.57929	34.0410097	35	1	24.2	65	12	10	30	12	Yes	3	4	4	4	4	No	Yes	No	Good
11/9/21	633	Eucalytpus	Eucalytpus	no	no	-118.57918	34.0408593	20	1	20	65	30	10	5	18	Yes	4	3	3	4	4	No	Yes	No	Good
11/9/21	634	Eucalytpus	Eucalytpus	no	no	-118.57919	34.0408469	20	1	15	35	24	1	1	1	Yes	3	4	3	3	4	No	Yes	No	Good
11/9/21	635	Eucalytpus	Eucalytpus	no	no	-118.5792	34.0408386	20	2	12.4, 7.3	40	9	6	12	12	Yes	2	3	4	4	4	No	Yes	No	Good
11/9/21	636	Chinese Elm		no	no	-118.57925	34.0407674	20	2	11.2, 10.1	70	9	3	20	9	No	4	3	4	4	3	No	Yes	No	Chinese elm, good
11/9/21	637	Cypress	Cupressus sempervirens	no	no	-118.57934	34.0408401	15	1	8.6	20	0	15	10	0	No	3	1	3	3	1	Yes	Yes	No	Cypress. Poor
11/9/21	638	Pine		no	no	-118.5795	34.0407619	20	1	20.5	70	0	0	0	0	No	1	2	3	4	4	Yes	Yes	No	Good
11/9/21	639	Monterey Pine	Pinus radiata	no	no	-118.57953	34.0407859	25	1	20	40	3	0	10	20	Yes	3	2	2	2	2	Yes	Yes	No	Good. In chicken coop. Monterey Pine
11/9/21	640	Sycamore	Platanus racemosa	yes	yes	-118.57996	34.0404305	35	1	41.7	80	30	20	18	33	Yes	4	4	3	4	4	No	Yes	Yes	Good. In oasis
11/9/21	641	Sycamore	Platanus racemosa	yes	yes	-118.58011	34.0405466	30	3	15.6, 12.1, 10.9	45	15	20	20	25	No	2	3	3	3	3	No	Yes	No	Good in oasis
11/9/21	642	Canary Island Palm	Phoenix canariensis	no	no	-118.57955	34.0407437	25	1	46.4	95	10	10	10	10	No	2	4	4	0	4	No	Yes		Canary island palm. Good. Location is off.

APPENDIX C

TOPANGA LAGOON TREE PHOTOS

April – November 2021

#1. California Pepper (34.03969955, -118.5839955)
trunks = 4 DBH= 20.8, 17.0, 16.0, 15.0

#2. Fan Palm (34.03969955, -118.5839996)
trunks = 1 DBH= 18.0

#3. Fan Palm (34.03969955, -118.5839966)
trunks = 1 DBH= 18.0

#4. Dracaena (34.03969955, -118.5839996)
trunks = 1 DBH= 20.0

#5. Dracaena (34.03969874, -118.5839996)
trunks = 1 DBH= 52.0

#6. Eucalyptus (34.0401001, -118.5830002)
trunks = 1 DBH= 28.0

#7. Monterey Pine (34.04019928, -118.5830002)
trunks = 1 DBH= 8.0

#8. Eucalyptus (34.04019928, -118.5830002)
trunks = 1 DBH= 29.0

#9. Eucalyptus (34.04029846, -118.5830002)
trunks = 1 DBH= 32.0

#10. Fan Palm (34.04019928, -118.5830002)
trunks = 1 DBH= 12.0

#11. Eucalyptus (34.04029846, -118.5830002)
trunks = 1 DBH= 19.4

#12. Eucalyptus (34.04019928, -118.5830002)
trunks = 1 DBH= 26.0

#13. Eucalyptus (34.04019928, -118.5830002)
trunks = 1 DBH= 29.5

#14. Eucalyptus (34.04019928, -118.5830002)
trunks = 1 DBH= 25.0

#15. Eucalyptus (34.04029846, -118.5830002)
trunks = 9 DBH= 12.0, 11.0, 8.5,
6.5, 4.5, 4.0, 7.0, 3.0, 5.0, 4.5

#16. Elderberry (34.04050064, -118.5830002)
trunks = 4 DBH= 8.5, 7.5, 5.4, 3.0

#17. Podocarpus (34.04040146, -118.5830002)
trunks = 1 DBH= 17.3

#18. Ficus (34.04050064, -118.5830002)
trunks = 2 DBH= 12.0, 1.8

#19. Ficus (34.04050064, -118.5830002)
trunks = 9 DBH= 7.5, 5.5, 4.5, 3.5, 2.5, 2.0, 1.5, 1.5, 1.2

#20. Ficus (34.04050064, -118.5830002)
trunks = 2 DBH= 7.5, 1.8

#21. Eucalyptus (34.04050064, -118.5830002)
trunks = 1 DBH= 58.0

#22. Eucalyptus (34.04040146, -118.5830002)
trunks = 1 DBH= 28.0

#23. Ficus (34.04050064, -118.5830002)
trunks = 3 DBH= 5.0, 4.0, 3.0

#24. Ficus (34.04050064, -118.5830002)
trunks = 5 DBH= 7.5, 4.8, 4.6, 4.4, 4.3

25. Ficus (34.04050064 -118.5830002)
trunks = 3 DBH=6.0, 4.5, 3.5

#26. Canary Island Pine (34.03929901, -118.5839996)
trunks = 1 DBH= 16.0

#27. Eucalyptus (34.03950119, -118.583996)
trunks = 2 DBH= 20.5, 10.0

#28. Dracaena (34.03950119, -118.5839996)
trunks = 5 DBH= 16.8, 11.0, 5.0, 4.5, 4.0

#29. Dracaena (34.03950119, -118.5839996)
trunks = 3 DBH= 13.0, 8.0, 5.0

#30. Canary Island Pine (34.03960037, -118.5839996)
trunks = 1 DBH= 19.2

#31. Ficus (34.03960037, -118.5839996)
trunks = 1 DBH= 11.2

#32. Eucalyptus (34.03990173, -118.5839996)
trunks = 3 DBH= 11.5, 9.0, 4.5

#33. Elm (34.04050064, -118.5839996)
trunks = 3 DBH= 5.0, 4.0, 3.0

#34. Brazilian Pepper Tree (34.04000092, -118.5830002)
trunks = 5 DBH= 7.0, 6.5, 5.0, 4.0, 2.0

#35. California Pepper (34.0401001, -118.5839996)
trunks = 1 DBH= 16.0

#36. Monterey Pine (34.0401001, -118.5839996)
trunks = 1 DBH= 16.5

#37. Ficus (34.04059982, -118.5830002)
trunks = 8 DBH= 10.3, 1.8, 2.6, 3.0, 3.0, 1.0, 1.0, 0.8

#38. Ficus (34.04059982, -118.5839996)
trunks = 9 DBH= 2.4, 2.4, 1.7, 3.0, 3.0, 2.4, 3.2, 4.0, 3.0

#39. Ficus (34.04059982, -118.5830002)
trunks = 10 DBH= 1.5, 1.2, 7.5, 2.0, 1.0 0.5, 2.0, 1.0, 1.7, 1.2

#40. Ficus (34. 04059982, -118.5830002)
trunks = 6 DBH= 5.0, 2.7, 2.7, 2.5, 2.0, 10.5

#41. Ficus 34.04059982, (-118.5830002)
trunks = 6 DBH= 3.0, 0.8, 1.8, 0.5, 1.5, 0.6

#42. Ficus (34. 04059982, -118.5830002)
trunks = 6 DBH= 5.6, 1.4, 0.8, 2.4, 2.5, 1.5

#43. Eucalyptus (34.04059982, -118.5830002)
trunks = 2 DBH= 22.0, 9.3

#44. Eucalyptus (34. 04059982, -118.5830002)
trunks = 1 DBH= 46.0

#45. Laurel Sumac (34.04069901, -118.5830002)
trunks = 11 DBH= 2.2, 0.5, 0.5, 1.0, 0.4,
0.5, 2.6, 1.6, 0.7, 0.6, 0.3

#46. Laurel Sumac (34. 04059982, -118.5830002)
trunks = 5 DBH= 3.4, 3.3, 2.3, 3.0, 2.0

#47. Eucalyptus (34.04059982, -118.5830002)
trunks = 1 DBH= 12.0

#48. Eucalyptus (34. 04069901, -118.5830002)
trunks = 2 DBH= 11.0, 7.0

#49. Eucalyptus (34.04069901, -118.5830002)
trunks = 2 DBH= 20.0, 12.0

#50. Ficus (34. 04069901, -118.5830002)
trunks = 3 DBH= 3.8, 3.0, 1.8

#51. Arroyo Willow (34.04069901, -118.5830002)
trunks = 20 DBH= 3.5, 2.5, 4.0, 5.0, 6.0, 5.0, 4.5, 4.5, 5.5, 5.0, 3.0, 2.0, 0.8, 2.0, 1.6, 1.8, 2.1, 4.3, 7.1, 2.2

#52. Sycamore (34. 04069901, -118.5830002)
trunks = 1 DBH= 7.6

#53. Arroyo Willow (34.04059982, -118.5830002)
trunks = 1 DBH=4.8
Note: Recorder touching sycamore in photo.

#54. Sycamore (34.04069901, -118.5830002)
trunks = 1 DBH= 4.8
Note: Sycamore in center with tag showing.

#55. Arroyo Willow (34.04069901, -118.5830002)
trunks = 5 DBH = 4.5, 3.5, 4.5, 3.0, 3.0

#56. Dracaena (34.03939819,-118.5830002)
trunks = 7 DBH= 5.6, 5.4, 4.6, 4.0, 2.0, 7.4, 1.8, 3.3

#57. Dracaena (34.03950119, -118.5830002)
trunks = 4 DBH= 14.0, 8.0, 3.6, 3.0, 5.0

#58. Dracaena (34.03950119, -118.5830002)
trunks = 1 DBH= 9.4

#59. Dracaena (34.03950119, -118.5830002)
trunks = 1 DBH= 11.7

#60. Fan Palm (34.03969955, -118.583996)
trunks = 1 DBH= 23.0

#61. Rubber Fig (34.03969955, -118.5839996)
trunks = 4 DBH= 17.4, 5.1, 11.8, 23.0

#62. Fan Palm (34.03969955, -118.5839996)
trunks = 1 DBH= 24.6

#63. Myoporum (34.03939819, -118.5830002)
trunks = 1 DBH= 10

#64. Elderberry (34.03939819, -118.5830002)
trunks = 3 DBH= 8.9, 8.4, 7.2

#65. Lemonade Berry (34.03939819, -118.5830002)
trunks = 2 DBH= 5.5, 3.4

#66. Dracaena (34.03939819, -118.5830002)
trunks = 4 DBH= 3.6, 3.2, 3.3, 3.0

#67. Rubber Fig (34.03950119, -118.5830002)
trunks = 3 DBH= 13.2, 10.7, 4.2

#68. Dracaena (34.03950119, -118.5830002)
trunks = 1 DBH= 6.3

#69.Monkey Puzzle (34.03950119, -118.5830002)
trunks = 1 DBH= 11.2

#70. Dracaena (34.03950119, -118.5830002)
trunks = 7 DBH= 7.5, 3.1, 2.1, 21.0, 11.0, 1.8, 1.2, 2.2

#71. Dracaena (34.03960037, -118.5830002)
trunks = 9 DBH= 12.5, 2.1, 2.6, 2.0, 2.0,
1.4, 2.4, 2.4, 2.8

#72. Myoporum (34.03960037, -118.5830002)
trunks = 4 DBH= 23.0, 1.4, 2.1, 1.3

#73. Dracaena (34.03960037, -118.5830002)
trunks = 12 DBH= 6.4, 2.8, 4.8, 2.0, 2.0, 5.3,
5.8, 2.1, 1.8, 7.3, 7.4, 2.3

#74. Fan Palm (34.03969955, -118.5830002)
trunks = 1 DBH= 16.0

#75. Dracaena (34.03969955, -118.5830002)
trunks = 5 DBH= 3.5, 3.4, 3.6, 3.0, 3.0

#76. Dracaena (34.03979874, -118.5830002)
trunks = 9 DBH= 7.7, 4.8, 2.8, 19.0, 6.0, 14.0,
3.3, 4.1, 2.6

#77. Black Acacia (34.03990173, -118.5830002) # trunks = 6 DBH= 4.7, 3.9, 3.3, 3.0, 3.0, 2.9

#78. Brazilian Pepper Tree (34.04000092, -118.5830002) # trunks = 8 DBH= 5.9, 4.3, 3.6, 1.0, 2.0, 3.4, 1.6, 1.2, 2.4

#79.Brazilian Pepper Tree (34.03990173, -118.5830002) # trunks = 11 DBH= 6.0, 1.4, 2.8, 1.0, 1.2, 5.5, 2.6, 3.5, 4.1, 1.5

#80.Arroyo Willow (34.03979874 -118.5830002) # trunks = 5 DBH= 9.2, 3.7, 3.5, 5.4, 2.9

#81. Laurel Sumac (34.03953796, -118.5831522) # trunks = 6 DBH= 7.0, 1.0, 1.5, 2.5, 5.5, 4.5

#82. Arroyo Willow (34.03952251, -118.5831756) # trunks = 4 DBH= 6.5, 3.5, 1.0, 6.5

#83. Dracaena (34.03959466, -118.5832536)
trunks = 14 DBH= 11.5, 2.0, 14.0, 3.5, 1.6, 2.8, 6.0, 4.0, 3.0, 10.0, 4.0, 4.2, 2.6, 10.5

#84. Arroyo Willow (34.03979874, -118.5830002)
trunks = 4 DBH= 4.5, 2.5, 4.0, 3.3

#85. Eucalyptus (34.03972843, -118.58323884)
trunks = 1 DBH= 20.0

#86. Arroyo Willow (34.03976018, -118.5832236)
trunks = 2 DBH= 12.0, 8.0

#87. Sycamore (34.03994783, -118.5831369)
trunks = 2 DBH= 6.0, 3.0

#88. Arroyo Willow (34.03990396, -118.5831132)
trunks = 5 DBH= 5.8, 4.0, 1.8, 0.6, 0.8

#89. Sycamore (34.03993059, -118.5831484)
trunks = 2 DBH= 2.0, 2.0

#90. Arroyo Willow (34.03998105, -118.5831377)
trunks = 4 DBH= 2.5, 0.7, 33.2, 3.6

#91. Eucalyptus (34.03998369, -118.5831674)
trunks = 3 DBH= 24.0, 17.0, 15.0

#92. Arroyo Willow (34.03995604, -118.5830932)
trunks = 11 DBH= 4.8, 3.8, 2.6, 0.8, 1.2, 1.0, 0.7, 3.5, 1.0, 1.0, 0.5

#93. Arroyo Willow (34.03997119, -118.583101)
trunks =1 DBH=12.0

#94. Arroyo Willow (34.04003159, -118.5830781)
trunks = 3 DBH= 6.0, 3.0, 2.0

#95. Arroyo Willow (34.04005534, -118.5830707)
#trunks = 1 DBH= 3.5

#96. Arroyo Willow (34.04008859, -118.5830479)
#trunks = 1 DBH= 4.0

#97. Sycamore (34.04009658, -118.5830767)
#trunks = 1 DBH= 1.0

#98. Arroyo Willow (34.04010898, -118.5831018)
trunks = 2 DBH= 8.8, 5.5

#99. Arroyo Willow (34.04009634, -118.5830298)
trunks = 4 DBH= 2.7, 1.5, 4.0, 0.5

#100. Arroyo Willow (34.04007989, -118.5830274)
trunks = 4 DBH= 6.0, 6.0, 4.0, 3.0

#101. Sycamore (34.04010916, -118.583034)
trunks = 1 DBH= 5.5

#102. Sycamore (34.04012708, -118.5830097)
trunks = 1 DBH= 8.0

#103. Arroyo Willow (34.04013518, -118.5829956)
trunks = 4 DBH= 2.0, 0.7, 4.0, 0.5

#104. Arroyo Willow (34.04014198, -118.582994)
trunks = 8 DBH= 2.8, 1.0, 2.7, 0.5, 2.6,
2.0, 0.5, 0.6

#105. Arroyo Willow (34.04015396, -118.582997)
trunks = 13 DBH= 4.1, 2.0, 1.3, 0.5, 1.0, 5.0
1.3, 2.3, 2.0, 1.0, 2.4, 3.0, 1.5

#106. Arroyo Willow (34.04015924, -118.5830138)
trunks = 3 DBH= 2.0, 1.2, 1.3

#107. Arroyo Willow (34.0401715, -118.5830194)
trunks = 7 DBH= 3.7, 3.4, 4.4, 3.6, 3.9, 2.0, 2.0

#108. Arroyo Willow (34.04023361, -118.58830952)
trunks = 2 DBH= 7.2, 4.0

#109. Arroyo Willow (34.04023957, -118.5830881)
trunks = 2 DBH= 6.0, 1.4

#110. Arroyo Willow (34.04019867, -118.5829637)
trunks = 7 DBH= 3.0, 1.0, 4.4, 2.6, 2.0, 2.3, 3.4

#111. Arroyo Willow (34.0402204, -118.582981)
trunks = 5 DBH= 3.3, 3.0, 2.1, 3.0, 2.3,

#112. Arroyo Willow (34.04020182, -118.582985)
trunks = 12 DBH= 2.0, 2.0,5.0, 8.0, 1.8,
1.3, 1.6, 1.0, 0.5, 2.0, 0.8, 0.5

#113. Arroyo Willow (34.0402607, -118.582907)
trunks = 9 DBH= 2.4, 2.0, 1.6, 1.0, 0.8,
0.4, 1.0, 1.2, 1.8

#114. Arroyo Willow (34.0402241, -118.5828989)
trunks = 2 DBH= 4.5, 4.0

#115. Arroyo Willow (34.0402472, -118.5829025)
trunks = 4 DBH= 3.0, 1.5, 3.5, 3.5

#116. Arroyo Willow (34. 04025085, -118. 5829722)
trunks = 17 DBH= 3.0, 2.5, 1.8, 3.8, 3.6, 2.5, 1.5,
3.0, 3.5, 0.5, 1.0, 1.2, 2.4, 2.8, 3.5, 2.0,
2.0, 5.0

#117. Arroyo Willow (34.04029913, -118.5829419)
trunks = 3 DBH= 5.0, 4.0, 6.0

#118. Arroyo Willow (34.04029644, -118.582892)
trunks = 5 DBH= 3.0, 2.8, 2.0, 2.3, 2.5

#119. Arroyo Willow (34.04035161, -118.5828896)
trunks = 5 DBH= 6.5, 6.0, 5.0, 5.5, 3.5

#120. Arroyo Willow (34.0403592, -118.5828337)
trunks = 3 DBH= 4.0, 3.7, 3.5

#121. Arroyo Willow (34.0401601, -118.582933)
trunks = 5 DBH= 5.0, 3.6, 5.0, 6.4, 4.6

#122. Eucalyptus (34.0404634, -118.582317)
trunks = 4 DBH= 0.5, 0.4, 5.0, 6.5

#123. Arroyo Willow (34.04035161, -118.5828896)
trunks = 1 est DBH= 4.5 est
Note: Trunks buried under sediment, unable to count and measure trunks/DBH

#124. Arroyo Willow (34.04058584, -118.5827718)
trunks = 11 DBH= 1.8, 1.6, 1.2, 0.3, 0.4, 1.9, 1.2, 0.7, 0.4, 0.3, 1.5

#125. Sycamore (34.04050407, -118.5828028)
trunks = 4 DBH= 5.0, 3.5, 1.0, 2.0

#126. Eucalyptus (34.0404634, -118.582317)
trunks = 1 DBH= 4.0

#127. Arroyo Willow (34.04051908, -118.5828549)
trunks = 5 DBH= 2.3, 1.8, 1.7, 1.4, 1.0

#128. Arroyo Willow (34.04050062, -118.5828843)
trunks = 5 DBH= 3.0, 1.6, 1.8, 1.4, 2.5

#129. Cottonwood (34.04053018, -118.5827341)
trunks = 5 DBH= 2.3, 0.5, 1.6, 1.8, 1.8

#130. Arroyo Willow (34.04051403, -118.5827339)
trunks = 19 DBH= 1.8, 1.6, 0.5, 1.4, 1.5,2.0,
1.5, 1.6, 3.2, 3.5, 1.5, 1.0,
0.9, 1.8, 2.2, 2.5, 3.0, 1.0, 0.7

#131. Arroyo Willow (34.04055032, -118.5827979)
trunks = 6 DBH= 6.0, 0.5, 1.0, 0.5, 1.5, 1.5

#132. Sycamore (34.04061587, -118.5827489)
trunks = 5 DBH= 4.0, 1.8, 1.7, 1.7, 2.0

#133. Arroyo Willow (34.04061659, -118.5827358)
trunks = 10 DBH= 2.5, 2.0, 1.5, 2.0, 0.5, 1.5,
1.3, 0.5, 1.0, 1.6

#134. Arroyo Willow (34.04064543, -118.5827753)
trunks = 5 DBH= 9.0, 2.1, 2.4, 1.8, 0.5

#135. Arroyo Willow (34.04078973, -118.5826773)
trunks = 5 DBH= 5.0, 4.5, 4.0, 2.5, 2.4, 1.2

#136. Sycamore (34.0408249, -118.5826846)
trunks = 1 DBH= 10.0

#137. Alder (34.04082548, -118.5826384)
trunks = 2 DBH= 6.0, 1.6

#138. Arroyo Willow (34.04082548, -118.5826384)
trunks = 5 DBH= 4.8, 2.3, 2.0, 1.0, 1.6

#139. Arroyo Willow (34.0408579, -118.5826405)
trunks = 8 DBH= 3.0, 2.4, 1.0, 1.8, 1.6, 2.1, 3.6, 4.0

#140. Arroyo Willow (34.04087181, -118.5826199)
trunks = 9 DBH= 6.0, 1.5, 1.6, 4.0, 2.0,
4.0, 1.8, 5.0, 1.3

#141. Arroyo Willow (34.04088294, -118.5825874)
trunks = 2 DBH= 4.5, 1.6

#142. Arroyo Willow (34.04089477, -118.5825789)
trunks = 3 DBH= 3.0, 2.8, 2.5

#143. Arroyo Willow (34.04090085, -118.5825632)
trunks = 5 DBH= 6.0, 3.3, 0.5, 1.0, 3.4

#144. Arroyo Willow (34.04090085, -118.5825632)
trunks = 6 DBH= 2.5, 1.6, 3.6, 0.3, 1.0, 3.3

#145. Arroyo Willow (34.04090623, -118.5825475)
trunks = 6 DBH= 0.5, 0.4, 2.0, 0.5, 1.2, 3.5

#146. Arroyo Willow (34.04090839, -118.5825288)
trunks = 5 DBH= 2.6, 1.0, 1.8, 1.4, 1.5

#147. Arroyo Willow (34.04091837, -118.582526)
trunks = 1 DBH= 4.0

#148. Sycamore (34.04090769, -118.582021)
trunks = 2 DBH= 8.6, 0.4

#149. Arroyo Willow (34.04092084, -118.5824962)
trunks =1 DBH= 6.4

#150. Sycamore (34.04094088, -118.5824796)
trunks = 1 DBH= 14.7

#151. Arroyo Willow (34.04096948, -118.5824684)
trunks = 1 DBH= 8.3

#152. Sycamore (34.04097834, -118.5824684)
trunks = 5 DBH= 7.0, 5.5, 6.5, 5.6, 6.0

153. Arroyo Willow (34.04100014, -118.5824191)
#trunks = 10* DBH= 7.5, 6.0, 6.0, 7.0, 5.0, 6.3
Note: Additional trunks underground, unable to measure.

#154. Sycamore (34.04096999, -118.5823914)
#trunks = 1 DBH= 9.5

#155. Sycamore (34.04098001, -118.5824029)
#trunks = 1 DBH= 11.6

#156. Arroyo Willow (34.04098543, -118.5823826)
#trunks = 2 DBH= 5.0, 3.0

#157. Arroyo Willow (34.04099605, -118.582367)
#trunks = 1 DBH= 4.3

#158. Arroyo Willow (34.04098863, -118.582367)
#trunks = 1 DBH= 4.3

#159. Arroyo Willow (34.04093102, -118.582486)
trunks = 5 DBH= 5.5, 2.5, 1.5, 3.0, 1.8

#160. Arroyo Willow (34.04100206, -118.5822224)
trunks = 3 DBH= 8.0, 5.0, 4.5

#161. Arroyo Willow (34.04102833, -118.5822933)
trunks = 2 DBH= 9.4, 7.3

#162. Arroyo Willow (34.04105546, -118.5822448)
trunks = 5 DBH= 4.3, 4.0, 3.2, 1.0, 3.6

#163. Arroyo Willow (34.04105698, -118.5821911)
trunks = 5 DBH= 7.5, 5.3, 7.7, 2.0, 3.4

#164. Arroyo Willow (34.04105246, -118.5821881)
trunks = 2 DBH= 4.5, 4.0

#165. Arroyo Willow (34.04105698, -118.5821911)
trunks = 1 DBH= 9.0

#166. Arroyo Willow (34.04102552, -118.5822154)
trunks = 1 DBH= 6.0

#167. Sycamore (34.0410461, -118.5822094)
trunks = 1 DBH= 13.4

#168. Arroyo Willow (34.04104981, -118.5822189)
trunks = 3 DBH= 4.5, 3.8, 5.5

#170. Sycamore (34.04106007, -118.5822193)
trunks = 1 DBH= 10.0
Note: Tag 169 lost.

#171. Arroyo Willow (34.04107396, -118.8521979)
trunks = 7 DBH= 9.0, 5.0, 9.0, 5.0, 6.0, 5.5, 5.0

#172. Sycamore (34.04108476, -118.582166)
trunks = 1 DBH= 6.8

#173. Arroyo Willow (34.04110877, -118.5820586)
trunks = 2 DBH= 6.8, 4.4

#174. Fan Palm(34.0410977, -118.5820683)
trunks = 4 DBH= 20.0, 1.0, 0.8, 1.6

#175. Arroyo Willow (34.04105697, -118.582066)
trunks = 5 DBH= 1.8, 1.8, 1.0, 1.6, 2.3

#176. Arroyo Willow (34.04100832, -118.5820869)
trunks = 3 DBH= 6.2, 1.0, 3.4

#177. Arroyo Willow (34.04100565, -118.5820325)
trunks = 5 DBH= 4.0, 1.8, 2.8, 3.0, 4.0

#178. Arroyo Willow (34.04104603, -118.5820249)
trunks = 4 DBH= 6.0, 3.0, 6.0, 7.0

#179. Sycamore (34.04101969, -118.5819236)
trunks = 1 DBH= 13.4

#180. Arroyo Willow (34.0410059, -118.5819579)
trunks = 4 DBH= 3.2, 1.8, 1.4, 2.6

#181. Alder (34.04101792, -118.5818952)
trunks = 6 DBH= 10.5, 8.5, 8.3, 4.0, 8.7, 8.6

#182. Arroyo Willow (34.04103166, -118.5818621)
trunks = 2 DBH= 10.7, 5.5

#183. Sycamore (34.04106728, -118.5818487)
trunks = 1 DBH= 5.2

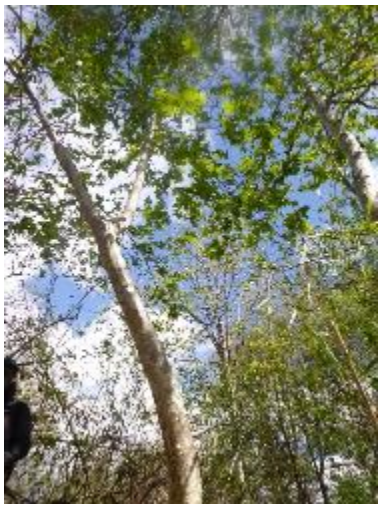
#184. Sycamore(34.04105741, -118.5818491)
trunks = 2 DBH= 8.0, 7.0

#185. Sycamore (34.04108036, -118.581813)
trunks = 1 DBH= 7.9

#186. Arroyo Willow (34.04107086, -118.5818091)
trunks = 1 DBH= 5.4

#187. Cottonwood(34.04106973, -118.5818005)
trunks = 1 DBH= 17.2

#188. Sycamore (34.04111364, -118.5818036)
trunks = 1 DBH= 7.2



#189. Sycamore (34.04109324, -118.5817805)
trunks = 1 DBH= 4.7

#190. Sycamore (34.04108674, -118.5817716)
trunks = 1 DBH= 7.4

#191. Arroyo Willow (34.0411263, -118.5817954)
trunks = 1 DBH= 6.5

#192. Arroyo Willow (34.04110093, -118.581765)
trunks = 4 DBH= 3.0, 2.7, 3.0, 0.5

#193. Arroyo Willow (34.04103582, -118.5817421)
trunks = 7 DBH= 3.5, 3.2, 0.5, 0.3, 1.0, 3.4, 2.0

#194. Sycamore (34.04105254, -118.5816667)
trunks = 1 DBH= 10.2

#195. Red Willow (34.04105144, -118.5816263)
trunks = 7 DBH= 8.5, 6.2, 2.3, 1.2, 2.5, 3.2, 9.6

#196. Alder (34.04104535, -118.5815974)
trunks = 1 DBH= 6.1

#197. Sycamore (34.04103044, -118.5815853)
trunks = 1 DBH= 4.2

#198. Alder (34.04107784, -118.5815583)
trunks = 6 DBH= 13.8, 11.0, 5.5, 8.0, 13.8, 3.0

#199. Sycamore (34.04106326, -118.5815129)
trunks = 1 DBH= 6.2

#200. Sycamore (34.04106152, -118.5814767)
trunks = 1 DBH= 10.1

#201. Red Willow (34.04111671, -118.5814601)
trunks = 6 DBH= 7.4, 1.5, 0.8, 8.3, 6.6, 5.0

#202. Arroyo Willow (34.04112407, -118.5814578)
trunks = 4 DBH= 11.0, 8.0, 4.0, 3.0

#203. Arroyo Willow (34.04113244, 118.581441)
trunks = 5 DBH= 10.6, 3.0, 1.0, 1.0, 2.2

#204. Arroyo Willow (34.04115361, -118.5821001)
trunks = 11 DBH= 6.0, 2.0, 1.0, 4.2, 3.5, 5.2, 1.0, 3.5, 4.4, 4.0

#205. Red Willow (34.04118435, -118.5820492)
trunks = 7 DBH= 10.0, 8.6, 6.6, 4.2, 7.8, 4.2, 4.0, 5.5

#206. Elderberry (34.04128157, -118.5819146)
trunks = 14 DBH= 10.5, 3.0, 0.6, 1.5, 1.5, 1.8, 0.3, 0.5, 0.4, 1.0, 0.5, 0.6

#207. Arroyo Willow (34.04118501, -118.5819032)
trunks = 9 DBH= 9.0, 7.0, 5.6, 4.2, 5.5, 0.7, 5.0, 4.0, 6.0, 0.5

#208. Red Willow (34.04125276, -118.5818599)
#trunks = 3 DBH= 4.6, 4.0, 2.0

#209. Red Willow (34.04128071, -118.5818563)
#trunks = 8 DBH=10.6, 5.2, 3.1, 2.9, 3.8, 1.8, 5.6, 4.6

#210. Red Willow (34.04121181, -118.5817744)
#trunks = 5 DBH= 10.5, 3.0, 0.6, 1.5, 1.5, 1.3

#211. Willow (34.04121195, -118.5817752)
#trunks = 16 DBH= 9.0, 0.5, 0.4, 2.4, 2.0, 5.0, 3.0, 1.0, 3.2, 5.5, 2.4, 1.8, 7.0, 4.6, 6.0, 2.3

#212. Eucalyptus (34.04127429, -118.5817119)
trunks = 1 DBH= 35.5

#213. Red Willow (34.04128409, -118.5817286)
#trunks = 5 DBH= 6.0, 2.6, 3.0, 1.5, 2.5

#214. Elderberry (34.04131309, -118.5816886)
trunks = 16 DBH= 1.2, 0.5, 1.0, 2.0, 1.0, 1.5, 1.0, 1.0, 1.3, 2.0, 0.5, 0.8, 0.6, 0.6, 2.2, 0.4

#215. Sycamore (34.04131309, -118.5816886)
trunks = 1 DBH= 10.8

216. Sycamore (34.04139447, -118.5818183)
trunks = 2 DBH= 11.8, 2.5

#217. Eucalyptus (34.04133265, -118.5816474)
trunks = 1 DBH= 62.4

218. Eucalyptus (34.04160265, -118.581389)
trunks = 5 DBH= 40.0, 1.8, 1.8, 1.7, 1.5

#219. Elderberry (34.04119987, -118.5816411)
trunks = 15 DBH= 36.0, 19.0, 1.5, 1.8, 1.8, 2.0, 2.0, 0.4, 1.0, 1.8, 1.6, 1.0, 2.2, 1.8, 1.7, and others too small to measure

220. Red Willow (34.04124216, -118.5814187)
trunks = 19 DBH= 6.0, 4.0, 7.0, 6.0, 8.5,
2.5, 2.0, 9.5, 5.8, 4.2, 6.5, 4.3,
4.0, 9.5, 7.6, 2.0, 9.0, 4.0, 4.5

#221. Arroyo Willow (34.04131993, -118.5812678)
trunks = 6 DBH= 4.2, 3.5, 3.2, 2.5, 3.8, 1.7

#222. Elderberry (34.04133152, -118.5813138)
trunks = 12 DBH= 1.4, 0.4, 1.0, 1.5, 3.0, 2.0,
2.3, 1.0, 1.0, 3.3, 1.0, 1.0

#223. Sycamore (34.04132887, -118.5812579)
trunks = 2 DBH= 19.0, 6.0

#224. Elderberry (34.04137091, -118.5811904)
trunks = 1 DBH= 15.0

#225. Elderberry (34.041378, -118.5811331)
trunks = 4 DBH= 2.0, 2.5, 18.0, 16.0

#226. Arroyo Willow (34.04138126, -118.5810644)
trunks = 8 DBH= 13.5, 4.0, 5.0, 2.0, 6.0,
2.5, 3.5, 2.0

#227. Sycamore (34.04147877, -118.5808798)
trunks = 5 DBH= 34.0, 24.0, 10.5, 2.4, 3.6

#228. Elderberry (34.04145207, -118.5808123)
trunks = 7 DBH= 7.0, 1.6, 4.0, 4.0, 4.0, 5.0, 5.5

#229. Arroyo Willow (34.04133275, -118.5811705)
trunks = 5 DBH= 4.2, 4.0, 3.8, 1.0, 1.0

#230. Arroyo Willow (34.04128173, -118.5811287)
trunks = 5 DBH= 24.0, 2.0, 3.3, 3.7, 3.1

#231. Arroyo Willow (34.04125425, -118.5809632)
trunks = 5 DBH= 3.6, 2.5, 2.2, 1.3, 2.4

#232. Red Willow (34.04133787, -118.5809569)
trunks = 1 DBH= 12.0

#233. Arroyo Willow (34.04134256, -118.5807957)
trunks = 5 DBH= 15.0, 7.0, 2.0, 3.5, 4.0

#234. Arroyo Willow (34.04112389, -118.5809121)
trunks = 3 DBH= 12.8, 2.5, 5.0

#235. Red Willow (34.04107357, -118.5809452)
trunks = 2 DBH= 4.0, 3.0

#236. Arroyo Willow (34.04112833, -118.5809368)
trunks = 3 DBH= 10.3, 6.5, 7.0

#237. Arroyo Willow (34.04113733, -118.5809644)
trunks = 5 DBH= 7.0, 4.5, 2.3, 6.0, 5.0

#238. Arroyo Willow (34.04112128, -118.5809863)
trunks = 3 DBH= 8.3, 1.3, 4.8

#239. Red Willow (34.04116064, -118.5810661)
trunks = 3 DBH= 16.5, 13.5, 11.5

#240. Arroyo Willow (34.04114525, -118.5811269)
trunks = 1 DBH= 5.5

#241. Arroyo Willow (34.04112829, -118.581847)
trunks = 3 DBH= 6.3, 5.0, 4.5

#242. Arroyo Willow (34.04112989, -118.5812433)
trunks = 2 DBH= 6.0, 3.3

#243. Sycamore (34.04105344, -118.5810077)
trunks = 2 DBH= 4.0, 2.0

#244. Sycamore(34.044105106, -118.5810065)
trunks = 1 DBH= 4.0

#245. Arroyo Willow (34.041005522, -118.5810736)
trunks = 2 DBH= 12.8, 12.5

#246. Fan Palm (34.04095251, -118.5810698)
trunks = 1 DBH= 20.0

#247. Fan Palm (34.04091919, -118.5810636)
trunks = 1 DBH= 17.0

#248. Fan Palm (34.04091409, -118.5810581)
trunks = 1 DBH= 19.4

#249. Pittosporum (34.04093106, -118.5811079)
trunks = 4 DBH= 13.0, 1.5, 1.5, 1.0

#250. Fan Palm (34.04092628, -118.5811135)
trunks = 1 DBH= 16.0

#251. Fan Palm (34.04092692, -118.5811206)
trunks = 1 DBH= 16.5

#252. Arroyo Willow (34.04099372, -118.5811399)
trunks = 1 DBH= 11.5

#253. Red Willow (34.04095503, -118.5812441)
trunks = 7 DBH= 11.5, 11.0, 3.8, 11.0, 8.6, 6.5, 7.0

#254. Red Willow (34.04095389, -118.581244)
trunks = 2 DBH= 4.0, 4.5

#255. Arroyo Willow (34.04097562, -118.5813016)
trunks = 2 DBH= 10.5, 6.5

#256. Red Willow (34.04094761, -118.5814112)
trunks = 6 DBH= 12.6, 12.5, 14.0, 12.0, 8.0, 5.4

#257. Arroyo Willow (34.04095723, -118.581415)
trunks = 7 DBH= 6.6, 4.4, 7.0, 3.8, 2.0, 4.8, 5.2

#258. Sycamore (34.04105123, -118.5813892)
trunks = 1 DBH= 6.8

#259. Red Willow (34.04101519, -118.5814919)
trunks = 3 DBH= 3.5, 2.4, 4.0

#260. Arroyo Willow (34.04097897, -118.5814794)
trunks = 1 DBH= 10.6

#261. Arroyo Willow (34.04098073, -118.5814454)
trunks = 1 DBH= 12.5

#262. Arroyo Willow (34.04098636, -118.5814502)
trunks = 1 DBH= 7.9

#263. Arroyo Willow (34.04094964, -118.5815269)
trunks = 3 DBH= 16.0, 12.0, 4.0

#264. Eucalyptus (34.04093909, -118.5815124)
trunks = 1 DBH= 23.0

#265. Arroyo Willow (34.04103313, -118.5814972)
trunks = 1 DBH= 6.7

#266. Arroyo Willow (34.04101751, -118.5817822)
trunks = 2 DBH= 17.0, 14.0

#267. Arroyo Willow (34.04095526, -118.5818407)
trunks = 4 DBH= 11.0, 3.0, 12.4, 14.5

#268. Arroyo Willow (34.04094668, -118.5818069)
trunks = 5 DBH= 8.5, 8.0, 7.5, 6.0, 12.0

#269. Arroyo Willow (34.04089384, -118.5819478)
trunks = 5 DBH= 8.2, 2.3, 3.6, 2.0, 3.2

#270. Arroyo Willow (34.04096413, -118.5820251)
trunks = 18 DBH= 8.4, 8.0, 4.7, 2.5, 5.0, 1.0,
1.0, 1.0, 1.0, 1.0, 1.0, 4.0, 3.5, 4.4,
3.8, 2.8, 2.0, 4.0

#271. Red Willow (34.04096015, -118.5820558)
trunks = 2 DBH= 8.5, 7.0

#272. Red Willow (34.04094954, -118.58208)
trunks = 16 DBH= 7.5, 4.0, 4.5, 2.5, 5.0, 3.7,
3.6, 1.8, 1.5, 1.0, 0.5, 0.5, 5.0,
5.3, 3.0, 3.4

#273. Red Willow (34.04080093, -118.5826431)
trunks = 5 DBH= 5.0, 5.0, 4.0, 5.0, 3.6, 3.0

#274. Red Willow (34.04081184, -118.58264132)
trunks = 5 DBH= 4.0, 3.8, 4.0, 2.4, 2

#275. Red Willow (34.04070959 , -118.58264963)
trunks = 2 DBH= 4.3, 4.0

#276. California Sycamore (34.04068099, -118.58265309) #trunks = 2 DBH = 4.1, 2

#277. Red Willow (34.04067428, -118.586715
trunks = 5 DBH= 8.8, 6.0, 3.8, 4.0, 5.0

#278. Red Willow (34.04066297, -118.5826821)
trunks = 7 DBH= 6.0, 2.3, 1.8, 1.2, 3.4, 2.0, 5.5

#279. Sycamore (34.04064842, -118.5826821)
 trunks = 2 DBH= 5.2, 1.2

#280. Arroyo Willow (34.04062279, -118.5826777)
trunks = 3 DBH= 4.7, 2.0, 0.4

#281. Arroyo Willow (34.04062529, -118.5826777)
trunks = 1 DBH= 4.5

#282. Arroyo Willow (34.04058112, -118.5826989)
trunks =2 DBH= 6.5, 5

#283. Arroyo Willow (34.04056434, -118.5826979)
trunks = 2 DBH= 7.0, 5.8

#284. Arroyo Willow (34.04056434, -118.5826979)
trunks = 5 DBH= 5.5, 4.2, 4.4, 3.6, 4.8

#285. Arroyo Willow (34.04046109, -118.582732)
trunks = 6 DBH= 3.2, 3.1, 2.8, 1.5, 1.8, 2.8

#286. Red Willow (34.04015956, -118.5829203)
trunks = 4 DBH= 4.1, 3.3, 3.5, 2.0

#287. Arroyo Willow (34.0401218, -118.5829203)
trunks = 5 DBH= 11.5, 5.0, 9.0, 6.5, 0.5

#288. Red Willow (34.04011237, -118.589308)
trunks = 6 DBH= 2.3, 1.0, 3.4, 4.3, 4.5, 1.2

#289. Arroyo Willow (34.04008664, -118.582931)
trunks = 5 DBH= 8.0, 3.0, 4.0, 5.3, 5.0

#290. Red Willow (34.03989861, -118.582967)
trunks = 7 DBH= 9.0, 1.3, 1.2, 0.8, 9.1, 2.0, 1.6, 1.2

#291. Arroyo Willow (34.03991468, -118.5829637)
trunks = 4 DBH= 7.5, 6.5, 1.1, 3.2

#292. Red Willow (34.03990476, -118.582931)
trunks = 5 DBH= 15.3, 4.0, 1.8, 0.4, 5.9

#293. Red Willow (34.03988216, -118.5829349)
trunks = 6 DBH= 3.2, 1.8, 0.6, 1.8, 6.3, 6.4

#294. Arroyo Willow (34.03983942, -118.5829508)
trunks = 2 DBH= 11.4, 1.0

#295. Red Willow (34.039802231, -118.5829666)
trunks = 3 DBH= 6.2, 3.4, 11.0

#296. Arroyo Willow (34.0397931, -118.5829816)
trunks = 1 DBH= 7.3

#297. Red Willow (34.0397874, -118.5830317)
trunks = 2 DBH= 11.5, 11.3

#298. Arroyo Willow (34.03977472, -118.5830286)
trunks = 2 DBH= 11.3, 10.0

#299. Fan Palm (34.03978208, -118.5830286)
trunks = 1 DBH= 19.8

#300. Arroyo Willow (34.03972491, -118.5829776)
trunks = 10 DBH= 3.5, 1.7, 2.4, 2.3, 2.0, 3.7, 4.2, 6.5, 3.4, 4.2

#301. Arroyo Willow (34.03970625, -118.5829367)
trunks = 8 DBH= 3.6, 2.0, 2.2, 3.4, 1.2, 1.0, 0.8, 2.0, 1.6

#302. Laurel Sumac (34.0396108, -118.5829271)
trunks = 5 DBH= 4.8, 2.0, 2.0, 1.0, 3.0

#303. Laurel Sumac (34.04071448, -118.581954)
trunks = 5 DBH= 8.8, 2.5, 1.5, 2, 1.8, 1.0

#304. Tree Tobacco (34.03956869, -118.5829228)
trunks = 5 DBH= 3.6, 2.8, 2.2, 3.6, 3.5

#305. Arroyo Willow (34.03954185, -118.5829015)
trunks = 3 DBH= 7.0, 6.5, 4.5

#306. Arroyo Willow (34.03962323, -118.5829847)
trunks = 6 DBH= 10.5, 2.5, 10.2, 2.0, 7.0, 4.5

#307. Red Willow (34.03953391, -118.5829708)
trunks = 1 DBH= 14.0

#308. Coast Live Oak (34.03947961, -118.582994)
trunks = 1 DBH= 18.0

#309. Red Willow (34.03944251, -118.5830277)
trunks = 3 DBH= 11.5, 2.4, 13.0

#310. Red Willow (34.03944723, -118.582982)
trunks = 1 DBH= 5.8

#311. Red Willow (34.03943768, -118.5829539)
trunks = 5 DBH= 9.0, 2.0, 0.7, 0.3, 0.3

#312. Red Willow (34.03944053, -118.5829712)
trunks = 3 DBH= 5.1, 3.0, 2.0

#313. Arroyo Willow (34.03941734, -118.5829625)
trunks = 4 DBH= 7.2, 3.4, 8.2, 16.0

#314. Red Willow (34.03930688, -118.5830011)
trunks = 3 DBH= 9.3, 5.4, 3.3

#315. Brazilian Pepper (34.03951821, -118.5830662) # trunks = 1 DBH= 10.0

#316. Brazilian Pepper (34.0395395, -118.5830808)
trunks = 1 DBH= 11.5

#317. Elderberry (34.03953575, -118.5830736)
trunks = 5 DBH= 4.5, 3.5, 2.4, 1.8, 2.1,

#318. Eucalyptus (34.04010774, -118.5814729)
trunks = 2 DBH= 28.4, 5.1

#319. Dracaena (34.04004084, -118.5815418)
trunks = 5 DBH= 11.5, 4.5, 2.0, 4.0, 2.5

#320. Dracaena (34.04005725, -118.5815662)
trunks = 5 DBH= 11.0, 9.0, 6.0, 3.8, 3.5

#321. Dracaena (34.04007943, -118.5815592)
trunks = 5 DBH= 6.0, 3.5, 7.0, 2.2, 2.0

#322. Ficus (34.04008569, -118.5815222)
trunks = 4 DBH= 8.0, 4.0, 4.5, 2.5

#323. Dracaena (34.04007654, -118.5815823)
trunks = 4 DBH= 19.4, 2.5, 2.3, 2.0

#324. Sycamore (34.0401716, -118.581546)
trunks = 2 DBH= 4.5, 3.2

#325. Coast Live Oak (34.04023744, -118.5815415)
trunks = 1 DBH= 4.7

#326. Date Palm (34.04025927, -118.5816443)
trunks = 1 DBH= 38.0

#327. Dracaena (34.04026125, -118.5816532)
trunks = 4 DBH= 15.5, 8.5, 4.0, 3.5

#328. Dracaena (34.04029496, -118.5815288)
trunks = 2 DBH= 12.4, 7.8

#329. Dracaena (34.04029791, -118.5815283)
trunks = 4 DBH= 11.6, 8.5, 4.0, 4.3

#330. Dracaena (34.04029314, -118.5815299)
trunks = 3 DBH= 12.8, 7.8, 4.6

#331. Dracaena (34.04032669, -118.5815102)
trunks = 5 DBH= 10.6, 8.0, 6.5, 8.0, 10.5

#332. Dracaena (34.04038261, -118.5814695)
trunks = 5 DBH= 12.2, 5.0, 3.5, 8.4, 8.5

#333. Elderberry (34.04044248, -118.5814795)
trunks = 11 DBH= 11.0, 8.5, 15.0, 3.5, 3.0, 3.5, 2.0, 14.0, 6.5, 7.5, 7.5, 4.0

#334. Elderberry (34.0409278, -118.5814274)
trunks = 7 DBH= 14.0, 9.5, 4.5, 4.5, 8.5, 5.0, 4.0

#335. Sycamore (34.0405233, -118.5814658)
trunks = 5 DBH= 4.0, 2.0, 1.7, 0.5, 0.4

#336. Laurel Sumac (34.04060419, -118.5814123)
trunks = 9 DBH= 4.5, 4.3, 7.0, 4.0, 3.7, 3.0, 1.5, 1.8, 3.8, 3.5

#338. Arroyo Willow (34.04060447, -118.5813903)
trunks = 4 DBH= 37.3, 2.0, 0.3, 1.8
Note: No tree #337 tag lost

#339. Tree Tobacco (34.04066149, -118.5814769)
trunks = 5 DBH= 1.4, 1.2, 2.2, 0.8, 1.3

#340. Dracaena (34.04072247, -118.5815028)
trunks = 6 DBH= 9.9, 4.4, 3.3, 4.2, 7.5, 2.6

#341. Laurel Sumac (34.04079834, -118.5814468)
trunks = 12 DBH= 4.1, 3.4, 1.2, 3.6, 3.5, 3.5, 2.7, 2.0, 2.4, 3.2, 1.8, 3.5

#342. Laurel Sumac (34.04076664, -118.5812738)
trunks = 7 DBH= 4.1, 2.0, 1.7, 1.2, 1.0, 1.0, 2.0

#343. Fan Palm (34.04076919, -118.581275)
trunks = 1 DBH= 25.0
Note: No tree #344 tag lost

#345. Sycamore (34.04084876, -118.5815824)
trunks = 8 DBH= 27.0, 24.0, 3.0, 5.0, 1.0, 2.0, 6.9, 2.0,

#346. Elderberry (34.04004867, -118.5817335)
trunks = 7 DBH= 7.0, 4.5, 2.0, 1.8, 1.4, 0.8, 6.9

#347. Dracaena (34.04005541, -118.5816896)
trunks = 1 DBH= 13.1

#348. Olive (34.04013792, -118.5817133)
trunks = 3 DBH= 12.6, 11.3, 14.0

#349. Dracaena (34.04007183, -118.5817638)
trunks = 1 DBH= 6.4

#350. Fan Palm (34.04007685, -118.5817662)
trunks = 1 DBH= 23.4

#351. Dracaena (34.04007953, -118.5817625)
trunks = 2 DBH= 8.0, 3.0

#352. Banana (34.03997338, -118.5817931)
trunks = 3 DBH= 5.0, 5.0, 4.8

#353. Giant Bird of Paradise (34.03997241, -118.5817924) # trunks = 1 DBH= 6.5

#354. Juniper (34.03997259, -118.581779948)
trunks = 2 DBH= 4.0, 3.6

#355. Juniper (34.04009362, -118.5817933)
trunks = 1 DBH= 8.5

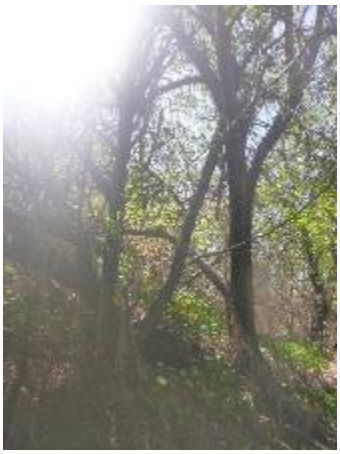
#356. Juniper (34.04009749, -118.5817946)
trunks = 5 DBH= 10.0, 2.2, 2.0, 2.3, 1.8

#357. Laurel Sumac (34.04007962, -118.5820612)
trunks = 12 DBH= 2.5, 1.8, 2.0, 2.1, 1.7, 0.4, 0.6, 2.0, 1.0, 1.0, 1.6, 1.7

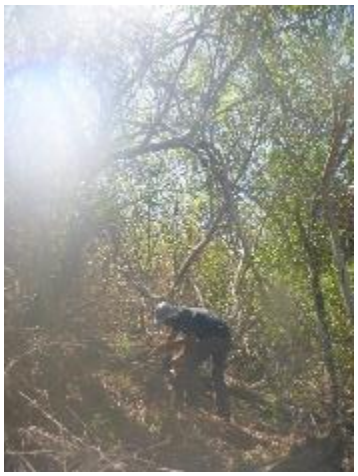
#358. Arroyo Willow (34.04029896, -118.5821931)
trunks = 2 DBH= 38.0, 13.5 **Keep both during construction**

#359. Sycamore (34.04029834, -118.58213)
trunks = 3 DBH= 29.5, 14.0, 28.0

#360. Elderberry (34.04034441, -118.5821856)
trunks = 3 DBH= 5.5, 4.0, 3.0



#361. Red Willow (34.04030464, -118.5825877)
trunks = 2 DBH= 11.0, 9.0



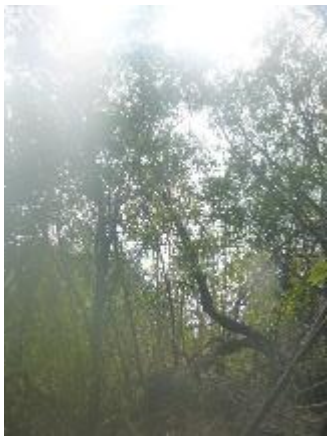
#362. Red Willow (34.0402715, -118.5826561)
trunks = 3 DBH= 8.5, 7.7, 25.5

#363. Sycamore (34.04029285, -118.5826561)
trunks = 2 DBH= 16.4, 8.0

#364. Arroyo Willow (34.04022092, -118.5827277)
trunks = 3 DBH= 18.0, 14.0, 11.0

#365. Red Willow (34.04022499, -118.5827069)
trunks = 1 DBH= 9.5

#366. Arroyo Willow (34.04015654, -118.582733)
trunks = 1 DBH= 9.8



#367. Red Willow (34.0407171, -118.5825697)
trunks = 5 DBH= 14.0, 14.0, 10.0, 2.8, 5.0

#368. Red Willow (34.04054183, -118.5825464)
trunks = 10 DBH= 16.0, 8.0, 9.0, 4.5, 15.0, 4.2, 2.2, 6.0, 3.3, 1.3

#369. Red Willow (34.04065519, -118.5825264)
trunks = 2 DBH= 11.0, 7.5

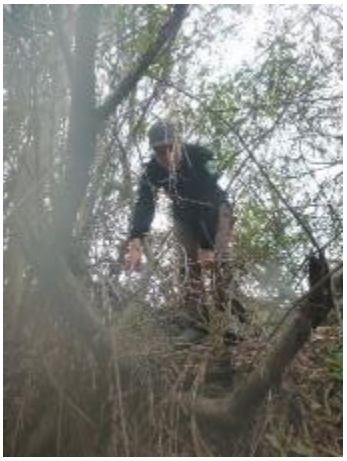
#370. Red Willow (34.04067859, -118.5824446)
trunks = 12 DBH= 13.5, 11.0, 3.3, 2.7, 2.3, 1.4, 3.2, 0.3, 2.4, 6.0, 3.5

#371. Red Willow (34.04070561, -118.5824446)
trunks = 4 DBH= 9.8, 6.5, 7.7, 10.0

#372. Arroyo Willow (34.04072124, -118.5824664)
trunks = 3 DBH= 13.0, 3.6, 9.0

#373. Arroyo Willow (34.04062696, -118.5823171)
trunks = 2 DBH= 7.8, 7.5

#374. Arroyo Willow (34.04060391, -118.5823206)
trunks = 2 DBH= 9.7, 2.0



#375. Arroyo Willow (34.04060732, -118.5823206)
trunks = 3 DBH= 7.0, 3.5, 3.2

#376. Arroyo Willow (34.04060881, -118.5823156)
trunks = 2 DBH= 4.0, 3.6

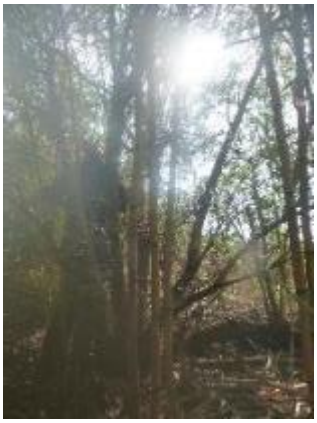
#377. Arroyo Willow (34.04064264, -118.5822971)
trunks = 1 DBH= 8.8

#378. Arroyo Willow (34.04062036, -118.5822943)
trunks = 2 DBH= 9.8, 8.2

#379. Arroyo Willow (34.04068861, -118.5822757)
trunks = 5 DBH= 12.4, 3.8, 3.5, 3.7, 13.0

#380. Arroyo Willow (34.04070021, -118.58229)
trunks = 5 DBH= 6.8, 4.5, 2.3, 5.9, 7.9

#381. Arroyo Willow (34.0407314, -118.5822264)
trunks = 5 DBH= 16.0, 16.0, 3.0, 2.3, 0.5



#382. Elderberry (34.04087599, -118.582108)
trunks = 10 DBH= 2.5, 1.5, 1.3, 2.0, 1.5, 1.2, 3.1, 3.3, 3.5, 1.5, 3.7

#383 Arroyo Willow (34.04071931, -118.58193769)# trunks=9 DBH= 12.7, 12, 6.0, 5.0, 4.0, 13.0,2.0,5.2, 8.8

#384. Sycamore (34.04057325, -118.5818835) # trunks = 3 DBH= 8.2, 1.3, 1.9

#385. Coast Live Oak (34.0405267, -118.5818349) # trunks = 5 DBH= 3.5, 3.0, 2.0, 0.4, 0.5

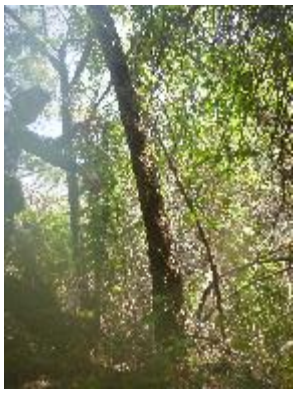
#386. Sycamore (34.0405222, -118.5817288) # trunks = 4 DBH= 11.8, 3.5, 3.3, 6.4

#387. Arroyo Willow (34.04085348, -118.5819151) # trunks = 5 DBH= 6.5, 5.0, 8.0, 9.0, 7.3

#388. Elderberry (34.04084049, -118.5816604) # trunks = 13 DBH= 5.5, 1.8, 7.6, 13.4, 3.8, 6.5, 7.7

#389. Elderberry (34.04083844, -118.5816622) trunks = 3 DBH= 9.0, 6.5, 5.0

#390. Elderberry (34.04076669, -118.5817055)
trunks = 5 DBH= 17.0, 3.3, 5.5, 13.8, 16.4



#391. Elderberry (34.04080864, -118.5817729)
trunks = 1 DBH= 5.1

#392. Elderberry (34.04079853, -118.5817787)
trunks = 5 DBH= 19.0, 3.2, 2.0, 4.0, 8.6

#393. Eucalyptus (34.039997, -118.5821103)
trunks = 1 DBH = 36

#394. Eucalyptus (34.04000473, -118.5821449)
trunks = 1 DBH = 36

#395. Eucalyptus (34.0399741, -118.5825159)
trunks = 1 DBH= 41.0

#396. Pine (34.04002209, -118.58244503)
#trunks = 3 DBH = 14.6, 9.6, 12.8

#397. Cypress (34.03995866, -118.58246527)
#trunks = 12 DBH = 2.8, 2.5, 3.5, 1.6, 1.3, 2, 3.1, 2, 2, 4, 1, 3.4

#398. Cypress (34.03997894, -118.58252813)
#trunks = 1 DBH = 10.2

#399. Canary Island Palm (34.0399598, -118.5825432) # trunks = 1 DBH= 20.5

#400. Ficus (34.03997814, -118.5826078)

#401. Cypress (34.03997725, -118.5826142)

trunks = 1 DBH= 20.0

#402. Fan Palm (34.04004038, -118.5826941)
trunks = 1 DBH= 16.8

#404. Fan Palm (34.039999676, -118.582753)
trunks = 1 DBH= 17.3

trunks = 5 DBH= 6.9, 5.2, 9.2, 5.4, 7.3

#403. Dracaena (34.04002138, -118.5827045)
trunks = 5 DBH= 4.4, 4.4, 4.4, 4.5, 4.4

#405. Lemon Tree (34.03998417, -118.5827413)
trunks = 5 DBH= 2.5, 2.0, 2.6, 1.5, 2.0

#406. Eucalyptus (34.03987468, -118.587393)
trunks = 1 DBH= 45.0

#407. Eucalyptus (34.03990632, -118.5828133)
trunks = 1 DBH= 19.0

#408.Bird of Paradise (34.03982332, -118.5828193)
trunks = 14 DBH= All trunks ~5.5

#409.Bird of Paradise (34.03976903, -118.5828252)
trunks = 16 DBH= All trunk ~5.5

#410. Canary Island Palm (34.03984213, -118.5823964)
trunks = 1 DBH= 27.0

#411. Brazilian Pepper (34.04014094, -118.5826053)
trunks = 4 DBH= 8.0, 4.4, 8.0, 11.0

#412. Dracaena (34.04013042, -118.5826517)
trunks = 4 DBH= 6.5, 6.0, 13.0, 6.5

#413. Fan Palm (34.04011846, -118.582658)
trunks = 1 DBH= 14.8

#414. Brazilian Pepper (34.04010293, -118.582667)
trunks = 2 DBH= 6.0, 4.5

#415. Dracaena (34.04007956, -118.586795)
trunks = 2 DBH= 5.0, 3.0

#416. Ficus (34.04007172, -118.582684)
trunks = 5 DBH= 7.4, 4.2, 4.5, 2.3, 6.0

#417. Dracaena (34.04006065, -118.582687)
trunks = 7 DBH= 12.0, 6.5, 4.2, 5.3, 5.0, 4.0, 4.0

#418. Eucalyptus (34.03965071, -118.5827657)
trunks = 1 DBH= 25.0

#419. Eucalyptus (34.0396709, -118.5826669)
trunks = 1 DBH= 46.2

#420. Eucalyptus (34.0396909, -118.5825542)
trunks = 5 DBH= 51.0, 2.2, 2.2, 2.5, 3.3

#421. Eucalyptus (34.03961605, -118.5821711)
trunks = 1 DBH= 30.0

#422. Eucalyptus (34.03986902, -118.582008)
trunks = 1 DBH= 30.0

#423. Canary Island Palm (34.03989247, -118.5818583)
trunks = 1 DBH= 48.0

#424. Eucalyptus (34.03990943, -118.5818069)
trunks = 1 DBH= 53.0

#425. Euphorbia(34.03992539, -118.5817591)
trunks = 7 DBH= 6.3, 4.5, 2.0, 4.7, 1.6, 1.0, 1.6

#426. Ficus (34.03984569, -118.5817484)
trunks = 2 DBH= 10.5, 9.6

#427. Ficus (34.03973114, -118.5817185)
trunks = 2 DBH= 15.3, 15.2

#428. Ficus (34.03976969, -118.5815195)
trunks = 5 DBH= 15.0, 6.2, 4.0, 3.8, 6.0

#429. Ficus (34.03986888, -118.5815933)
trunks = 1 DBH= 4.5

#430. Ficus (34.03985451, -118.5814931)
trunks = 2 DBH= 12.0, 11.7

#431. Ficus (34.03988379, -118.5814395)
trunks = 4 DBH= 7.0, 5.2, 10.8, 11.0

#432. Fan Palm (34.03988379, -118.5814395)
trunks = 1 DBH=28.0

#433. Eucalyptus (34.03959488, -118.5843833)
trunks = 1 DBH= 23.0

#434. Eucalyptus (34.03949031, -118.584316)
trunks = 1 DBH= 21.6

#435. Eucalyptus (34.03827812, -118.5843811)
trunks = 1 DBH= 22.0

#436. Laurel Sumac (34.0393897, -118.5841698)
trunks = 6 DBH= 4.0, 3.4, 2.8, 2.6, 2.6, 2.5

#437. Eucalyptus (34.0383897, -118.5841698)
trunks = 1 DBH= 20.0

#438. Juniper (34.03926692, -118.5840258)
trunks = 2 DBH= 9.7, 9.5

#439. Mexican Fan Palm (34.03923372, -118.5836395)
trunks = 1 DBH= 36.0

#440. Eucalyptus Roost (34.0385539, -118.583315)
trunks = 5 DBH= 25.8, 3.5, 3.6, 2.5, 1.5

#441. Myoporum (34.03853628, -118.583221)
trunks = 4 DBH= 6.1, 3.6, 4.3, 5.0

#442. Myoporum (34.03851638, -118.582314)
trunks = 6 DBH= 3.7, 3.0, 2.6, 3.2, 4.0, 2.6

#443. Eucalyptus (34.03849711, -118.5832828)
trunks = 5 DBH= 18.0, 1.4, 14.1, 1.6, 1.5

#444. Eucalyptus (34.03845634, -118.582871)
trunks = 11 DBH= 9.5, 6.9, 1.0, 2.0, 2.0,
2.0, 0.5, 1.5, 2.1, 2.0, 1.4

#445. Laurel Sumac (34.03845522, -118.5832506)
trunks = 14 DBH= 3.2, 2.4, 1.7, 1.6, 2.1, 2.2, 1.8,
2.3, 2.6, 2.8, 1.4, 2.3, 5.1

#446. Tamarisk (34.03863244, -118.5828353)
trunks = 1 DBH= 23.3

#447. Arroyo Willow (34.03884058, -118.582954)
trunks = 6 DBH= 3.7, 3.4, 4.7, 5.0, 2.3, 5.3

#448. Myoporum (34.03901166, -118.5829509)
trunks = 4 DBH= 4.3, 3.6, 2.9, 2.3

#449. Myoporum (34.03898948, -118.5829479)
trunks = 2 DBH= 2.2, 4.7

#450. Myoporum (34.03904743, -118.582937)
trunks = 6 DBH= 6.4, 3.4, 3.4, 2.2, 3.0, 2.5

#451. Canary Island Pine (34.03900348, -118.5828982)
trunks = 5 DBH= 4.5, 4.5, 2.0, 1.9, 2.0

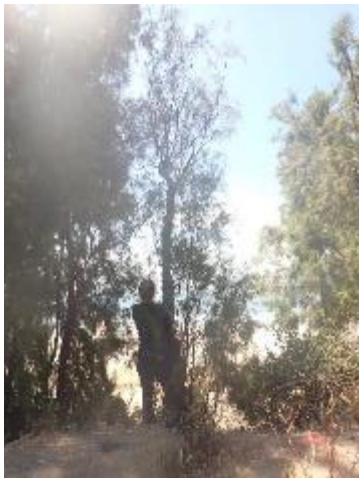
#452. Eucalyptus (34.03886337, -118.5828272)
trunks = 1 DBH= 8.6

#453. Fan Palm (34.0388376, -118.582833)
trunks = 1 DBH= 11.2

#454. Tamarisk (34.03874488, -118.5828143)
trunks = 3 DBH= 13.4, 12.7, 12.5

#455. Tamarisk (34.0387815, -118.5827905)
trunks = 25 DBH= 12.2, 11.0, 15.4, and x22 trunks <2

#456. Tamarisk (34.03881324, -118.5827735)
trunks = 25 DBH= 16.0, 11.1, and x22 trunks <2



#457. Tamarisk (34.03884714, -118.5827078)
trunks = 1 DBH= 6.0

#458. Tamarisk (34.03885509, -118.5826897)
trunks = 25 DBH= 25.0, 12.3, 9.0, and x22 trunks <2

#459. Myoporum (34.03888497, -118.5826823)
trunks = 3 DBH= 4.7, 3.0, 4.4

#460. Tamarisk (34.03886715, -118.5826485)
trunks = 35 DBH= 30.4, 18.0, 20.0, and x32 trunks <2

#461. Eucalyptus (34.03873953, -118.5823996)
trunks = 1 DBH= 29.3

#462. Fan Palm (34.03884923, -118.5825393)
trunks = 1 DBH= 11.3

#463. Eucalyptus (34.03887518, -118.5824309)
trunks = 2 DBH= 8.8, 4.5

#464. Fan Palm (34.038917, -118.5824218)
trunks = 1 DBH= 11.1

#465. Fan Palm (34.03889581, -118.5824084)
trunks = 1 DBH= 13.3

#466. Spineless Yucca (34.03890803, -118.5823423) # trunks = 1 DBH= 22.0

#467. Fan Palm (34.03873404, -118.582212) # trunks = 2 DBH= 19.1, 7.9

#468. Fan Palm (34.03867874, -118.5821407) # trunks = 1 DBH= 20.2

#469. Fan Palm (34.0387205, -118.5819918) # trunks = 1 DBH = 18.0

#470. Fan Palm (34.03874541, -118.5819817) # trunks = 1 DBH= 21.8

#471. Fan Palm (34.03876018, -118.5818704) # trunks = 1 DBH= 18.6

#472. Chinese Elm (34.03902008, -118.5823048)
trunks = 1 DBH= 14.4

#473. Spineless Yucca (34.0389339, -118.5822862)
trunks = 2 DBH= 8.1, 5.7

#474. Chinese Elm (34.03899499, -118.5822409)
trunks = 1 DBH= 6.9

#475. Eucalyptus (34.03902844, -118.582148)
trunks = 1 DBH= 22.0

#476. Eucalyptus (34.0389088, -118.5820717)
trunks = 4 DBH= 10.5, 3.7, 2.5, 2.5

#477. Fan Palm (34.03903007, -118.582058)
trunks = 1 DBH= 13.4

#478. Fan Palm (34.03902493, -118.5820317)
trunks = 1 DBH= 11.1

#479. Fan Palm (34.03903908, -118.5820255)
trunks = 1 DBH= 15.2

#480. Fan Palm (34.03902489, -118.589726)
trunks = 1 DBH= 15.2

#481. Fan Palm (34.03901841, -118.5819421)
trunks = 1 DBH= 16.2

#482. Fan Palm (34.03904314, -118.5819421)
trunks = 1 DBH= 16.8

#483. Eucalyptus (34.03905874, -118.5819095)
trunks = 1 DBH= 16.6

#484. Fan Palm (34.03904732, -118.5819168)
trunks = 1 DBH= 21.3

#485. Fan Palm (34.03906123, -118.581887)
trunks = 1 DBH= 19.0

#486. Eucalyptus (34.03907576, -118.5818771)
trunks = 1 DBH= 9.9

#487. Eucalyptus (34.03906792, -118.5818678)
trunks = 1 DBH= 7.2

#488. Fan Palm (34.03909586, -118.581921)
trunks = 1 DBH= 19.3

#489. Fan Palm (34.03911681, -118.5819465)
trunks = 1 DBH= 16.8

#490. Elm (34.03917113, -118.5818743)
trunks = 1 DBH= 9.5

#491. Fan Palm (34.03915733, -118.5818427)
trunks = 1 DBH= 14.9

#492. Fan Palm (34.03915967, -118.58188578)
trunks = 1 DBH= 10.7

#493. Elm (34.03911907, -118.5817638)
trunks = 1 DBH= 15.7

#494. Palm (34.03910938, -118.5817533)
trunks = 1 DBH= 33.0

#495. Fan Palm (34.03913844, -118.5817533)
trunks = 1 DBH= 16.2

#496. Fan Palm (34.03914101, -118.581702)
trunks = 1 DBH= 17.1

#497. Fan Palm (34.03914356, -118.5816924)
trunks = 1 DBH= 12.1

#498. Fan Palm (34.0392096, -118.5815816)
trunks = 1 DBH= 14.5

#499. Fan Palm (34.03921058, -118.5815892)
trunks = 1 DBH= 14.6

#500. Fan Palm (34.0393155, -118.5815097)
trunks = 1 DBH= 20.0

#501. Laurel Sumac (34.03929419, -118.5814271)
trunks = 6 DBH= 3.5, 3.0, 2.0, 1.0, 3.3, 3.0

#502. Eucalyptus (34.03920849, -118.5813755)
trunks = 2 DBH= 7.5, 7.3

#503. Eucalyptus (34.03920567, -118.5813738)
trunks = 3 DBH= 8.0, 2.0, 14.4

#504. Eucalyptus (34.03920651, -118.5813729)
trunks = 1 DBH= 7.6

#505. Eucalyptus (34.03920612, -118.5813731)
trunks = 1 DBH= 6.5

#506. Eucalyptus (34.03929287, -118.581374)
trunks = 1 DBH= 14.1

#508. Fan Palm (34.03931994, -118.5813696)
trunks = 1 DBH= 17.0
Note: No tree #507 tag lost

#509. Eucalyptus (34.03931977, -118.5813689)
trunks = 7 DBH= 7.0, 2.0, 0.3, 0.3, 1.0, 2.5, 1.0

#510. Fan Palm (34.03933581, -118.5813556)
trunks = 1 DBH= 14.4

#511. Fan Palm (34.03922688, -118.5812832)
trunks = 1 DBH= 10.6

#512. Eucalyptus (34.03927464, -118.58125)
trunks = 1 DBH= 28.0

#513. Acacia (34.03940115, -118.581253)
trunks = 7 DBH= 5.2, 4.3, 4.6, 2.0, 2.5,4.3, 4.6

#514. Fan Palm (34.03939959, -118.5811906)
trunks = 1 DBH= 19.3

#515. Brazilian Pepper (34.03941037, -118.5812086)
trunks = 1 DBH= 12.3

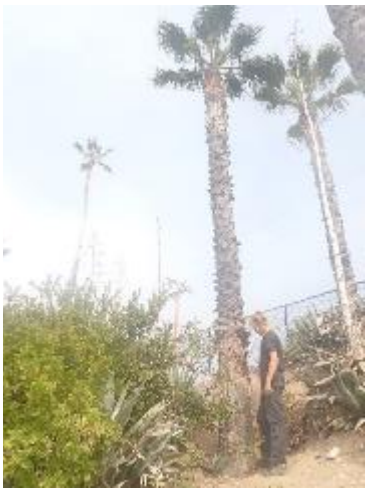
#516. Lemonade Berry (34.03943946, -118.5811051)
trunks = 4 DBH= 4.5, 4.0, 3.5, 1.5

#517. Lemonade Berry (34.03943947, -118.5811042)
trunks = 2 DBH= 4.3, 3.0

#518. Fan Palm (34.03936512, -118.5810666)
trunks = 1 DBH= 16.7

#519. Fan Palm (34.03936406, -118.5810708)
trunks = 1 DBH= 12.5

#520. Eucalyptus (34.03941195, -118.5810201)
trunks = 1 DBH= 6.6



#521. Fan Palm (34.03950016, -118.5810526)
trunks = 1 DBH= 14.8

#522. Fan Palm (34.0395142, -118.581036)
trunks = 1 DBH= 14.0

#523. Fan Palm (34.03949819, -118.5810195)
trunks = 1 DBH= 12.5

#524. Eucalyptus (34.03942399, -118.5809846)
trunks = 1 DBH= 6.1

#525. Eucalyptus (34.0394724, -118.5809183)
trunks = 1 DBH= 8.0

#526. Eucalyptus (34.03945691, -118.5809085)
trunks = 1 DBH= 5.7

#528. Fan Palm (34.03947033, -118.5808652)
trunks = 1 DBH= 14.3
Note: No tree #527 tag lost

#529. Fan Palm (34.03945981, -118.580846)
trunks = 1 DBH= 14.0

#530. Fan Palm (34.03946163, -118.5808093)
trunks = 1 DBH= 14.2

#531. Brazilian Pepper (34.03954188, -118.5809086) # trunks = 3 DBH= 3.0, 6.0, 4.5

#532. Fan Palm (34.0395699, -118.5808866)
trunks = 1 DBH= 18.4

#533. Acacia (34.03959942, -118.5808689)
trunks = 2 DBH= 4.0, 3.5

#534. Eucalyptus (34.03945049, -118.5807317)
trunks = 1 DBH= 8.8

#535. Brazilian Pepper (34.0394987, -118.5807337)
trunks = 18 DBH= 5.5, 4.5, 4.5, 6.8, and 14 trunks <2

#536. Eucalyptus (34.03953704, -118.5806931)
trunks = 1 DBH= 18.2

#537. Mountain Mahogany (34.03968499, -118.5806809)
trunks = 6 DBH= 2.5, 1.0, 1.0, 2.5, 2.0, 1.5

#538. Fan Palm (34.03969436, -118.5806058)
trunks = 1 DBH= 15.8

#539. Eucalyptus (34.0395904, -118.5805681)
trunks = 5 DBH= 15.5, 15.2, 10.1, 9.3, 11.0

#540. Aleppo Pine (34.03978521, -118.5804731)
trunks = 1 DBH= 11.6

#541. Aleppo Pine (34.03980541, -118.5804135)
trunks = 1 DBH= 11.8

TOPANGA CANYON BLVD TREE PHOTOS

April – November 2021

#544. Eucalyptus (34.04460966, -118.5800194) Trunks: 1 DBH: 31

#545. Pine (34.04460492, -118.5800285) Trunks: 1 DBH: 20.9

#546. Eucalyptus (34.04463859, -118.5800835) Trunks: 1 DBH: 10

#547. Cypress (34.04461137, -118.5802458) Trunks: 1 DBH: 20

#548. Eucalyptus (34.04456054, -118.5802275) Trunks: 1 DBH: 41.3

#549. Eucalyptus (34.04457432, -118.5801663) Trunks: 1 DBH: 27.3

#550. Eucalyptus (34.04451644, -118.5801672) Trunks: 1 DBH: 36

#551. Brazilian Pepper (34.04445938, -118.5802176) Trunks: 3 DBH: 12.4, 11.8, 9.5

#552. Eucalyptus (34.04454882, -118.5799806) Trunks: 1 DBH: 30

#553. Eucalyptus (34.04454327, -118.5799527) Trunks: 4 DBH: 10, 13.6, 12.8, 14.8

#554. Eucalyptus (34.04439197, -118.5799635) Trunks: 1 DBH: 28.5

#555. Toyon (34.04422193, -118.5799692) Trunks: 3 DBH: 6, 6.2, 4.3

#556. Eucalyptus (34.04413418, -118.5798727) Trunks: 3 DBH: 28.7, 8.1, 20.2

#557. Eucalyptus (34.0440830, -118.5799373) Trunks: 1 DBH: 15

#558. Mexican Fan Palm (34.04378576, -118.5797618) Trunks: 1 DBH: 22.1

#559. Elderberry (34.04361439, -118.5797774) Trunks: 3 DBH: 15.5, 13.6, 11.2

#560. Monkey Puzzle (34.04355411, -118.5796636) Trunks: 1 DBH: 12.6

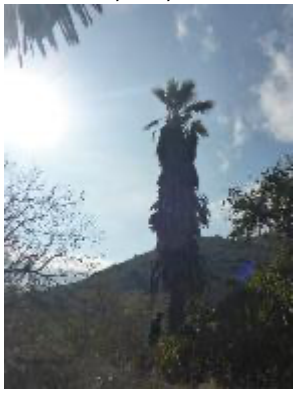
#561. Cherry (34.04349226, -118.5797453) Trunks: 4 DBH: 8.5, 4.9, 3, 6

#562. Ficus (34.04362072, -118.5795999) Trunks: 1 DBH: 15.2

#563. Ficus (34.04364228, -118.5795618) Trunks: 3 DBH: 6.7, 8.7, 5.2

#564. Mexican Fan Palm (34.04363295, -118.5795416) Trunks: 1 DBH: 15.7

#565. Ficus (34.04358851, -118.5795082) Trunks: 4 DBH: 14, 8.4, 6.6, 8.4, 8.8



#566. Mexican Fan Palm (34.04343693, -118.5796998) Trunks: 1 DBH: 20

#567. Canary Island Palm (34.04342315, -118.5796394) Trunks: 1 DBH: 32.5

Tag #568-574 Missing

#574. Cherry (34.0431675, -118.5792967) Trunks: 4 DBH: 9.3, 6.3, 9.8, 1.1

Tag #575-577 Missing

#578. Pine (34.04301556, -118.5793313) Trunks: 1 DBH: 20

#579. Pine (34.04299968, -118.5792655) Trunks: 1 DBH: 12

#580. Dracaena (34.04295767, -118.5793074) Trunks: DBH:

#581. Rubber Plant (34.04293248, -118.5792902) Trunks: 3 DBH: 7.5, 7.6, 9.8

#582. Sweet Pittosporum (34.04279429, -118.5793144) Trunks: 1 DBH: 5.5

#583. Brazilian Pepper (34.04274555, -118.5793794) Trunks: 1 DBH: 19.5

Tag #584 Missing

#585. Pomegranate (34.04271574, -118.5791339) Trunks: 10 DBH: 5, 1, 1, 1, 1, 1

Tag #586 Missing

#587. Cherry (34.0426174, -118.5790599) Trunks: 4 DBH: 9.5, 4.3, 2.4, 2.6

#588. Cherry (34.042579, -118.5790381) Trunks: 1 DBH: 7

#589. Blue Jacaranda (34.04258545, -118.579123) Trunks: 5 DBH: 12.5, 0.7, 2.2, 4.1, 0.8

#590. Eucalyptus (34.04238448, -118.5792407) Trunks: 1 DBH: 43.9

#591. Ficus (34.0423893, -118.5791788) Trunks: 2 DBH: 6, 5.7

#592. Ficus (34.04238539, -118.5791723) Trunks: 1 DBH: 6.6

#593. Ficus (34.04238406, -118.5791557) Trunks: 1 DBH: 8

#594. Ficus (34.04238578, -118.5791554) Trunks: 2 DBH: 3.5, 6.5

#595. Ficus (34.04236543, -118.5791499) Trunks: 3 DBH: 6.6, 2.5, 3.8

#596. Toyon (34.04236099, -118.5789687) Trunks: 5 DBH: 7, 3, 3.5, 4, 3.5

#597. California Pepper (34.04226756, -118.5789124) Trunks: 2 DBH: 15.3, 21.3

#598. Strawberry (34.04214582, -118.5788767) Trunks: 1 DBH: 8.5

#599. Eucalyptus (34.04213328, -118.5788759) Trunks: 1 DBH: 29

#600. Sweet Pittosporum (34.04203873, -118.5788606) Trunks: 6 DBH: 5.5, 5, 4.5, 2, 3

#601. California Pepper (34.04191248, -118.5788741) Trunks: 1 DBH: 15.5

#602. Fire Thorn (34.04191121, -118.5788729) Trunks: 5 DBH: 5, 5, 4.7, 2.2, 2.5, 0.8

#603. Eucalyptus (34.04192546, -118.5789009) Trunks: 1 DBH: 44

#604. Eucalyptus (34.04192142, -118.5789814) Trunks: 1 DBH: 27.5

#605. Eucalyptus (34.04189804, -118.579032) Trunks: 1 DBH: 36

#606. Eucalyptus (34.04189732. -118.5790333) Trunks: 1 DBH: 13

#607. Dracaena (34.0419034, -118.5790467) Trunks: 1 DBH: 5

#608. Eucalyptus (34.04188281, -118.5790625) Trunks: 6 DBH: 12, 14, 12, 17.6, 6.9, 7.4

#609. Pine (34.04177684, -118.5790439) Trunks: 1 DBH: 16

#610. Dracaena (34.04173937, -118.5790487) Trunks: 1 DBH: 14

Tag #611 Missing

#612. Brazilian Pepper (34.04176564, -118.5789304) Trunks: 2 DBH: 8.9, 6.5

#613. Cherry (34.04157703, -118.5790193) #Trunks: 1 DBH: 11

#614. Cherry (34.04157688, -118.5790179) Trunks: 2 DBH: 5.5, 6.5

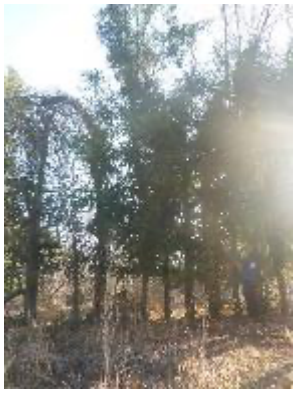
#615. Cherry (34.04157755, -118.5790121) Trunks: 2 DBH: 8.1, 5.4

#616. Cherry (34.04157674, -118.5790015) Trunks: 2 DBH: 4.5, 7.4

#617. Cherry (34.04157658, -118.5789896) Trunks: 1 DBH: 7.1

#618. Cherry (34.04157623, -118.5789832) Trunks: 2 DBH: 7, 6.3

#619. Cherry (34.04157626, -118.5789785) Trunks: 1 DBH: 10.2



#620. Cherry (34.04157523, -118.5789715) Trunks: 1 DBH: 7

#621. Cherry (34.04157609, -118.5789648) Trunks: 1 DBH: 7.6

#622. Cherry (34.04157738, -118.5789576) Trunks: 2 DBH: 10, 7.2

#623. Cherry (34.04157822, -118.5789495) Trunks: 4 DBH: 8, 3, 8.5, 6.5

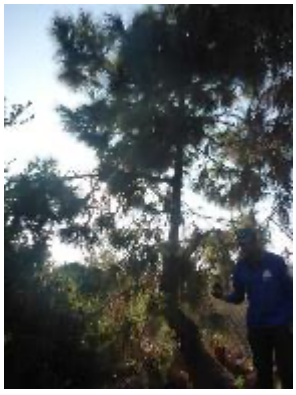
#624. Cherry (34.04157954, -118.5789402) Trunks: 1 DBH: 5.4

#625. Cherry (34.04158196, -118.5789293) Trunks: 1 DBH: 4.4

#626. Cherry (34.04158438, -118.5789206) Trunks: 1 DBH: 28.1

#627. Laurel Sumac (34.04152361, -118.5787778) Trunks: 8 DBH: 7, 6.2, 2.5, 4, 3.8, 2.7, 3.5

#628. Pine (34.04148836, -118.5790471) #Trunks: 1 DBH: 11.3



#629. Pine (34.04146331, -118.5790464) #Trunks: 1 DBH: 8.9

#630. Sweet Pittosporum (34.04138756, -118.5789974) #Trunks: 1 DBH: 8

#631. Cherry (34.04130737, -118.5789697) Trunks: 1 DBH: 9.2

#632. Eucalyptus (34.04100967, -118.5792879) #Trunks: 1 DBH: 24.2

#633. Eucalyptus (34.04085926, -118.579185) #Trunks: 1 DBH: 20

#634. Eucalyptus (34.04084685, -118.5791919) #Trunks: 1 DBH: 15

#635. Eucalyptus (34.04083857, -118.5791974) #Trunks: 2 DBH: 12.4, 7.3

#636. Chinese Elm (34.04076744, -118.5792484) #Trunks: 2 DBH: 11.2, 10.1

#637. Cypress (34.04084005, -118.579337) #Trunks: 1 DBH: 8.6

#638. Pine (34.0407619, -118.5794962) #Trunks: 1 DBH: 20.5

#639. Monterey Pine (34.0407858, -118.5795255) #Trunks: 1 DBH: 20

#640. Sycamore (34.04043047, -118.579964) #Trunks: 1 DBH: 41.7

#641. Sycamore (34.04054659, -118.5801072) #Trunks: 3 DBH:15.6, 12.1, 10.9

#642. Canary Island Date Palm (34.0407437, -118.579547) #Trunks: 1 DBH: 46.4

APPENDIX D

TOPANGA LAGOON RESTORATION PROJECT

NATIVE TREE REPLACEMENT PLANTING, MITIGATION AND MONITORING PLAN

PREPARED BY
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4.7.22

TABLE OF CONTENTS

1. BACKGROUND	3
2. PROJECT AREA	3
Figure 1. Topanga Lagoon Restoration Project Area Parcel Map	4
3. PROJECT SPECIFIC INFORMATION	4
4. MITIGATION REQUIRED	4
Table 1. Summary of Native Trees on project site	5
5. TIMELINE	5
Table 2. Summary of Mitigation Reporting requirements and timeline.	5
6. MITIGATION TREE REQUIREMENTS	6
Stock Selection and size	6
Site preparation	6
Planting method	7
Maintenance	7
Irrigation Method	7
Standard for deterioration triggering replacement planting	8
Invasive Pests and Disease Monitoring	8
Figure 2. Proposed Plant assessment criteria	9
7. SUCCESS CRITERIA	10
8. REPORT REQUIREMENTS	10

1. BACKGROUND

This document provides details on the Topanga Lagoon Restoration Project Native Tree Replacement Planting Mitigation and Monitoring Plan (PLAN) that will provide mitigation tree planting, maintenance and monitoring guidance required as a result of the implementation of the Topanga Lagoon Restoration Project. Implementation of this PLAN will ultimately be the responsibility of California Department of Parks and Recreation for any impacts north of Pacific Coast Highway, and Los Angeles County Department of Beaches and Harbors on the south side of Pacific Coast Highway.

Once a preferred alternative is identified and final design impacts are clear, a planting plan will be included in the Topanga Lagoon Habitat Restoration Plan. The planting plan will address all required mitigations from the Coastal Development Permit and any additional regulatory permits.

Upon completion of site disturbance, the required mitigation trees will be planted in pre-approved locations within the project site. All existing native trees are uniquely tagged, and identified on maps with details provided in the Native Tree and Oak Tree Report associated with the project (Draft 2022). All mitigation plantings will similarly be tagged and mapped per Los Angeles County Local Coastal Plan Local Implementation Plan requirements.

Onsite mitigation of existing native trees that remain must be monitored for 10 years (7 years for oaks). If any of the retained native trees deteriorate to below the standard or dies due to project impacts, then up to 10 trees of that species from Santa Monica Mountains stock shall be planted and added to the annual tree report and map. Mitigation trees planted shall also be monitored for 10 years (7 years for oaks), starting from the date planted.

This document will become an appendix for any specific project contract and guide the selection, planting, maintenance and monitoring of any mitigation plants for 10 years post construction

2. PROJECT AREA

The Topanga Lagoon Restoration Project is located on State Parks parcels APN 4448-002-900 and 4448-002-901on the north side of Pacific Coast Highway (PCH) and west of Topanga Canyon Blvd. Also included is parcel 4448-001-900 which is owned by the Los Angeles County Department of Beaches and Harbors.

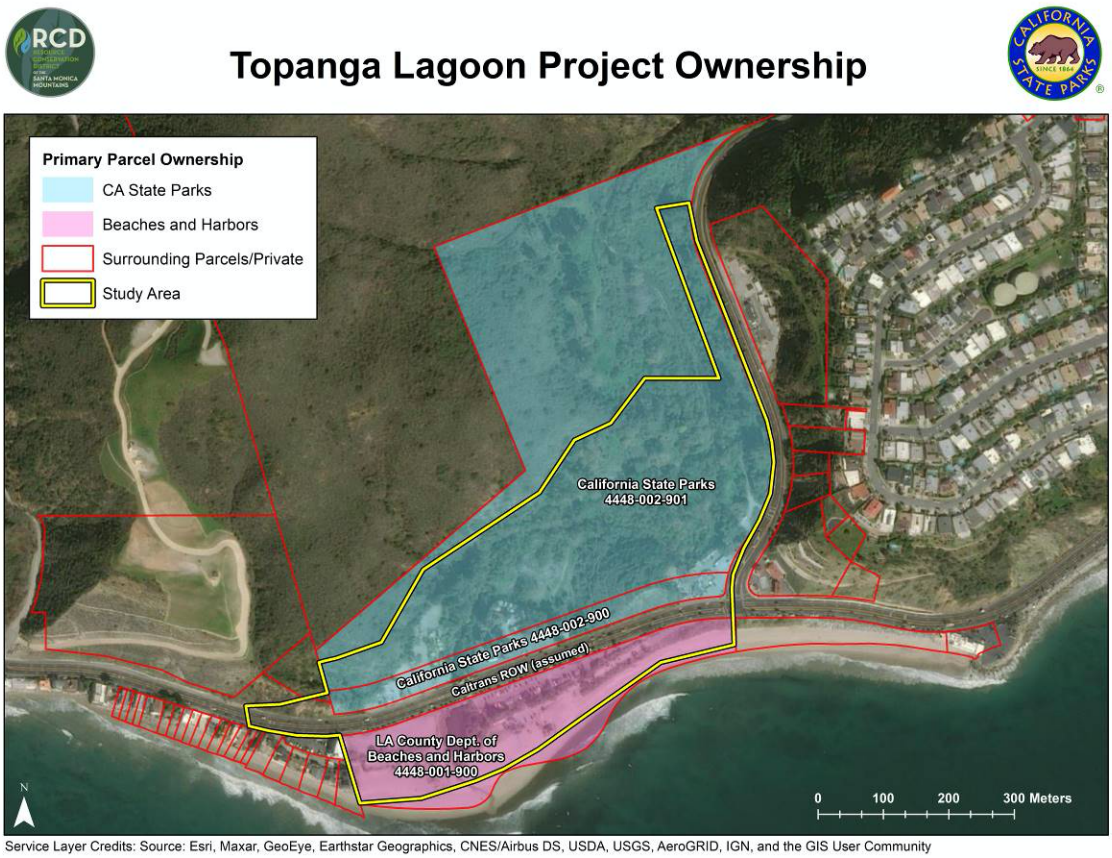


Figure 1. Topanga Lagoon Restoration Project Area Parcel Map

3. PROJECT SPECIFIC INFORMATION

CDPR and DBH will develop contracts to fulfill their mitigation planting, maintenance and monitoring requirements. Each contract will contain at least the following information:

1. Project Name
2. Project Number
3. Permit Number
4. APNs
5. Applicant Name and Contact Info
6. Name and Affiliation of preparer
7. Biologist/Arborist contact info
8. Date (For revisions and supplements to the report, the date of the revision will be added to the title page.)

4. MITIGATION REQUIRED

Once the preferred alternative and the final impacts are identified, a coordinated planting plan will be developed. This PLAN will show project specific trees with Tree Protection Zone (TPZ) disturbance, even when impact is only at the edge of the TPZ. The mitigation category (existing), impact (removal or % encroachment), unique tag number, species, trunk DBH measure for 1 or 2 largest trunks, canopy measure, and number of mitigation trees required will

all be tabulated. The standards in LA County §22.44.1920.K.1 and any other applicable regulatory permits such as CDFW will be used to determine the number of mitigation trees required.

All additional Mitigation trees planted during the 10 year monitoring period (7 years for oaks) will be uniquely numbered, mapped, cared for, and monitored. Data on the unique tag number, species, size at planting, and GPS coordinates will be provided in an additional table and map and included in the first contract Baseline report submitted following planting.

It is common practice to plant between 10-20% (depending on species) more than the required mitigation so that in case of unforeseen loss, those plants can be included as mitigation and keep the effort on the timeline track initiated at the start of the project.

The landowners are NOT responsible for the loss of mitigation plants due to wildfire, landslide, or other unforeseeable natural disasters. Should the mitigation plants be destroyed by one of these events, the landowners will work with the county and other regulatory agencies to develop an appropriate response.

For each contract, Table 1 will be completed including a summary of all existing trees and shrubs tagged on the project site and subject to the mitigation planting contract.

Table 1. Summary of Native Trees on project site

Tree Tag Number	Species	Total DSH for 1-2 largest trunks (inches)	Canopy spread (ft)	STATUS: Remain Removal % Encroachment	Number of Mitigation Oaks/trees required	Monitoring period required

MAP 1. Site map showing all native trees and the Tree Protection Zones on project site
This map will be prepared for each individual contract.

5. TIMELINE

A timeline detailing the start and end date for mitigation planting and monitoring, including dates for report milestones will be completed as shown in Table 2 below.

Table 2. Summary of Mitigation Reporting requirements and timeline.

TASK	Timeline
Submit completed Native Tree Replacement Planting contract for LA County and other agency approval	Once contract signed with property owner.
Baseline Native Tree Replacement Planting Report (detailing number, species, size and location of all mitigation plantings, etc.)	Fall following contract initiation and planting
Annual Native Tree Replacement Planting Report Year 1-10 (7 years for oaks)	January of each calendar

6. MITIGATION TREE REQUIREMENTS

Mitigation trees shall be planted in late September through December – January, preferably following soaking rains.

Stock Selection and size:
All native mitigation trees/shrubs will come from Santa Monica Mountains seeds and stock. Native stock will be obtained from a reputable source where the provenance of seeds is clearly documented. If container stock is used, they will be inspected before transport to the site to ensure that there is no visible evidence of soil pathogens, insects, non-native frogs or other invasive species present.

The landowners will work with Los Angeles County Forestry, CDPR Angeles District, National Park Service, and Mountains Restoration Trust to obtain watershed appropriate seeds/container stock. If necessary, S&S Seeds and other commercial nurseries may be contracted to obtain the required mitigation plant materials, but again, care will be taken to ensure matching the provenance of the seed/stock.

Plants shall be healthy with the color, shape, size, and distribution of trunk, stems, branches, buds and leaves normal to the plant type specified. The size, color, and appearance of leaves shall be typical for the time of year and stage of growth of the species. Plants shall not show signs of prolonged moisture stress or over watering as indicated by wilted, shriveled, or dead leaves. Plant roots shall be normal to the plant type specified. The root system shall be reasonably free of stem girdling roots over the root collar or kinked roots from nursery production practices. At the time of planting, all plants shall have a root system, stem, and branch form that will not restrict normal growth, stability and health for the expected life of the plant.

Oaks are required to be mitigated by up to 1-gallon container trees from acorns of the vicinity. Oak mitigation trees need an acorn of the same species from the vicinity planted in the irrigation circle and will also have oak leaf mulch or other mycorrhizal amendment.

Use of the smallest possible container stock available is recommended in order to provide opportunity for site specific establishment of the roots.

Site preparation:
All invasive species roots will be removed to clear an area at least six times the width of the planting hole to mineral soil. We will make sure that proposed planting locations do not interfere with, or impact any existing native plants.

NOTE: Only mechanical weed control methods are recommended.

Planting method:
Actual planting shall be performed during those periods when weather and soil conditions are suitable in accordance with locally accepted horticultural practices. Planting soil as used in this

specification means the soil at the planting site. No planting shall take place during extremely hot, dry, windy, or freezing weather. No fertilizer supplements shall be applied to the plants during the planting process. Should evidence indicate that the seedlings are being outcompeted by the non-natives, a weed barrier or other application may be placed around the seedling to minimize the impacts of weeds and improve soil moisture levels.

Hand tools will be used excavate the planting hole which will be a minimum of three times the diameter of the root ball. If an auger is used to dig the initial planting hole, the soil around the auger hole shall be loosened along the sides. The top outer edge of the root ball will be set at the average elevation of the proposed finish grade of surrounding area.

The planting hole will be filled with water and allow to drain completely, making sure there is no standing water or drainage issue for that hole.

The container/seed/stake will be placed in the center of the planting hole and the crown will be even with the surrounding grade. If a chicken wire cage or other plant protection devise is planned, it will be installed according to directions appropriate for that material. In wildland settings, root loss to gophers and ground squirrels, as well as grazing from rabbits and deer can significantly damage new plants and therefore protection will be used as needed.

The soil is then backfilled in layers, tamping down to remove air pockets and settle the soil. A shallow watering basin approximately the same size as the diameter of the original excavated hole will be created and covered with locally collected mulch material, newspaper, weed control fabric or other approved weed suppression materials.

The plants will be watered thoroughly, provided with a unique aluminum tag that can endure for 10 years with embossed numbers that match the identification number and GPS coordinates on the map (Alphabetic characters may identify tree species, but number will be unique.)

Tree species will generally be installed on 20’ centers, shrubs on 5-10’ centers, and herbaceous species on 1-2’ centers. The goal is to create a natural growth pattern that blends into the surrounding open space.

Maintenance:
Appropriate care will be provided as needed to ensure survival and good growth. For Year 1, this will include daily checks during the first two weeks to assess watering needs, with weekly checks thereafter. Special attention will be paid to periods of invasive weed growth and appropriate irrigation during the dry summer/fall months the first few years. For Years 2-3, monthly maintenance will occur. During years 4-10 (7 for oaks), quarterly maintenance will occur, unless more intensive maintenance is needed to ensure survival.

Irrigation Method:
All plants will either be included in a temporary irrigation system or hand watered as needed based on rainfall. Watering is recommended up to once per week for the first year, and then weaned off supplemental water over the following three years. Should drought conditions extend that period of weaning, watering will be continued as needed to ensure the survival and health of the plants.

Standard for deterioration triggering replacement planting:
Should any of the mitigation plants die or loose sufficient vigor that their continued survival is not certain, then either: a) one of the extra plants installed as a buffer will be counted and monitored as their replacement, or b) a replacement plant will be installed.

Plant condition will be rated using the score sheet shown in Figure 2, which was developed using the criteria from the Guide for Plant Appraisal 9th Edition (Council for Tree and Landscape Appraisers 2000).

Invasive Pests and Disease Monitoring:
All stock will be inspected prior to arrival at the site to ensure that no pest infested or diseased plants are brought to the site. Once installed, the plants will be visually inspected to note any infestations or diseases and proper procedures will be used to either remove or contain these problems.

The Early Detection Rapid Response Plan for Invasive Beetles in Los Angeles County (Dagit and Burnap 2019) has been adopted by Los Angeles County as the protocol for detecting and managing existing and new infestations. Implementation of the recommended visual and trapping protocols will be incorporated into the ongoing maintenance and monitoring plan for the project.

Figure 2. Proposed Plant assessment criteria

Guide to Judging Plant Condition			
Condition Scoring system	**POINTS**	**%**	**Rating**
No problems (based on inspection)	5	90-100	Excellent
No apparent (immediately visible) problems	4	70-89	Good
Minor problem(s)	3	50-69	Fair
Major problem(s)	2	25-49	Poor
Extreme problem(s)	1	0-24	Very Poor
Inspector:			
Location:			
SPECIES		**Notes**	**Score**
TREE NO.			
Number trunks			
DBH(total of all trunks)			
Height			
Canopy Spread			
CONDITION FACTORS			
FACTOR 1. ROOTS			
Root anchorage			
Confined relative to top			
Collar soundness			
Mechanical injury			
Girdling or kinked roots			
Compaction or water-logged roots			
Toxic gas and chemical symptoms			
Presence of insects or diseases			
FACTOR 2. TRUNK			
Sound bark and wood, no cavities			
Upright trunk (well tapered)			
Mechanical or fire injury			
Cracks - frost, fire, etc.			
Swollen or sunken areas			
Presence of insects or diseases			
FACTOR 3. SCAFFOLD BRANCHES			
Strong attachments			
Smaller diameter than trunk			
Vertical branch distribution			
Included bark			
Decay and cavities			
Pruning problems			
Well-proportioned,-tapered, laterals along branches			
Wound closure Problems			
Amount of dead wood or fire injury (% of canopy)			
Presence of decay, insects or diseases			
FACTOR 4. SMALL BRANCHES AND TWIGS			
Vigor of current shoots, compared to past 3-5 years			
Well-distributed through the canopy			
Normal bud appearance - color, shape, size for sp.			
Presence of weak or dead twigs			
Presence of insects or diseases			
FACTOR 5. FOLIAGE			
Normal appearance - size and color for sp.			
Nutrient deficiencies			
Herbicide, chemical or pollutant injury symptoms			
Wilted or dead leaves			
Presence of insects or diseases			
Total subtotal points assessing all Five Factors			
Condition Rating (Sum/25*100)=%			

7. SUCCESS CRITERIA

The standard for success is considered to be reasonable growth (appropriate to species and initial planting size) and establishment of 100% of all required mitigation plants. If any of the original protected plants, not already mitigated by 10 plants, deteriorates below the standard condition or dies, then a replacement plant is to be identified as noted above. A mitigation replacement is monitored for the remainder of the original term of 10 years (7 years for oaks). A mitigation replacement that deteriorates is replaced within the year deterioration is noted.

8. REPORT REQUIREMENTS

A Baseline Native Tree Replacement Report will be prepared following installation of mitigation plants and start the clock ticking for the required establishment times. For on-site mitigation, the report will document condition of any trees/shrubs that were retained, as well as the information detailed below for mitigation plantings. The report will provide sources of seeds/stock, container size (if applicable), dates and details of installation, tables and maps showing the locations of all plants, access information, site condition information and any other pertinent details. A series of photo-documentation points will be established to document growth over time. Photos will be taken in fall each year prior to preparation of the annual report to illustrate condition at the end of each monitoring year. The baseline report will also include a map of all tagged plants, species, size, condition, canopy cover, and GPS coordinates. This table will be set up to allow additional notation of growth and condition over time, as well as document any problems. The report will be submitted to LA County Department of Regional Planning and any other regulatory agencies upon completion.

According to the LCP LIP requirements, an Annual Native Tree Replacement Report shall be prepared in January of each calendar year following initiation of a project mitigation planting and include, but not be limited to, the following elements:

1. Summary of previous reports. This will be a table listing protected trees and mitigation trees by number, showing results of tree DSH and health in columns for each year of monitoring. “DSH” for mitigation trees will be measured at 1-ft. from the ground.
2. For years of construction disturbance, the contractor will describe instituted tree protective measures for all original protected trees, results in terms of tree condition. Deterioration or death of any original protected tree will be mitigated by planting 10 additional mitigation trees of that species within the year following assessment of the deterioration. This will require an additional contract between the property owner and the contractor.
3. A table will include all enumerated trees listing unique number, tree species, original trunk or two trunks’ DSH, original canopy diameters in N-S and E-W dimensions, health and DSH of tree at monitoring for year in columns by year. For mitigation trees, measurement of “DSH” will be taken 1-ft. up the main trunk from surrounding grade, For original remaining protected trees, DSH will be measured at 4.5-ft. from ground along the trunk(s).
4. The table will include an entry in yearly columns for DSHs and tree condition. Trees that decline beyond the performance limit need to be identified for mitigation planting. The table will also document any protected tree requiring mitigation and new unique identification numbers of mitigation trees. Mitigation trees need to be planted within a year of the assessment of deterioration if it exceeds the number of buffer plants installed initially.

5. Map of all protected and mitigation trees on project site with tree position shown by number keyed to table is required. Different tree species should have different symbols, and legend as a key to symbol.
6. Summary by species of overall totals for trees retained in good condition, trees retained in condition worse than performance level specification (includes deaths), and new mitigation trees planted.

Copies of the Annual Native Tree Replacement Report will be submitted to LA County Department of Regional Planning and any other regulatory agencies upon completion.

APPENDIX E
ASSUMPTIONS AND LIMITING CONDITIONS

Any legal description provided to the consultants is assumed to be correct. Any title or ownership of the properties is assumed to be good and marketable. All property is appraised or evaluated as though free and clear, under responsible ownership and competent management.

All property is presumed to be in conformance with applicable codes, ordinances, statutes, or other regulations.

Care has been taken to obtain information from reliable sources. However, the consultant cannot be responsible for the accuracy of information provided by others.

The consultant shall not be required to give testimony or to attend meetings, hearings, conferences, mediations, arbitration, or trials by reason of this report unless subsequent contractual arrangements are made, including payment of an additional fee for such services.

This report and any appraisal value expressed herein represent the opinion of the consultant, and the consultant's fee is not contingent upon the reporting of a specified appraisal value, a stipulated result, or the occurrence of a subsequent event.

Sketches, drawings and photographs in this report are intended for use as visual aids, are not necessarily to scale, and should not be construed as engineering or architectural reports or surveys. The reproduction of information generated by architects, engineers, or other consultants on any sketches, drawings or photographs is only for coordination and ease of reference. Inclusion of said information with any drawings or other documents does not constitute a representation by Rosi Dagit as to the sufficiency or accuracy of said information.

Unless otherwise expressed: a) this report covers only the examined items and their condition at the time of inspections; and b) the inspection is limited to visual examination of accessible items without dissections, excavation, probing or coring. There is no warranty or guarantee, expressed or implied, that structural problems or deficiencies of plants and property may not arise in the future.

APPENDIX F.

ARBORIST DISCLOSURE STATEMENT

Arborists are tree specialists who use their education, knowledge, training and experience to examine trees, recommend measures to enhance the beauty and health of trees, and attempt to reduce the risk of living near trees. Clients may choose to accept or disregard the recommendations of the arborist, or to seek additional advice.

Arborists cannot detect every condition that could possibly lead to the structural failure of a tree. Trees are living organisms that fail in ways we do not fully understand. Conditions are often hidden within trees and below ground. Arborists cannot guarantee that a tree will be healthy or safe under all circumstances, or for a specified period of time. Likewise, remedial treatments, like any medicine, cannot be guaranteed.

Treatment, pruning, and removal of trees may involve considerations beyond the scope of the arborist's services such as property boundaries, property ownership, site lines, disputes between neighbors, and other issues. Arborists cannot take such considerations into account unless complete and accurate information is disclosed to the arborist. An arborist should then be expected to reasonably rely upon the completeness and accuracy of the information provided.

Trees can be managed, but they cannot be controlled. To live near trees is to accept some degree of risk. The only way to eliminate all risk associated with trees is to eliminate all trees.

APPENDIX G
RESUMES

Rosi Dagit, Sr. Conservation Biologist

ISA WC Certified Arborist #1084
Resource Conservation District of the Santa Monica Mountains
540 S. Topanga Canyon Blvd., Topanga, CA 90290
rdagit@rcdsmm.org

Since 1987, Rosi Dagit has coordinated current research within throughout the Santa Monica Mountains and became a Certified Arborist in 1990. She has led numerous projects related to the physiology of Coast Live Oaks exploring their ecological roles and relationships, resulting in a variety of research and restoration projects. She led development of the Early Detection Rapid Response Plan for Los Angeles County adopted in 2020, and previously coordinated the development and adoption of the Los Angeles County Oak Woodlands Conservation Management Plan (2011).

Ms. Dagit serves as a technical advisor to the CA Oak Foundation, and on the Los Angeles County Environmental Review Board.

Ms. Dagit has presented research results at numerous conferences, to university classes, local schools and docent groups, and for environmental industry groups. She continues her work in environmental education and has developed several community science projects and works extensively with a variety of partners to encourage more eyes on the ground monitoring. She has received numerous awards recognizing her contributions to the understanding of the ecology of the Santa Monica Mountains. Ms. Dagit has a Bachelor of Science, Marine Science degree and is a Certified Arborist.

Brianna Demirci, GIS Specialist

12000 Darby Ave., Northridge, CA 91326
demirci.brianna@gmail.com.

Brianna Demirci is a GIS specialist and wildlife biologist with a diverse background working for federal and state agencies, as well as private companies and organizations. She has over four years of experience working with geographic information systems to create maps utilized for consulting, conservation, planning, and data collection purposes. She has experience following guidelines specific to the City of Malibu, Los Angeles County, the California Coastal Commission, and the Santa Monica Mountains. Her mapping efforts have been used in restoration project planning proposals, biological permit acquisitions, mitigation projects, and private biological assessments.

APPENDIX
D

TOPANGA LAGOON RESTORATION PROJECT
FUEL MODIFICATION MEMO

6.26.23

Prepared by:
Rosi Dagit, Sr. Conservation Biologist
RCD of the Santa Monica Mountains
540 S. Topanga Canyon Blvd.
Topanga, CA 90290
rdagit@rcdsmm.org

Los Angeles County Fuel Modification Guidelines requires that any new plans provide a Fuel Modification Plan that illustrates the following zones:

- an ember resistant zone extending 5 feet beyond the edge of any combustible structure;
- Zone A extending out 30 feet from any combustible structure that limits vegetation to low growing species whose density and arrangement provides adequate defensible space;
- Zone B extends an additional 70 feet for a total of 100 feet from the structure where irrigation provided if needed to support vegetation that provides adequate defensible space and significantly reduces fire intensity; and
- Zone C extending from 100 – 200 feet where maintenance/modification is determined by on site inspection.
- 10 foot clearance along each side of a fire access road.

The design alternatives under consideration for the Topanga Lagoon Restoration Project strive to integrate protection for sensitive native habitat zones H1 and H1 buffer and H2 while also meeting fuel modification needs. Assumptions are that all structures will be appropriately hardened and non-combustible materials; non-habitable accessory structures will not be used to store combustible materials (with the potential exception of the maintenance storage shed); and native vegetation will be trimmed appropriately if needed to provide adequate clearance from structures.

A major goal of the Project is to retain as much native vegetation as possible, remove invasive species and revegetate any disturbed areas using locally appropriate native species.

With these assumptions in mind, Figures 1- 4 illustrate the integration of existing and proposed designs alternatives under consideration.

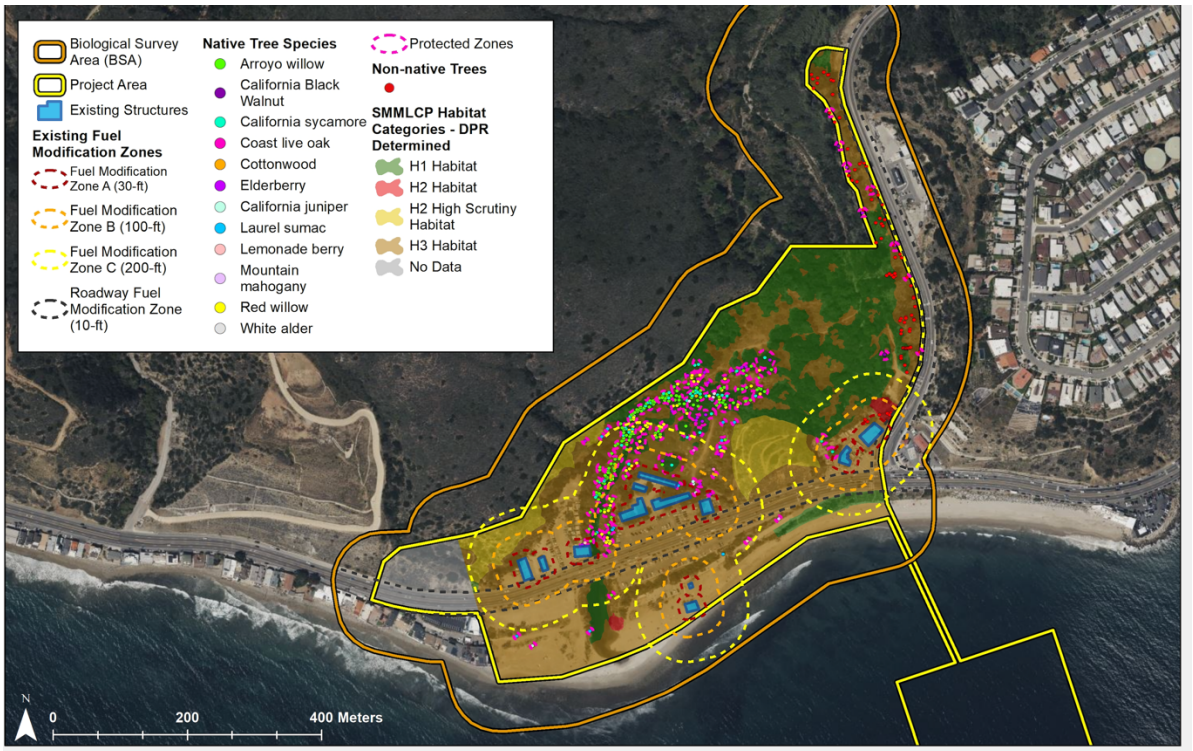


Figure 1. Existing conditions at Topanga Lagoon Restoration Study area

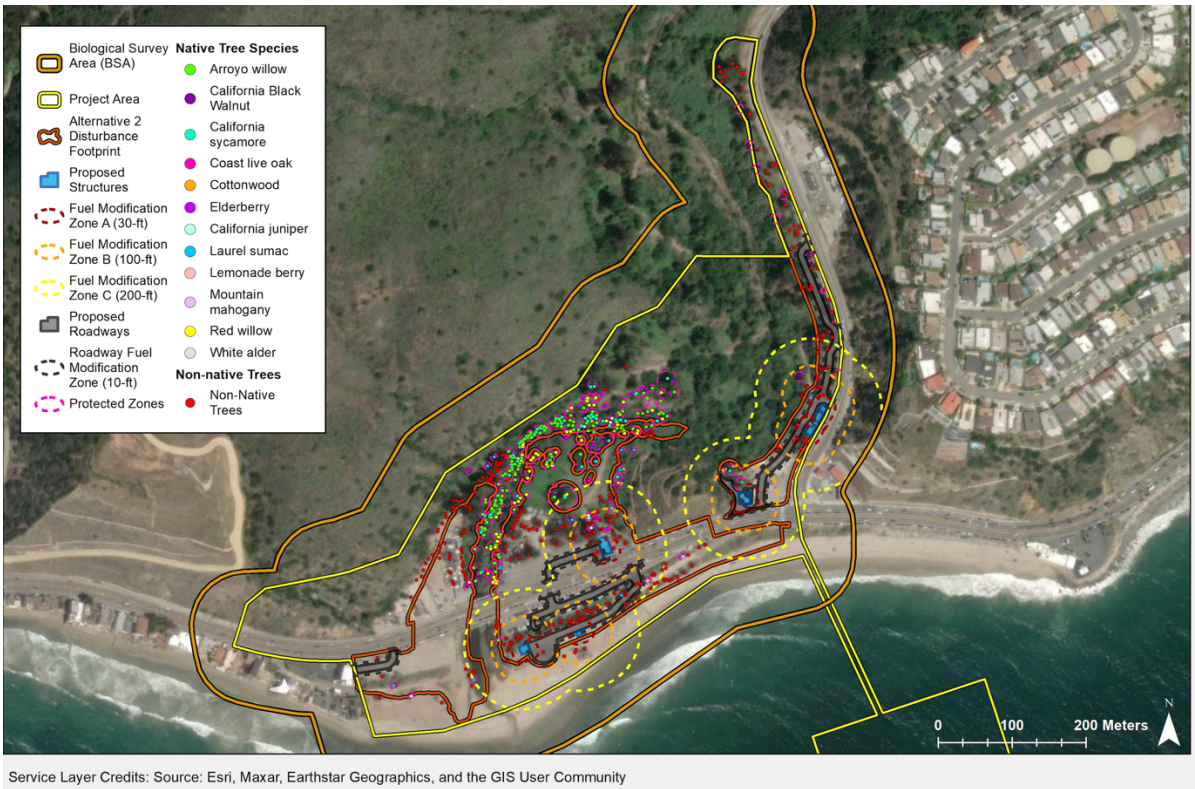
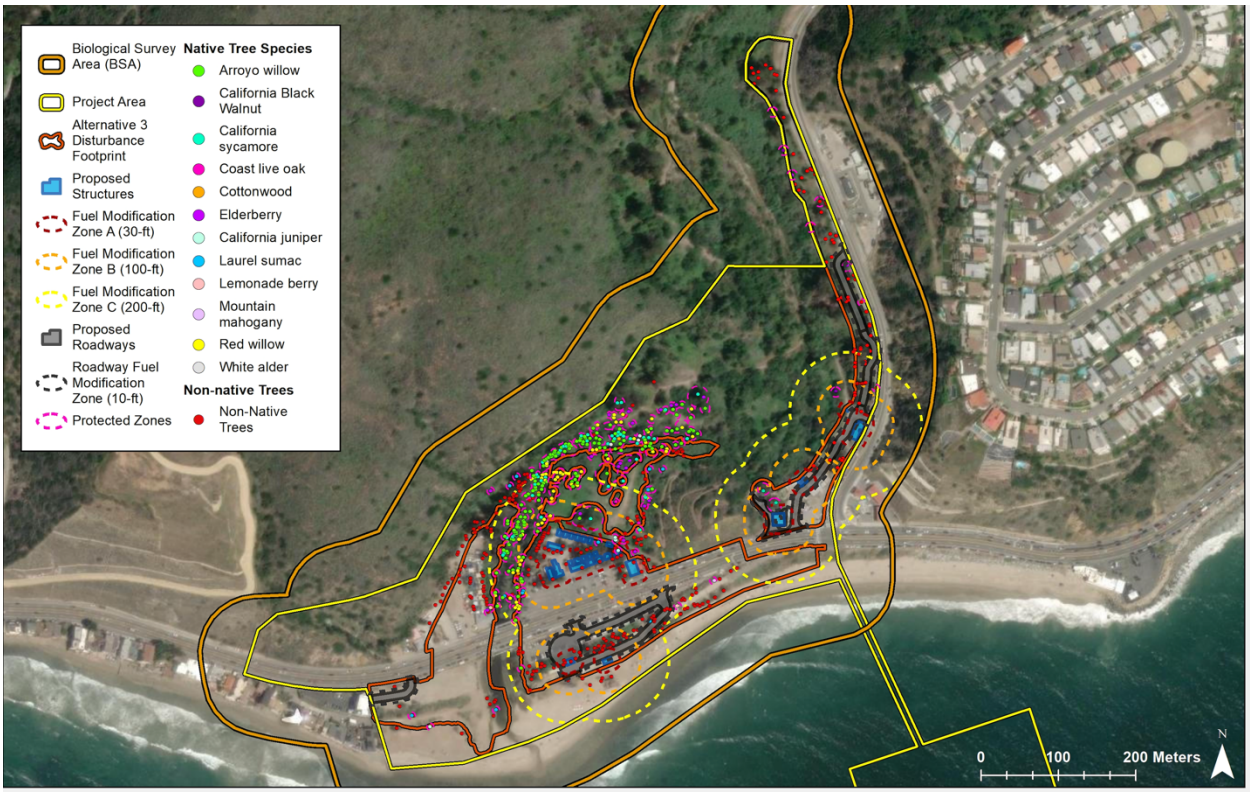
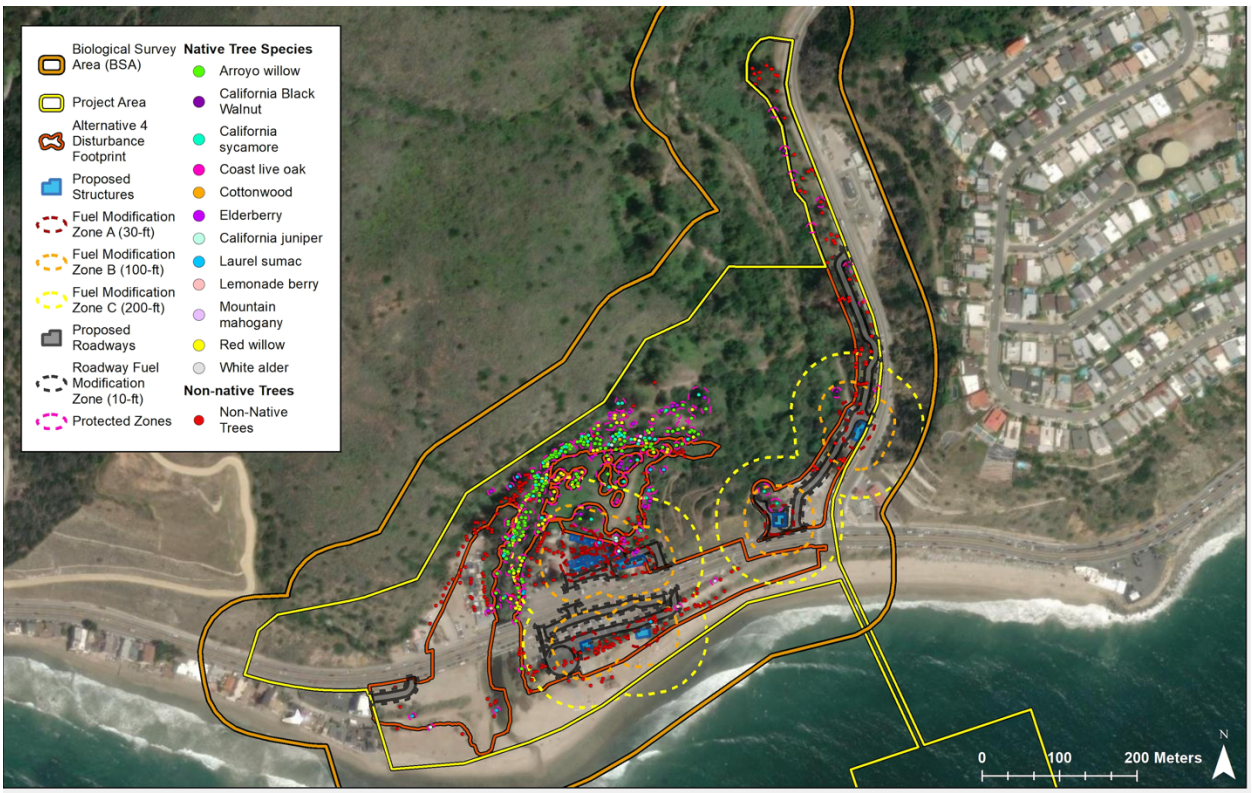


Figure 2. Proposed Fuel Modifications for Alternative 2 Maximum Habitat



Service Layer Credits: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Figure 3. Proposed Fuel Modifications for Alternative 3 Maximum Historical



Service Layer Credits: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

APPENDIX
E

Appendix D

BMI Surveys and Assessment

Client	Program	StationCode	SampleDate	FieldReplicate	AgencyCode_LabEffort	PersonnelCode_LabEffort	PercentSampleCounted	GridsAnalyzed	GridVolumeAnalyzed	ActualOrganismCount	BenthicLabEffortComments	FinalID	LifeStageCode	DistinctCode	BAResult	Unit	ResQualCode	gpgTaxonomyResults.QACode	gpgSampleInfo.QACode	TaxonomicQualifier	TaxonomicQualifier	ProjectCode.Results	LabSampleID	EnterDate
RCD of the Santa Monica Mountains	Topanga Lagoon	1 Biosweep	11/25/2021	1	ABCL	Charis Samia	100	1	1	433	whole sort	Ostracoda	X	Yes	189	Count	=	None	None	None	None	Wendy Willis	RSM1021.085	2/1/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	1 Biosweep	11/25/2021	1	ABCL	Charis Samia	100	1	1	433	whole sort	Oligochaeta	X	Yes	4	Count	=	None	None	None	None	Wendy Willis	RSM1021.085	2/1/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	1 Biosweep	11/25/2021	1	ABCL	Charis Samia	100	1	1	433	whole sort	Sperchon	X	Yes	1	Count	=	None	None	None	None	Wendy Willis	RSM1021.085	2/1/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	1 Biosweep	11/25/2021	1	ABCL	Charis Samia	100	1	1	433	whole sort	Dasyhelea	L	Yes	19	Count	=	None	None	None	None	Wendy Willis	RSM1021.085	2/1/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	1 Biosweep	11/25/2021	1	ABCL	Charis Samia	100	1	1	433	whole sort	Ceratopogonidae	P	No	4	Count	=	None	None	None	None	Wendy Willis	RSM1021.085	2/1/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	1 Biosweep	11/25/2021	1	ABCL	Charis Samia	100	1	1	433	whole sort	Chironominae	L	Yes	216	Count	=	None	None	None	None	Wendy Willis	RSM1021.085	2/1/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	1 Sediment Core	11/25/2021	1	ABCL	Saffron Hullinger	100	1	1	1104	whole sort	Ostracoda	X	Yes	1094	Count	=	None	None	None	None	Wendy Willis	RSM1021.086	2/1/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	1 Sediment Core	11/25/2021	1	ABCL	Saffron Hullinger	100	1	1	1104	whole sort	Ephydridae	P	Yes	1	Count	=	None	None	None	None	Wendy Willis	RSM1021.086	2/1/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	1 Sediment Core	11/25/2021	1	ABCL	Saffron Hullinger	100	1	1	1104	whole sort	Callibaetis	L	Yes	3	Count	=	None	None	None	None	Wendy Willis	RSM1021.086	2/1/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	1 Sediment Core	11/25/2021	1	ABCL	Saffron Hullinger	100	1	1	1104	whole sort	Chironominae	L	Yes	5	Count	=	None	None	None	None	Wendy Willis	RSM1021.086	2/1/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	1 Sediment Core	11/25/2021	1	ABCL	Saffron Hullinger	100	1	1	1104	whole sort	Chironominae	P	Yes	1	Count	=	None	None	None	None	Wendy Willis	RSM1021.086	2/1/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	2 Biosweep	11/25/2021	1	ABCL	Charis Samia	100	1	1	223	whole sort	Ostracoda	X	Yes	124	Count	=	None	None	None	None	Wendy Willis	RSM1021.087	2/1/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	2 Biosweep	11/25/2021	1	ABCL	Charis Samia	100	1	1	223	whole sort	Oligochaeta	X	Yes	30	Count	=	None	None	None	None	Wendy Willis	RSM1021.087	2/1/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	2 Biosweep	11/25/2021	1	ABCL	Charis Samia	100	1	1	223	whole sort	Chironominae	L	Yes	69	Count	=	None	None	None	None	Wendy Willis	RSM1021.087	2/1/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	2 Sediment Core	11/25/2021	1	ABCL	Charis Samia	100	1	1	75	whole sort	Ostracoda	X	Yes	63	Count	=	None	None	None	None	Wendy Willis	RSM1021.088	2/1/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	2 Sediment Core	11/25/2021	1	ABCL	Charis Samia	100	1	1	75	whole sort	Oligochaeta	X	Yes	1	Count	=	None	None	None	None	Wendy Willis	RSM1021.088	2/1/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	2 Sediment Core	11/25/2021	1	ABCL	Charis Samia	100	1	1	75	whole sort	Chironominae	L	Yes	11	Count	=	None	None	None	None	Wendy Willis	RSM1021.088	2/1/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	3 Biosweep	11/25/2021	1	ABCL	Joel Marin	100	1	1	66	whole sort	Ostracoda	X	Yes	42	Count	=	None	None	None	None	Wendy Willis	RSM1021.089	3/2/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	3 Biosweep	11/25/2021	1	ABCL	Joel Marin	100	1	1	66	whole sort	Oligochaeta	X	Yes	8	Count	=	None	None	None	None	Wendy Willis	RSM1021.089	3/2/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	3 Biosweep	11/25/2021	1	ABCL	Joel Marin	100	1	1	66	whole sort	Chironominae	L	Yes	14	Count	=	None	None	None	None	Wendy Willis	RSM1021.089	3/2/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	3 Biosweep	11/25/2021	1	ABCL	Joel Marin	100	1	1	66	whole sort	Tanypodinae	L	Yes	1	Count	=	None	None	None	None	Wendy Willis	RSM1021.089	3/2/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	3 Biosweep	11/25/2021	1	ABCL	Joel Marin	100	1	1	66	whole sort	Chironominae	P	Yes	1	Count	=	None	None	None	None	Wendy Willis	RSM1021.089	3/2/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	3 Sediment Core	11/25/2021	1	ABCL	Amber Henning	100	1	1	14	whole sort	Ostracoda	X	Yes	12	Count	=	None	None	None	None	Wendy Willis	RSM1021.090	3/2/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	3 Sediment Core	11/25/2021	1	ABCL	Amber Henning	100	1	1	14	whole sort	Gammaridae	X	Yes	1	Count	=	None	None	None	None	Wendy Willis	RSM1021.090	3/2/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	3 Sediment Core	11/25/2021	1	ABCL	Amber Henning	100	1	1	14	whole sort	Chironominae	L	Yes	1	Count	=	None	None	None	None	Wendy Willis	RSM1021.090	3/2/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	4 Biosweep	11/25/2021	1	ABCL	Charis Samia	100	1	1	8	whole sort	Ostracoda	X	Yes	3	Count	=	None	None	None	None	Wendy Willis	RSM1021.091	3/2/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	4 Biosweep	11/25/2021	1	ABCL	Charis Samia	100	1	1	8	whole sort	Chironominae	L	Yes	2	Count	=	None	None	None	None	Wendy Willis	RSM1021.091	3/2/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	4 Biosweep	11/25/2021	1	ABCL	Charis Samia	100	1	1	8	whole sort	Orthocladiinae	L	Yes	2	Count	=	None	None	None	None	Wendy Willis	RSM1021.091	3/2/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	4 Biosweep	11/25/2021	1	ABCL	Charis Samia	100	1	1	8	whole sort	Orthocladiinae	P	Yes	1	Count	=	None	None	None	None	Wendy Willis	RSM1021.091	3/2/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	4 Sediment Core	11/25/2021	1	ABCL	Amber Henning	100	1	1	20	whole sort	Ostracoda	X	Yes	14	Count	=	None	None	None	None	Wendy Willis	RSM1021.092	3/2/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	4 Sediment Core	11/25/2021	1	ABCL	Amber Henning	100	1	1	20	whole sort	Oligochaeta	X	Yes	2	Count	=	None	None	None	None	Wendy Willis	RSM1021.092	3/2/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	4 Sediment Core	11/25/2021	1	ABCL	Amber Henning	100	1	1	20	whole sort	Chironominae	L	Yes	3	Count	=	None	None	None	None	Wendy Willis	RSM1021.092	3/2/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	4 Sediment Core	11/25/2021	1	ABCL	Amber Henning	100	1	1	20	whole sort	Chironominae	P	Yes	1	Count	=	None	None	None	None	Wendy Willis	RSM1021.092	3/2/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	5 Biosweep	11/25/2021	1	ABCL	Joel Marin	100	1	1	110	whole sort	Ostracoda	X	Yes	74	Count	=	None	None	None	None	Wendy Willis	RSM1021.093	3/2/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	5 Biosweep	11/25/2021	1	ABCL	Joel Marin	100	1	1	110	whole sort	Ephydridae	L	Yes	2	Count	=	None	None	None	None	Wendy Willis	RSM1021.093	3/2/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	5 Biosweep	11/25/2021	1	ABCL	Joel Marin	100	1	1	110	whole sort	Chironominae	L	Yes	24	Count	=	None	None	None	None	Wendy Willis	RSM1021.093	3/2/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	5 Biosweep	11/25/2021	1	ABCL	Joel Marin	100	1	1	110	whole sort	Orthocladiinae	L	Yes	6	Count	=	None	None	None	None	Wendy Willis	RSM1021.093	3/2/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	5 Biosweep	11/25/2021	1	ABCL	Joel Marin	100	1	1	110	whole sort	Chironominae	P	Yes	1	Count	=	None	None	None	None	Wendy Willis	RSM1021.093	3/2/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	5 Biosweep	11/25/2021	1	ABCL	Joel Marin	100	1	1	110	whole sort	Tanypodinae	L	Yes	1	Count	=	None	None	None	None	Wendy Willis	RSM1021.093	3/2/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	5 Biosweep	11/25/2021	1	ABCL	Joel Marin	100	1	1	110	whole sort	Dasyhelea	L	Yes	1	Count	=	None	None	None	None	Wendy Willis	RSM1021.093	3/2/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	5 Biosweep	11/25/2021	1	ABCL	Joel Marin	100	1	1	110	whole sort	Ceratopogonidae	P	No	1	Count	=	None	None	None	None	Wendy Willis	RSM1021.093	3/2/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	5 Sediment Core	11/25/2021	1	ABCL	Amber Henning	100	1	1	15	whole sort	Ostracoda	X	Yes	5	Count	=	None	None	None	None	Wendy Willis	RSM1021.094	3/2/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	5 Sediment Core	11/25/2021	1	ABCL	Amber Henning	100	1	1	15	whole sort	Oligochaeta	X	Yes	9	Count	=	None	None	None	None	Wendy Willis	RSM1021.094	3/2/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	5 Sediment Core	11/25/2021	1	ABCL	Amber Henning	100	1	1	15	whole sort	Chironominae	L	Yes	1	Count	=	None	None	None	None	Wendy Willis	RSM1021.094	3/2/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	6 Biosweep	11/25/2021	1	ABCL	Jose Martin	100	1	1	4	whole sort	Hydrophilus	A	Yes	2	Count	=	None	None	None	None	Wendy Willis	RSM1021.095	3/2/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	6 Biosweep	11/25/2021	1	ABCL	Jose Martin	100	1	1	4	whole sort	Chironominae	L	Yes	2	Count	=	None	None	None	None	Wendy Willis	RSM1021.095	3/2/2022
RCD of the Santa Monica Mountains	Topanga Lagoon	7 Biosweep	11/25/2021	1	ABCL	Charis Samia	100	1	1	1	whole sort	Orthocladiinae	L	Yes	1	Count	=	None	None	None	None	Wendy Willis	RSM1021.097	3/2/2022

Benthic Macroinvertebrates

Identified Taxa	Tol Val (TV)	Func Feed Grp	1 Biosweep	1 Sediment Core	2 Biosweep	2 Sediment Core	3 Biosweep	3 Sediment Core	4 Biosweep	4 Sediment Core	5 Biosweep	5 Sediment Core	6 Biosweep	7 Biosweep
Insecta Taxa														
Ephemeroptera														
Callibaetis	9	cg		3										
Coleoptera														
Hydrophilus	5	p											2	
Diptera														
Ceratopogonidae	6	p	4								1			
Chironominae	6	cg	216	6	69	11	15	1	2	4	25	1	2	
Dasyhelea	6	cg	19								1			
Ephydridae	6			1							2			
Orthocladiinae	5	cg							3		6			1
Tanypodinae	7	p					1				1			
Non-Insecta Taxa														
Oligochaeta	5	cg	4		30	1	8			2		9		
Ostracoda	8	cg	189	1094	124	63	42	12	3	14	74	5		
Amphipoda														
Gammaridae	6	cg						1						
Trombidiformes														
Sperchon	8	p	1											
TOTAL			**433**	**1104**	**223**	**75**	**66**	**14**	**8**	**20**	**110**	**15**	**4**	**1**

APPENDIX
F

Technical Memo

California Grunion and Topanga Beach

Prepared by: Dr. Karen Martin, Pepperdine University

Grunion run near the lagoon at Topanga Beach, 2016

Background

Species Overview. California grunion, *Leuresthes tenuis*, is an indigenous endemic marine fish and cultural icon that is considered locally sensitive. Midnight grunion runs have fascinated people for generations, inspiring music, film and television shows. Primarily found in southern California, these silversides surf waves onto sandy beaches for spawning in the spring and summer months, on the nights following high semilunar tides of the new and full moons. They bury their eggs a few centimeters under the surface between the mean high tide (MHT) and highest high tide (HHT), then return to the ocean, leaving the eggs to incubate in the warm, moist sand onshore until tides rise again to wash them out to hatch (Martin 2015).

This native fish provides forage for larger fish, including halibut and sharks, marine mammals such as dolphins and sea lions, and birds including Brown Pelicans and California Least Terns (Love 2011). Wading birds including Great Blue Herons, Black-crowned Night Herons, and Snowy Egrets prey upon grunion during their runs (Martin and Raim 2014).

On shore, grunion eggs are eaten by many species of shorebirds, including those migrating along the Pacific Flyway, and by terrestrial mammals, including ground squirrels and raccoons. Their planktonic larvae may be found in brackish water lagoons, tidepools, and the nearshore environment (Barilotti 2020).

California grunion have never been abundant, and are difficult to monitor with traditional fishery methods (Barilotti 2020). Runs vary in size and extent along the shoreline and between different California beaches, and on different nights. Spawning runs take place between early March and mid-August.

Observational data of the spawning runs are acquired by citizen scientists dubbed "Grunion Greeters" (Martin et al. 2021). Efforts are underway to increase protection for this species by changing the fishing regulations.

Additional information about this species and the timing of their runs can be found at www.Grunion.org and in the video, "*Surf, Sand, and Silversides: The California Grunion*" that can be streamed on that site.

Conservation Concerns. Over the past 20 years, grunion runs have generally become less frequent and less abundant in their southern California habitat (Martin et al. 2020). A key reason is that portions of the grunion life cycle take place on land where they are vulnerable to a number of direct human impacts. Grunion are caught by humans of all ages in a unique recreational fishery that includes gear restrictions, a license requirement, and a closed season during peak spawning (Sandrozinski 2013). However, because the runs occur at night, enforcement of the regulations is inconsistent. Runs are also impacted by artificial lights; grunion tend to avoid areas where lights are brighter than a full moon (Simons et al. 2022).

During the time that the eggs are developing on land, the embryos are vulnerable to anthropogenic disturbance from vehicles on the beach, beach grooming, oil spills, and coastal construction activities, as well as natural predation, wave events causing erosion of sand, and high temperatures (Martin and Adams 2020; Barilotti 2020).

A northward habitat shift for California grunion is underway as ocean temperatures rise, with small new spawning populations found in areas of the San Francisco Bay and beyond (Martin et al. 2013). The temperatures of the sand where the eggs incubate, as well as the ocean temperatures constrain grunion reproductive habitat. The more northern grunion do not grow as large or live as long as those in southern California, and they have a much lower reproductive output.

Grunion at Topanga Beach

Past Surveys and Trends. Sandy beaches are critical reproductive habitat for California grunion, the only place they are known to spawn. Since 2004, surveys of grunion spawning runs have shown that Topanga Beach is one of the top ten beaches in the entire state for grunion spawning runs. Grunion run reliably there from as early as late February through July, in numbers greater than the median run size.

Over the past two decades, grunion spawning runs have been generally declining across their habitat range, including Los Angeles County (Martin et al., 2020). Runs are

measured with a metric developed for this purpose, the Walker Scale (Martin et al., 2021). The scale ranges from W0, no fish, to W5, thousands of fish covering an extended area of the beach for over an hour.

During 2021, reports from Topanga Beach ranged from W0 to W5 for ten spawning runs observed between March and July. These were conducted by citizen scientists trained as 'Grunion Greeters' under the oversight of Dr. Karen Martin. Surveys involved observing the beach during dates and times when runs are forecast, and reporting on weather, natural predators, and human hunters, along with other features. In 2021, Topanga Beach reports had a median of W3, meaning that half the runs observed contained thousands of fish. In 2020, observations of seven runs at Topanga Beach between May and July ranged from W0 to W3, with a median of W2, several hundred fish on shore at the peak of the run.

Although 2021 was a good year for California Grunion at Topanga Beach, the general trend range-wide is still declining. A median of W1 in both 2020 and 2021 was seen in Los Angeles County and over the grunion habitat range as a whole, meaning that more than half of the runs observed contained only one hundred fish or fewer on shore, with little spawning.

Discussion. Topanga Beach has many features that make it attractive to California grunion. These include the creek, with its freshwater lagoon where larvae may develop; the wide beach with coarse sand; the south-facing shoreline; the intertidal boulders that provide tidepool habitat; and the surf break. The lack of development or seawalls at the back of the beach result in lower nocturnal light levels and a more natural wave action. The absence of mechanized maintenance or beach grooming on this beach also benefits grunion by avoiding disturbance to eggs buried under the sand and by allowing wrack accumulation that reduces sand transport away from the beach face.

The runs at Topanga Beach are exceptional and can cover the entire length of the beach with thousands of fish so thick one cannot see sand between them, a W5 on the Walker Scale (Martin et al. 2021). This size of run is rare. Throughout the state, less than 5% of observed runs reach this size, and many grunion beaches never hold such a large run. A typical grunion season at Topanga Beach includes at least one of these memorable runs.

Runs generally start in the vicinity of the lagoon mouth, regardless of its open or closed condition. The area between the creek outlet and the present lifeguard tower is the portion of Topanga Beach most consistently used for spawning, but large runs may extend west to the houses and east to the rocks below Mastro's restaurant. There are times at present, however, when sand erodes to cobble over the upper intertidal beach west of the creek outlet, making that section inhospitable to spawning.

Similar to other beaches across the state, the decline of grunion at Topanga Beach is affected by coastal erosion associated with sea level rise and increased coastal construction. Climate change, ocean warming, and ocean acidification may also affect the

grunion during different parts of its life cycle (Smyder and Martin 2002; Martin et al. 2013; Tasoff and Johnson, 2019).

Topanga Beach has the advantage of natural seaweed accumulation from offshore kelp beds. When beaches are managed to allow this wrack to accumulate it provides a nutrient subsidy for the beach food web and helps to retain sand on the beach face. Avoiding beach grooming, therefore, benefits grunion use.

Potential Project Impacts on Grunion

A summary of the anticipated benefits and consequences of each project alternative is provided below.

Alternative 1: No Project/Managed Decline (0 acres restored): This alternative would result in further deterioration of grunion habitat as beach areas continue to shrink due to storm damage. The current beach configuration already contains narrow areas that are not suitable for grunion as no dry sand remains exposed at high tide. The west end of Topanga Beach tends to lose sand and become exposed cobble during the summer months, making it unsuitable spawning habitat. Erosion of the lagoon berm may harm both eggs located within the berm sand and larval and juvenile grunion potentially present within the lagoon. Adverse impacts to grunion will continue to worsen over time due to storm damage and rising sea levels if no action is taken.

Alternative 2: (9.5 wetted acres, 11.7 acres restored): Compared to the No Project Alternative 1, Alternative 2 will likely increase beach area both east and west of the lagoon providing greater resilience to sea level rise. This will delay or mitigate loss of grunion spawning habitat. The removal of fill will decrease the beach slope and result in a more natural beach face that is more conducive to colonization by intertidal organisms. The increased lagoon area with its brackish water could potentially provide more nursery habitat for larvae and juvenile grunion, possibly increasing survival at early life stages, or providing forage for other local fishes and birds.

Dune restoration may further increase beach resilience compared to Alternative 1 by storing sand and may increase habitat for predators on grunion adults and eggs. This is not a flaw of the alternative, but a natural consequence of the ecosystem. Such predators are already present in the Topanga ecosystem.

Alternative 3: (7.1 wetted acres, 9.8 acres restored): This alternative has similar effects on grunion as Alternative 2. The increase in beach and lagoon areas in this alternative are anticipated to provide more grunion habitat and buffer from sea level rise. The more natural slope would also improve habitat quality. Available potential nursery habitat for grunion larva and juveniles would increase significantly compared to the No Project Alternative 1, but would be less than Alternative 2.

Alternative 4: (7.1 wetted acres, 10.8 acres restored): Alternative 4 will likely provide the

most benefit for grunion because it maximizes the increase in beach habitat, which in turn increases spawning opportunities for California grunion. Dune restoration may increase beach resilience by storing sand. The wider beach and greater amount of sediment available will provide the greatest benefit to the beach and the beach-spawning grunion.

The increased beach footprint is also anticipated to increase human visitation. This has the potential to increase adverse impacts on spawning runs or the incubating eggs by potentially increasing disturbance from foot traffic and sand play.

Alternative 4 will increase the area of the lagoon compared to the No Project Alternative 1 and could provide more potential habitat for larval and juvenile grunion, possibly increasing survival at early life stages, or providing forage for other local fishes and birds. This is the same as under Alternative 3, but somewhat less than Alternative 2. For the grunion population, beach habitat area is more important than lagoon habitat area.

Project Recommendations

Avoid Night Lighting During Grunion Season. Bright lights at night should also be avoided on the beach or adjacent areas during the grunion season (March-August). The light on the beach face should not exceed 100 mlux, approximately the light of a full moon, at night in order to prevent adverse effects on grunion spawning runs (Simons et al., 2022).

Monitoring Construction During Grunion Season.
Any construction taking place from March to August should avoid work within 10 feet of the HHT line (as represented by the highest limit of dry wrack) as this area can be used for grunion spawning.

Work can only occur in this resource avoidance zone if grunion surveys by qualified monitors confirm that spawning did not occur in that area since the last full or new moon. Spawning runs can be forecast, within four nights after a full or new moon, at the highest tides and for two hours beyond.

If significant spawning is documented, the areas should be marked and protected from disturbance until the next full or new moon.

Implement Grunion Permit Conditions. Permits evaluated by the California Department of Fish and Wildlife, the California Coastal Commission, and others regularly contain provisions to protect California Grunion spawning runs and eggs. At a minimum, the following measures should be implemented in addition to those required by the permitting agencies.

"*Grunion monitoring shall be conducted by a qualified biologist for 30 minutes prior to, and two hours following, the predicted start of each nightly spawning event. Sufficient*

qualified biologists shall be employed to ensure that the entire construction site is monitored during the predicted grunion run. The magnitude and extent of a spawning event shall be defined in 300-foot segments of beach using the Walker Scale (Martin et al 2021). Every individual fish shall be counted to determine the Walker Scale value (e.g., 0, 1, 2, 3, 4, or 5) of each 300-foot segment within the proposed work area" (California Coastal Commission from 2020, cited in Martin et al., 2021).

Onsite Education Needed. Onsite educational signage and programs are needed for two reasons: 1) to minimize and mitigate impacts to grunion associated with the anticipated increase in beach use that is anticipated under all project alternatives; and, 2) to provide regional educational resources about the grunion that addresses a gap in statewide programs.

Recommended Signage. Educational interpretive signage should be developed and installed at Topanga Beach, similar to that found at Malibu Lagoon State Beach. The intent would be to provide the visiting public more information about the grunion at Topanga Beach, rules and regulations for recreational fishing, and how the species can be protected.

Onsite Education Program. Currently only two places in California regularly host public educational programs for grunion runs: Cabrillo Beach in San Pedro with the Cabrillo Marine Aquarium, and La Jolla Shores with the Birch Aquarium at Scripps. Topanga Beach has the potential to host similar programs during grunion runs. The grunion run as reliably at Topanga as at Cabrillo, and much more reliably than at La Jolla. Thousands of people attend these public events, which have a small admission fee.

Developing a program at Topanga with State Parks Interpreters or Docent volunteers would provide access to educational programming for a completely different area of California than is currently available, and increase ecological understanding of the beach ecosystem by the public. A program could begin away from the beach with a presentation, slide show, or video, and then continue on the beach for the run itself. Educational programs or walks could also be held during the daytime to explain the dune and lagoon habitats, as has been done in the past at Malibu Lagoon by the Resource Conservation District of the Santa Monica Mountains.

Post-Construction Management. To support the continued presence of grunion at Topanga Beach, the following measures should be conditions of the project.

Mechanical beach grooming will not occur, in order to retain the natural deposition of wrack along the beach. Trash and debris should be removed by hand as necessary.

Vehicle use on the beach shall be limited to that required for emergency response and occasional required maintenance. All vehicles must drive above the HHT line March-September unless no grunion spawning occurred in the task location during the last full or new moon.

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Resume/Qualifications

Dr. Karen Martin is Distinguished Professor Emeritus in Biology at Pepperdine University. PhD, UCLA, 1990; Postdoctoral Fellowship at U Washington's Friday Harbor Laboratories. Fellow, the Linnean Society of London; Fellow, American Institute of Fisheries Research Biologists.

Dr. Martin co-founded the Grunion Greeters, citizen scientists that monitor spawning runs in California, and the Beach Ecology Coalition, a non-profit organization to promote ecological management of sandy beaches. She has several awards for conservation and environmental efforts, was Trustee for Refugio Beach Oil Spill, and has more than 60 publications on coastal ecology, amphibious fishes, and the interface between water and land, including book *Beach-Spawning Fishes: Reproduction in an Endangered Ecosystem*.

Dr. Martin has worked with municipalities and agencies throughout California including California Coastal Commission, California Department of Fish & Wildlife, California State Parks, US Fish and Wildlife Service, National Marine Fisheries Service, and counties of San Diego, Orange, Los Angeles, Santa Barbara, and Monterey, and cities including San Diego, San Clemente, Malibu, Santa Monica, Newport Beach, and Manhattan Beach.

APPENDIX
G

TECHNICAL REPORT
Tidewater Goby (*Eucyclogobius newberryi*) Surveys for the Topanga Lagoon Restoration Project

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Table of Contents

	PageNumber
1.0 INTRODUCTION	4
2.0 TIDEWATER GOBY BACKGROUND	5
Population Dynamics in Topanga Lagoon	5
3.0 TOPANGA LAGOON RESTORATION PROJECT	6
4.0 SURVEY METHODS	7
Literature Review	7
Field Surveys and Analyses	7
Avoidance Training	8
Long term Visual Surveys	8
Seine Surveys	8
Water Quality Parameters	9
Physical Habitat Characteristics	10
Photo Documentation	10
5.0 SURVEY RESULTS	11
Field Surveys and Analyses	11
Long term Visual Surveys	11
Seine Surveys	12
Water Quality Parameters	13
Physical Habitat Characteristics	19
Photo Documentation	19
6.0 ALTERNATIVES ANALYSIS	20
Actions common to all Alternatives	21
Alternative 1	22
Anticipated Alternative 1 Impacts	22
Anticipated Alternative 1 Benefits	22
Alternative 2	24
Anticipated Alternative 2 Impacts	24
Anticipated Alternative 2 Benefits	24
Alternative 3	26
Anticipated Alternative 3 Impacts	26
Anticipated Alternative 3 Benefits	26
Alternative 4	28
Anticipated Alternative 4 Impacts	28
Anticipated Alternative 4 Benefits	28
7.0 SUMMARY	30
8.0 RECOMMENDATIONS FOR SPECIES PROTECTION	31
Hydroacoustic Monitoring and Impact Avoidance	31
Pre-Construction	32
During Construction	33
Post- Construction	35
Literature Cited	36
Appendix A. Summary of all Survey Data	40
Appendix B. Photographs	41
Appendix C. Resumes/Qualifications	42

Tables

Table 1. Summary of Tidewater Goby Seining events in Topanga Lagoon	12
Table 2. Summary of Habitat Acreage in the Topanga Lagoon Restoration Project Area.	20
Table 3. Comparison of Impacts and Benefits of Proposed Alternatives	30

Figures

Figure 1. Tidewater Goby survey area including visual, seining, spot sampling and water quality monitoring locations.	11
Figure 2. Summary of tidewater goby abundance estimates in Topanga Lagoon.	12
Figure 3. Salinity in the main body of Topanga Lagoon July – November 2021 by the Hach Hydrolab HL7	13
Figure 4. pH in the main body of Topanga Lagoon July – November 2021 Hach Hydrolab HL7	14
Figure 5. Water Temperature in the main body of Topanga Lagoon July – November 2021 collected by the Hach Hydrolab HL7	15
Figure 6. Water Temperature in the main body of Topanga Lagoon July – November 2020-2021 collected by the HOBO Tidbit	16
Figure 7. Dissolved Oxygen in the main body of Topanga Lagoon July – November 2021 by the Hach Hydrolab HL7	17
Figure 8. Turbidity in the main body of Topanga Lagoon July – November 2021 by the Hach Hydrolab HL7	18
Figure 9. EC in the main body of Topanga Lagoon July – November 2021 by the Hach Hydrolab HL7	18
Figure 10. ORP in the main body of Topanga Lagoon July – November 2021 by the Hach Hydrolab HL7	19
Figure 11. Alternative 1: No Project/Managed Decline (0 acres restored, 3.6 wetted acres, 33.8 riparian/transitional/upland acres and beach 4.18 acres).	23
Figure 12. Alternative 2: Lagoon Habitat Maximized, Removal of Motel (9.5. wetted acres, with 27.8 riparian/transitional/upland acres restored and beach expansion to 4.39 acres).	25
Figure 13. Alternative 3: Least Lagoon Habitat Expansion, Full Retention of Motel (7.7 wetted acres, with 29.47 riparian/transitional/upland acres restored and beach expansion to 4.42 acres).	27
Figure 14. Alternative 4: Maximum Managed Retreat, Partial Motel Retention (7.6 wetted acres, with 29.48 riparian/transitional/upland acres restored and beach expansion to 4.56 acres).	29

1.0 INTRODUCTION

The intent of this document is to provide information on the federally endangered tidewater goby (*Eucyclogobius newberryi*) to support preparation of CEQA/NEPA documents, meet Local Coastal Plan Coastal Development Permit and regulatory permit preparation for the Topanga Lagoon Restoration Project (Project). Evaluation of the potential impacts of each proposed restoration alternative is guided by the directives of the Tidewater Goby Critical Habitat Plan (US Fish and Wildlife Service 2013), the Topanga State Park General Plan (2012), and the Santa Monica Mountains Local Coastal Program (LA County 2014).

Tidewater gobies were initially listed in 1994 (Federal Register: 59 FR5494) with additional critical habitat designations and revisions between 1996 and 2008 (Federal Register 64 FR42250 1999; 65 FR 69693 2000; 71 FR68914 2006 and FR 2008). Topanga Lagoon, along with the other coastal lagoons within the Santa Monica Bay have been designated Critical Habitat (LA-2) since 2000. As noted in the Federal Register, the population in Topanga is considered essential because it connects source populations, promoting gene flow between meta-populations. As such Topanga is considered essential to the conservation of the species and deserving of special management considerations to ensure that any development of the wetland habitat, changes to groundwater or flows, channelization or pollution threats are avoided. Preliminary informal consultation with USFWS has provided direction incorporated into the development of restoration design alternatives to avoid and minimize potential impacts associated with the proposed restoration and to expand habitat as much as possible.

Once common in coastal lagoon systems from Oregon to the US-Mexico border, tidewater gobies were extirpated from most systems in the Santa Monica Bay by the 1980's (Swift et al. 1989), with the only population remaining in the lagoon at Pt. Mugu. Historically present in Malibu Lagoon, a translocation of 56 individuals in 1991 resulted in re-establishment of a population there (Manion 1993). By 2001, tidewater gobies had migrated down coast to re-colonize Topanga Lagoon and DNA analysis indicated that Malibu had been the source population (Jacobs and Swift 2001).

The Resource Conservation District of the Santa Monica Mountains (RCDSMM) has conducted incidental visual monitoring of tidewater gobies in Topanga Lagoon and the lower reach of Topanga Creek as part of monthly snorkel surveys focused on southern steelhead trout since 2008. Spot seining of Topanga Lagoon occasionally occurred as well. Starting in 2020, the RCDSMM has been conducting more focused surveys to examine the habitat, foraging and predation patterns under contract with California Department of Parks and Recreation (RCDSMM Technical Memo TE 811188-2 2020; 2021). Recent presence/abundance surveys are noted to provide context with regional historic trends. Finally the potential effects of project alternatives will be examined for their impact on the species.

2.0 TIDEWATER GOBY BACKGROUND

Tidewater gobies (family Gobionellidae), *Eucyclogobius newberryi* (Girard 1856) are small (<62mm) annual fish species endemic to California (Swift et al. 2016). These benthic associated species inhabit shallow, brackish water estuaries and lagoons throughout the California coast, spanning from Del Norte to San Diego County (Swift et al. 1989, Swift et al. 2016). The vast majority of the coastal wetlands inhabited by the tidewater goby are partially or completely isolated from marine tidal influence due to a formation of a seasonal summer sandbar at the estuary mouth that influences the range of salinity, water quality and overall tidal processes (Cousins et al. 2010, Jacobs et al. 2011, Cooper et al. 2012). This seasonal closure pattern found only in Mediterranean regions around the globe, has profound implications for the viability, connectivity, and long-term persistence of tidewater goby populations not only in Topanga Lagoon but throughout the California coast.

Dispersal of tidewater gobies is primarily driven by adults and constrained by limited windows of opportunity due to mouth closure of most lagoons and occurs largely during storm events (U.S. Fish and Wildlife Service 2005, Earl et al. 2010). Marine dispersal of larvae and small juveniles is likely limited by intolerance of these early life stages to marine salinity (Hellmair 2011). Therefore, successful tidewater goby reproduction requires closed estuarine habitat while opening is necessary for dispersal and metapopulation function (Swift et al. 1989, Kent and Marliave 1997, Lafferty et al. 1999, Dawson et al. 2002, Spies et al. 2019).

Although some variation has been observed, the tidewater goby is typically an annual species (Irwin and Soltz 1984, Swift et al. 1989, Swenson 1999). Reproduction occurs year-round although distinct spawning peaks in early spring and late summer do occur (Swenson 1999). While sandy substrate for breeding is preferred, they have been known to also utilize rocky, mud, and silt substrates. Tidewater gobies have a wide tolerance for salinity levels from 0 to 42 parts per thousand, water temperature levels from 8 to 25 degrees Celsius (46 to 77 degrees Fahrenheit), and water depths from 25 to 200 centimeters (10 to 79 inches) (Irwin and Soltz 1984, Swift et al. 1989, Worcester 1992, Lafferty 1997, Smith 1998).

Population Dynamics in Topanga Lagoon

Due to the limitations of visual episodic surveys, it is not possible to identify abundance trends in Topanga Lagoon, although the seasonal pattern of more individuals observed in spring – Fall suggests a relatively stable population. Seining suggests that reproduction extends from early spring to late fall in Topanga Lagoon, with peak abundance in late summer.

This contrasts with the more variable population in Malibu Lagoon that has been systematically monitored following the restoration since 2013. The peak of the population abundance in Malibu occurred in the 1990's immediately following re-introduction, but started to decline by 2005, and was limited to eight individuals moved from the construction zone in 2012 (Bay Foundation 2019, RCDSMM data). Despite the

addition of close to two acres of suitable sandy breeding habitat, few tidewater gobies have been observed in Malibu Lagoon since. It is hypothesized that the increased levels of dissolved oxygen have favored a new suite of fish species many of which prey upon tidewater gobies.

By contrast in Topanga Lagoon, predators are limited to birds and since 2019 introduced red swamp crayfish that have made their way down the creek into the lagoon. The only other fish species documented in Topanga Lagoon are occasional California grunion *(Leuresthes tenuis*), and arroyo chub (*Gila orcuttii*), which are more frequently observed at the upstream end of the lagoon where it merges into the creek.

3.0 TOPANGA LAGOON RESTORATION PROJECT

Review of historic maps indicates that Topanga Lagoon was almost 30 acres in size in the late 1800's. Since the 1930's, the Topanga Lagoon footprint has been less than 1 acre. It is a naturally bar-built lagoon, meaning it is closed off (disconnected) from the ocean by a beach sand berm for long periods of time. The greater lagoon area is divided into a patchwork of ownerships and development, with many of the existing facilities showing signs of damage and is projected to further deteriorate into the future.

The northern portion of the lagoon area is owned by the California Department of Parks and Recreation (CDPR) as part of Topanga State Park. It includes remnants of the historic Topanga Ranch Motel and associated beach parking. Visitor services include a parking lot and restroom along with several concessions that lease space onsite. The aging PCH bridge owned by the California Department of Transportation (Caltrans) bisects the lagoon and constrains the size of its mouth and channel. The lifeguard tower, beach, restrooms, and parking areas south of the PCH are managed by Los Angeles County Department of Beaches and Harbors (DBH) and are currently experiencing significant impacts from coastal erosion and storm surges, which is projected to increase with sea level rise (SLR).

The open water areas of the lagoon are managed by both CDPR and DBH and are significantly degraded due to impaired/limited habitat and water quality concerns; unmanaged human use-syringes, human feces, and trash are commonly encountered. The limited size of the open water area also exposes sensitive species to significant temperature changes with few retreat areas to use during drought, heat waves, and other extreme weather events. There is no coordinated coastal access and visitor services plan for the greater lagoon area, resulting in some facilities contributing to onsite degradation. Improved parking and overnight accommodations are in high demand locally along the coast.

Despite the existing use patterns and problems, Topanga Lagoon still hosts resources considered important at the regional, state, and national levels. The only currently reproducing population of the federally endangered steelhead trout (*Onchorynchus mykiss,* Southern California DPS) within the Santa Monica Mountains is also present,

although at very low levels. A wide range of other important species use the greater area such as protected nesting birds, state sensitive species like the arroyo chub (*Gila orcuttii*), western pond turtle (*Actinemys marmorata*), and two-striped garter snake (*Thamnophis hammondii*), among others. The beach supports a significant run of California grunion *(Leuresthes tenuis*).

USFWS, CDFW and NMFS have all required that the existing wetted (perennial above-surface water) area of the lagoon be protected and maintained during construction. Therefore all the restoration alternatives propose expanding wetland, transitional and upland habitat by grading radiating out from the edge of the existing wet limits. There is a balance between protection of existing fish habitat with the opportunity for these elements to expand over time in response to changes in sea level inundation.

A key principle in the Topanga Lagoon Restoration Project planning is to maximize long-term resource benefits while minimizing short-term harm. Every effort will be made to avoid negative impacts to sensitive resources during project construction. Adaptive management strategies will be incorporated into the plan and will include measures for assessing and maintaining the area post-restoration to identified standards of success.

The 30% design alternatives being considered during the CEQA/NEPA review were developed to emphasize important target elements of overall project goals that evolved based on extensive public, technical and landowner input. None of the alternatives propose impacting the archaeological resources and all are designed to protect existing lagoon habitat for tidewater gobies. Natural breaching patterns based on rainfall is also preserved. The fill on the west side of the lagoon will be removed and provide opportunity for implementing dune habitat and living shoreline protections.

Additionally, there are design elements that are examined in each alternative that could potentially be incorporated into other alternatives. For example, the dendritic pattern of grading proposed on the west side of Alternative 2 could be used for Alternative 3 or 4 as well.

4.0 SURVEY METHODS

Literature Review

A query of the California Natural Diversity Database (CNDDB) was conducted on 10 June 2021 to confirm that tidewater gobies are listed as present. Additional review of the Federal Register listings and the Critical Habitat designations confirmed that Topanga Lagoon is considered to be a critically important population. A complete list of references are attached.

Field Surveys and Analysis

The RCDSMM has been monitoring the population of tidewater gobies since 2008 as an ancillary part of the focused southern steelhead trout surveys. Additional surveys have been conducted in collaboration with partners at UCLA and CSUCI since 2019.

All surveys were conducted under permits from USFWS TE-811188-4 expires 1/4/2024 CDFW (#S-200630009-20275-001, expires 12/11/2023 renewal pending), and CDPR Right of Entry and Scientific Collection Permits (expire in 2025). All surveys were conducted by RCDSMM biologists with assistance from USFWS staff, as well as Dr. David Jacobs, Dr. Camm Swift and Brenton Spies.

Avoidance Training

The purpose of the field training was to educate field crews and volunteers in the biology, life history, and practical methods for avoiding impacts to Tidewater Goby. These training sessions are conducted as needed when new personnel begin to assist with surveys. This also provides a template for training construction personnel to protect the fish during any construction activities.

Training Components include:

- Biology and life history of the tidewater goby
- Topanga Lagoon: Identification of tidewater goby, discussion of preferred habitats vis-a vis life history, methods for avoidance of impacts when sampling sediments or surface waters.

Long term Visual Surveys

Long-term monitoring provides an important lens through which to examine abundance and distribution population trends. Even though it has not been feasible due to funding limitations to quantitatively measure abundance of tidewater gobies, by documenting opportunistic observations and intermittent seining in combination with recording rainfall, lagoon-ocean connectivity, sedimentation impacts, as well as catastrophic events like floods and wildfires, it is possible to get a better understanding of the dynamic biological responses exhibited.

Visual surveys for tidewater gobies in Topanga Lagoon extend from the ocean upstream to their upper limit of occurrence in Topanga Creek at have been conducted during monthly snorkel surveys since 2008. Surveyors noted presence of gobies and estimate abundance as they logged temperature, substrate, and algae information before continuing upstream for the rest of the survey. Survey limits discussed in this report are show in Figure 1.

Seine Surveys

In addition to the monthly visual surveys, spot seines of Topanga Lagoon are conducted occasionally to document presence and relative abundance. Seine nets are the preferred collection method when conducting tidewater goby surveys in all sites coast wide. This is important in order to standardize annual survey efforts from multiple collectors, calculate site specific detection probability for the Minimum Viability Abundance (MVA) model under development (Spies *pers. comm.),* and to better estimate seasonal and temporal populations trends. In addition, maximum depth and distance of each seine haul was recorded to calculate total area/volume surveyed.

A 3.2 meter by 1.2 meter x 3 mm mesh net affixed to poles was pulled across the lagoon from east to west in the mid-section, and then parallel to the east shore from the wing wall to the end of the lagoon, with the weighted bottom of the net kept firmly along the substrate, and the net angled to prevent fish from escaping. At the end of each pull, the net was raised and all fish were counted, sized, and released. Distances for each seine pull varied. A single pass was used to identify species composition, size and abundance. Buckets of lagoon water were ready to receive fish as soon as the nets were brought in. Water was collected a small distance away from where seining occurred so that fish were not frightened away. Water was changed in the bucket after each seine.

The tidewater goby and all native fish were measured quickly and Fork Length (FL) recorded to prevent mortality. All fish were moved into the buckets before measuring began. Hands were wet during handling and measuring to protect the mucus layer on the fish to prevent fish infection. Dip nets were used when moving fish from buckets for measuring when possible.

After being measured, fish were returned to a bucket, and then gently returned to the lagoon after seining completed. Fish were not thrown back. Sensitive and endangered species were measured and returned first. These fish are topsmelt and tidewater goby.

In fall 2020 and 2021, a total of 10 locations were systematically surveyed in Topanga Canyon Lagoon at 30 m intervals starting from the mouth of the lagoon and extending above the PCH bridge. Additional spot surveys were conducted where habitat of interest was accessible. Algae/vegetation cover assessments and sediment cores were conducted in 7/10 sites as well.

Additional fish parameters noted:
a. Present or absent (each seine pull)
b. Approximate number of fish collected (each seine pull)
c. Age/size classes (e.g. larvae, juveniles, adults)
d. Gravid females present?
e. Parasites, infection, disease (e.g. white microsporidia tissue infection)

Water Quality Parameters
Starting in fall 2021, visual surveys also coincided with monthly water quality testing in addition to monthly snorkel surveys. Water temperature (ºC) and dissolved oxygen (mg/L) were tested using a handheld YSI 55 DO meter. Conductivity (µS/cm) and pH were tested using handheld Oakton probes (waterproof ECTestr11 and waterproof pHTestr 30, respectively). Salinity (ppm) was tested using a handheld refractometer (ATC 300011 SPER SCIENTIFIC salt refractometer). Air temperature was measured using a mercury thermometer.

Three in situ locations in the main lagoon, just upstream of the bridge, and upstream about 80m were tested, and grab samples were collected from each of these locations to be tested for nitrates, nitrites, phosphates, and turbidity in the lab using a LaMotte Smart Colorimeter 3. All probes were calibrated prior to each survey date.

HOBO Tidbit continuously recording water temperature loggers were deployed between 2019 and 2021 at these same locations to document diurnal water temperature patterns in anticipation of the restoration project. During summer of 2021, a Hach Hydrolab HL7 mulitparameter data sonde was deployed along the west bank in the main part of Topanga Lagoon as shown in Figure 1. The sonde continuously recorded temperature, pH, EC, turbidity, dissolved oxygen, ORP, and salinity at 30 minute intervals.

Calibration and data uploading occurred monthly. Raw data was filtered to only include desired parameters (date-time object, date, time, temperature, pH, EC, turbidity, dissolved oxygen, ORP, salinity). Limits were imposed on data according to the HL Series Sensors manual (Hydrolab, 2019). EC limited to ≤ 100 mS/cm, turbidity limited to ≤ 3000 NTU, DO limited to ≤ 60 mg/L, ORP limited to ≥ -999 mV and ≤ 999 mV. Values outside of these ranges were replaced with NA values in R and blank cells in excel. No limits on remaining parameters (pH, temperature, salinity) as no values approached limits were imposed. The data frame was cleaned to represent time only in which sonde was deployed in water. Data values during transport before and after deployment were removed.

Due to density of data, graphs were prepared for three periods of deployment:
- 2021-07-13 10:00:00 and 2021-08-10 10:00:00.
- 2021-08-16 14:50:00 and 2021-09-23 08:00:00
- 2021-09-23 10:00:00 and 2021-11-02 10:00:00

Plots were created in ggplot2 (Wickham H, 2016). Trend-lines were generated with generalized added model (GAM and y ~ s(x, bs = "cs"), the default smoothing method in ggplot2 when visualizing data with 1000 + observations.

Physical Habitat Characteristics
Lagoon mouth characteristics were noted, including whether the mouth was open or closed and if there was evidence of any recent overwash or other marine influence. Additionally, sediment type/grain size (e.g. fine sand, small cobble, anaerobic mud, etc.) was noted at each survey location within each site.

Photo Documentation
Photographs were taken during each survey event including:
1) tidewater goby (when present)
2) all native fish species (especially other goby spp.)
3) all non-native species (fish, invertebrates, amphibians, etc.)
4) lagoon mouth clearly showing closed/open status with reference object for scale

Figure 1. Tidewater Goby survey area including visual, seining, spot sampling and water quality monitoring locations.

5.0 SURVEY RESULTS

Field Surveys and Analysis

Long term Visual Surveys

Since 2008, the RCDSMM has conducted over 139 individual visual surveys and a summary of all survey dates and data is found in Appendix A. Visual surveys took place in association with snorkel surveys and water quality sampling. Figure 2 summarizes the observations recorded.

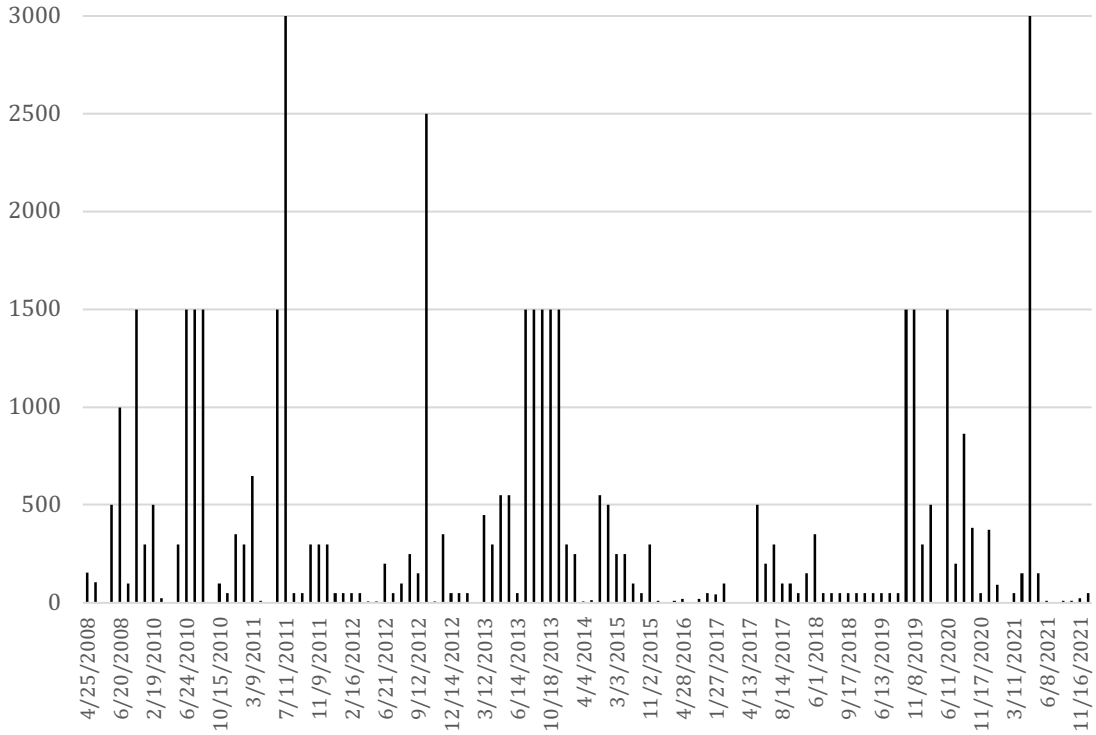


Figure 2. Summary of tidewater goby abundance estimates in Topanga Lagoon.

Seine Surveys

Data from 2012-2021 seine surveys is summarized in Table 1. Note that surveys were discontinued during 2015-2016 and 2018-2019 to avoid unnecessary disturbance due to extremely low water levels in the lagoon. A summary of all survey dates and data is found in Appendix A.

Table 1. Summary of Tidewater Goby Seining events in Topanga Lagoon

Seine Dates	# Juv	# Adults	# Total	Lagoon condition	Max Depth (cm)	Average Depth (cm)
2/6/2010	nd	nd	300	Closed	nd	nd
10/24/2012	3	3	6	Closed	nd	nd
4/22/2013	nd	nd	100's	nd	nd	nd
7/12/2013	nd	nd	1,000+	Closed	130	70
4/4/2014	nd	nd	8	nd	nd	nd
11/24/14	398	98	500	Closed	50	40
2/5/2016	nd	nd	10	Closed	140	60
1/27/2017	nd	nd	44	Open	nd	nd
1/10/2018	nd	nd	150	Open	95	45
10/15/2019	nd	nd	>1,000	Closed	nd	75
7/2/2020	350	515	865	Closed	175	65
7/22/2020	50	334	384	Closed	175	55
11/19/2020	167	206	373	Closed	120	45
11/25/2020	81	12	93	Closed	120	45
10/26/2021	nd	nd	12	Closed	nd	nd
11/16/2021	nd	nd	25	Closed	75	40
12/16/21	nd	nd	25	Open	nd	50

Water Quality Parameters

From June - November 2021, The Bay Foundation installed a Hach Hydrolab HL7 mulitparameter data sonde along the west bank in the main part of Topanga Lagoon as shown in Figure 1. The sonde continuously recorded temperature, pH, EC, turbidity, dissolved oxygen, ORP, and salinity at 30 minute intervals. Data sonde results are presented in graphs based on the reporting period. These will be consolidated into a single graph for 2021 in the final version of this report. All parameters are within the documented tolerance range for tidewater goby.

Salinity

Surface salinity levels in the main body of Topanga Lagoon were mostly low, with a few higher saline events observed when overwash or tidal exchange occurred. No stratification has been documented. Between 2012-2014, mean salinity was 1.5 ppt, with a maximum of 5 ppt and minimum of 0 ppt. This pattern continues to be observed with little to no stratification of salinity documented and is consistent with the data gathered by the HydroLab data sonde in 2021. Samples taken at the upper lagoon site (80m upstream of PCH bridge) occasionally are slightly brackish (7 ppt in December 2021 following a breach event) but generally under 1 ppt. Thus, Topanga Lagoon is primarily a freshwater dominated system, with brackish conditions only occurring during and immediately following a breach event with tidal overwash.

Topanga Lagoon is predominantly freshwater during the enclosed summer season, reaching into the low range of brackish by reaching up to 5ppt when overwash occurs. Salinity data collected from deployment to 08/19/2021 appears anomalous and will be omitted from analysis. Figure 3. shows the range of salinity recorded by monitoring period from July – November 2021.

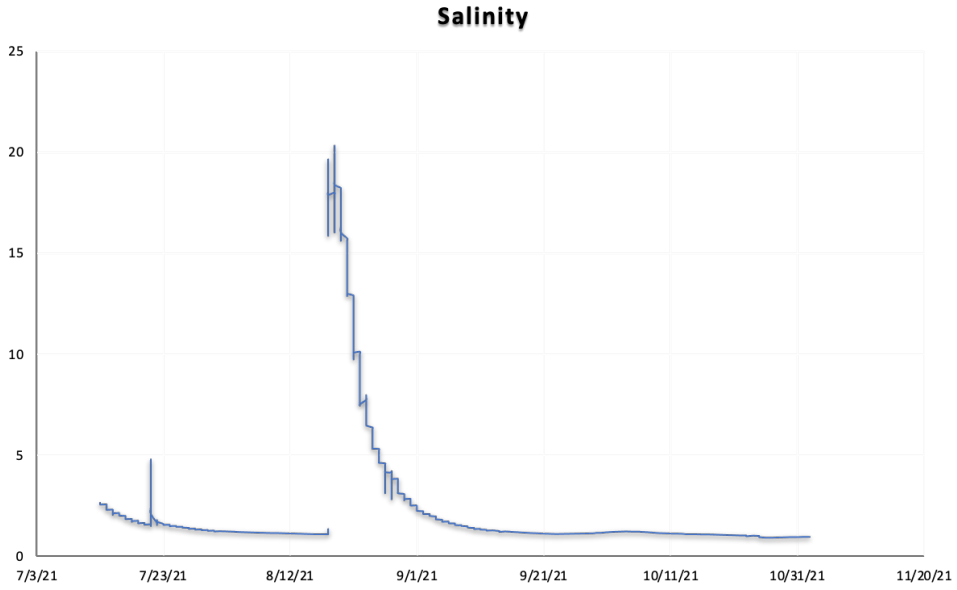


Figure 3. Salinity in the main body of Topanga Lagoon July – November 2021 by the Hach Hydrolab HL7

pH

The range of pH observed in Topanga Lagoon varied from a low of 7.5 to a high of 8.9 during the July – November 2021 deployment (Figure 4). pH levels throughout the creek and lagoon remained fairly consistent in 2012-2014 and did not fluctuate significantly. Most aquatic species prefer a pH range between 6.5-9 in freshwater systems, which is also the range for the RWQCB Water Quality Objective. Although average pH (7.6-8.2) was slightly on the alkaline side, even maximum recorded levels (7.9-8.5) remained within the tolerance limit range for most aquatic species. Again, this pattern appears to be holding with both our 2020-2021grab sample and sonde data.

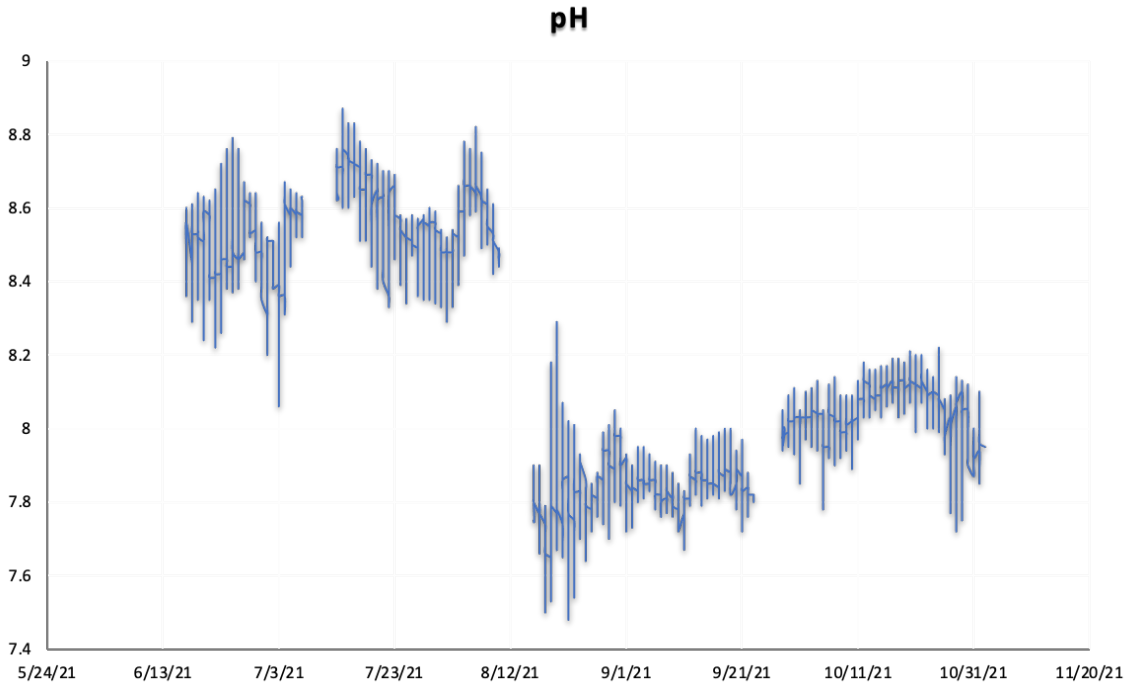


Figure 4. pH in the main body of Topanga Lagoon July – November 2021 Hach Hydrolab HL7

Water Temperature

Water temperature documented by the Hach Hydroloab HL7 showed diurnal cycles ranging from a low of 12 ºC in the fall to a high of almost 29ºC in August 2021 as shown in Figure 5.

Water temperatures collected as grab samples between 2012-2014 were mostly comparable in the lower and upper lagoon except for during a period of time from April to June 2014 when temperatures were considerably higher in the lower lagoon. The first flush temperatures during that time ranged between 12.6-14.2 ºC, while the non-storm event mean was 16.3 ºC with a maximum of 22.5 ºC and minimum of 7.4 ºC.

During July 2020, water temperature in the main lagoon exceeded 35 ºC and continued to fluctuate from 20-35 ºC into September (Figure 5). This corresponded with a shallow depth and stagnant condition due to the drought. In general, the main lagoon area

temperatures range between 7-25 ºC. This is well within the tolerance range of tidewater gobies (Swift et al. 1989) but on the high end of the preferred temperature range for southern steelhead (McEwan and Jackson 1996).

The duration of time when water temperatures are challenging for aquatic species is also important. Figure 6. Based on the HOBO Tidbit data shows that temperatures between 21-25 ºC were higher in summer/fall 2020, and substantially lower in 2021, although the lagoon experienced lengthy time periods in both years that are on the upper end of thermal tolerance for tidewater gobies.

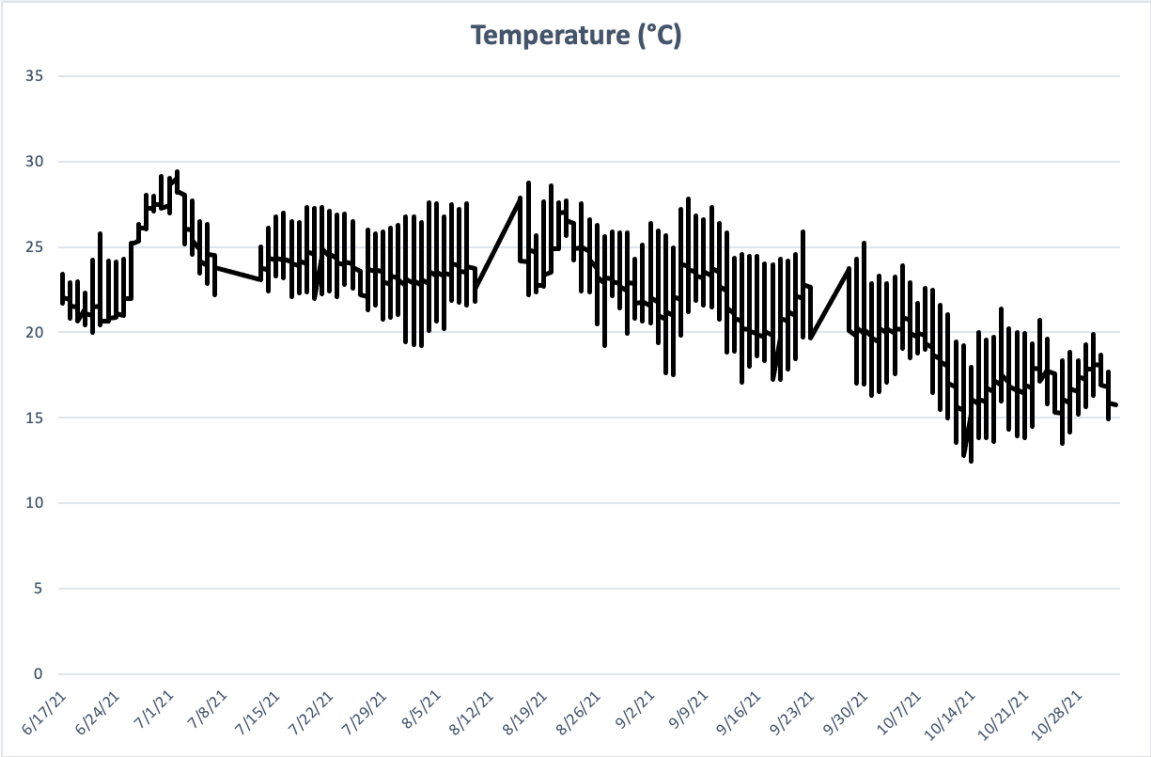
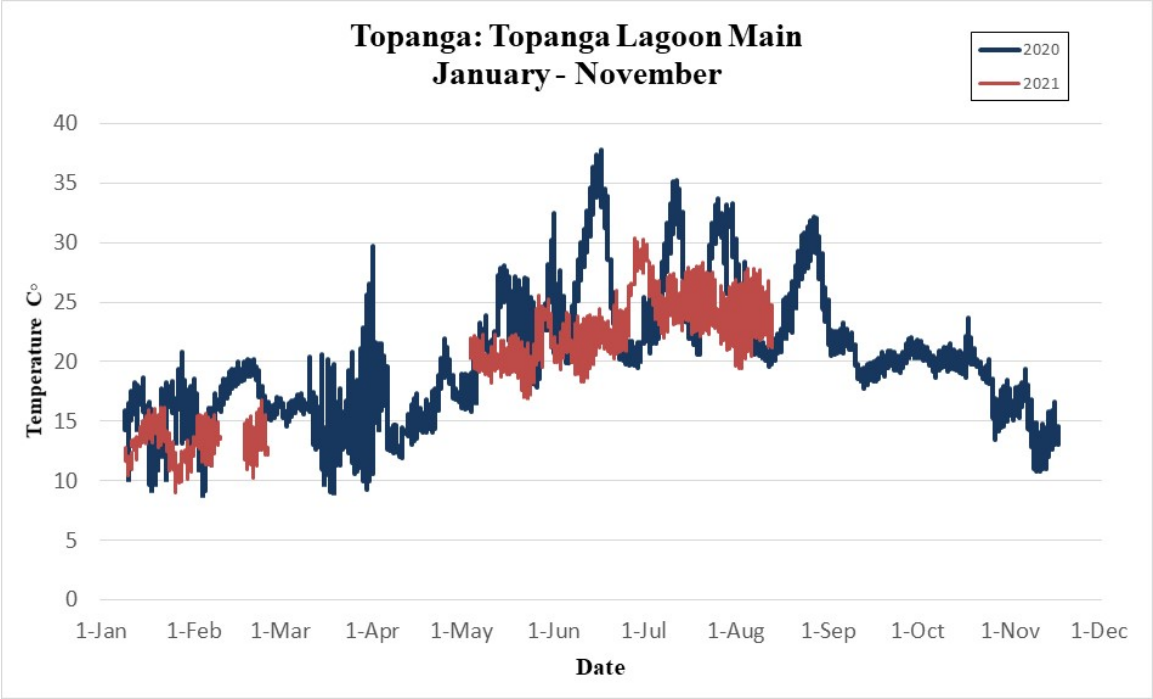


Figure 5. Water Temperature in the main body of Topanga Lagoon July – November 2021 collected by the Hach Hydrolab HL7



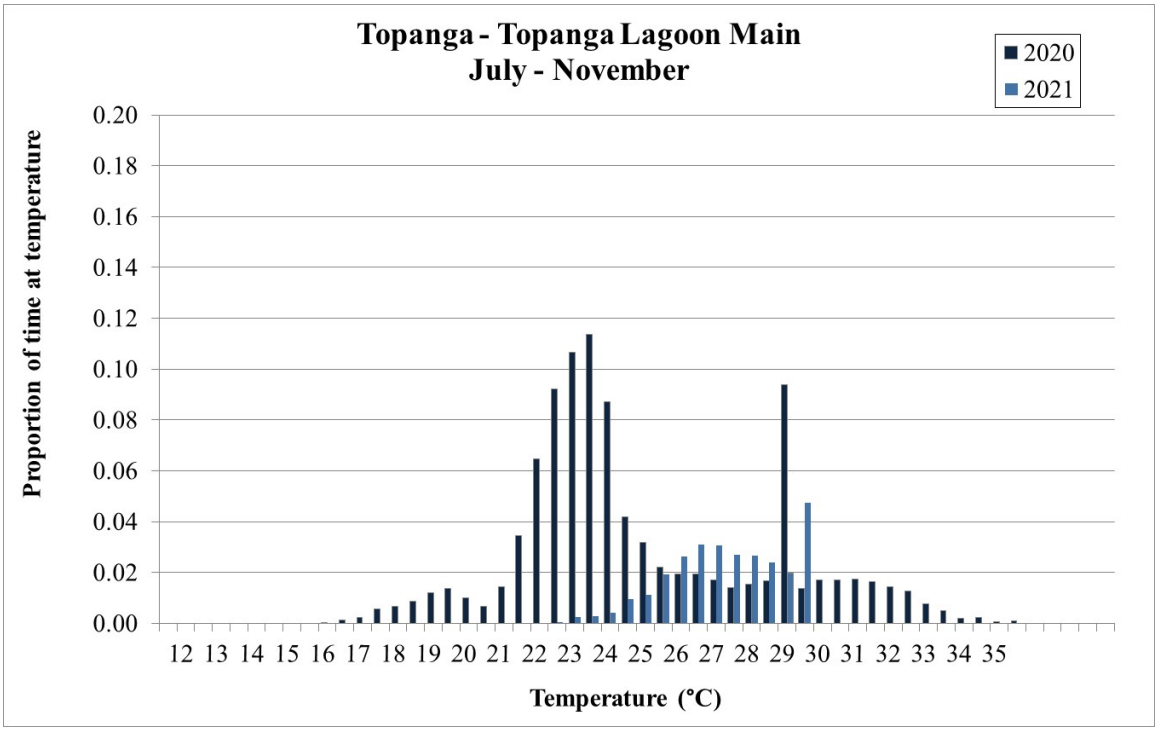


Figure 6. Water Temperature in the main body of Topanga Lagoon July – November 2020-2021 collected by the HOBO Tidbit

Dissolved Oxygen

Dissolved oxygen (DO) levels are typically highest in the middle to late in the day when plants and algae are photosynthesizing, and lowest in the early morning, after plants and algae have been respiring throughout the night. The Los Angeles Regional Water Quality Control Plan (LARWQCB 1994 with 2011 updates) has a water quality objective of greater than 5 mg/l for any single determination in cold water, and greater than 7 mg/l for all waters, except where natural conditions cause lesser concentrations. As shown in Figure 7, DO levels in Topanga Lagoon vary diurnally but typically remain above 5 mg/l.

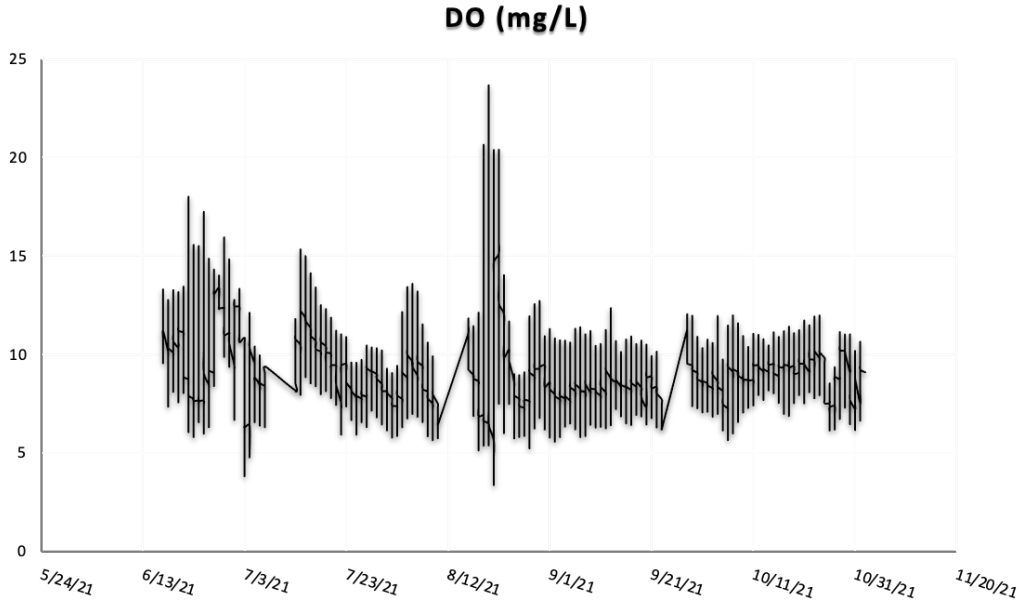


Figure 7. Dissolved Oxygen in the main body of Topanga Lagoon July – November 2021 by the Hach Hydrolab HL7

Turbidity

Overall turbidity ranged between 0-25 NTU with spikes that could be a result of people, dogs or birds stirring up the sediments (Figure 8). Turbidity was recorded as 4,306.3 NTU on 10/31/2021 12:00, which exceeds the Hydrolab limit of 3,000 NTU. This observation was excluded from the dataset and marked as NA.

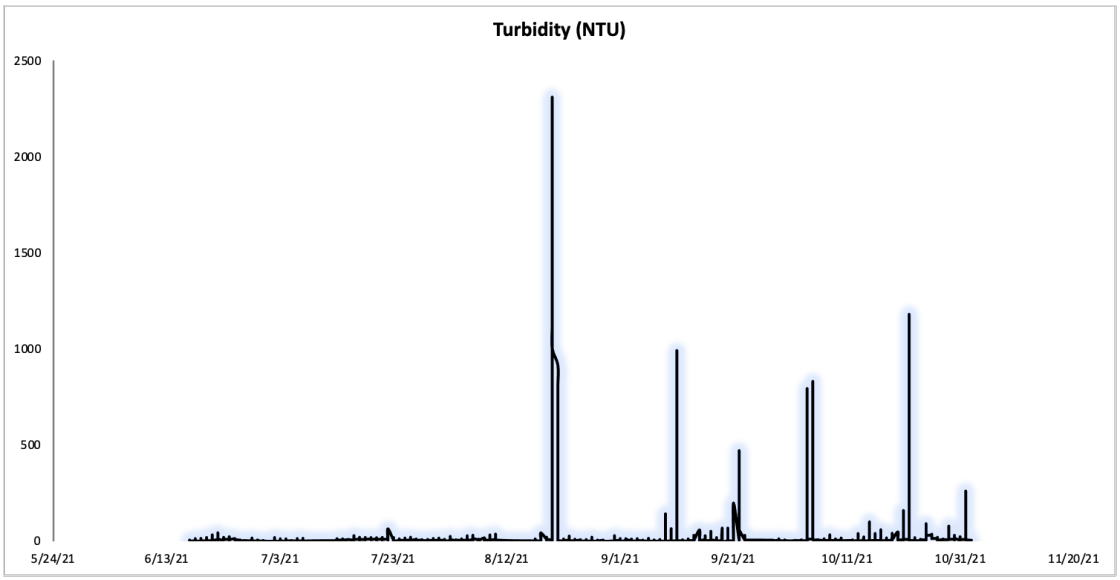


Figure 8. Turbidity in the main body of Topanga Lagoon July – November 2021 by the Hach Hydrolab HL7

Electrical Conductivity (EC)

The ability to conduct an electrical current is based on the level of salts or other chemicals dissolved in water. This measurement is used to calculate the amount of total dissolved salts (TDS), which in turn provides insight into the electrical conductivity of the water. The standard EC for drinking water is less than 400 µS. Freshwater values range from 0-1500 µS and ocean water is typically 50,000 µS. During the deployment of the sonde values ranged from a low of 2 up to over 30 µS between July – November 2021 (Figure 9).

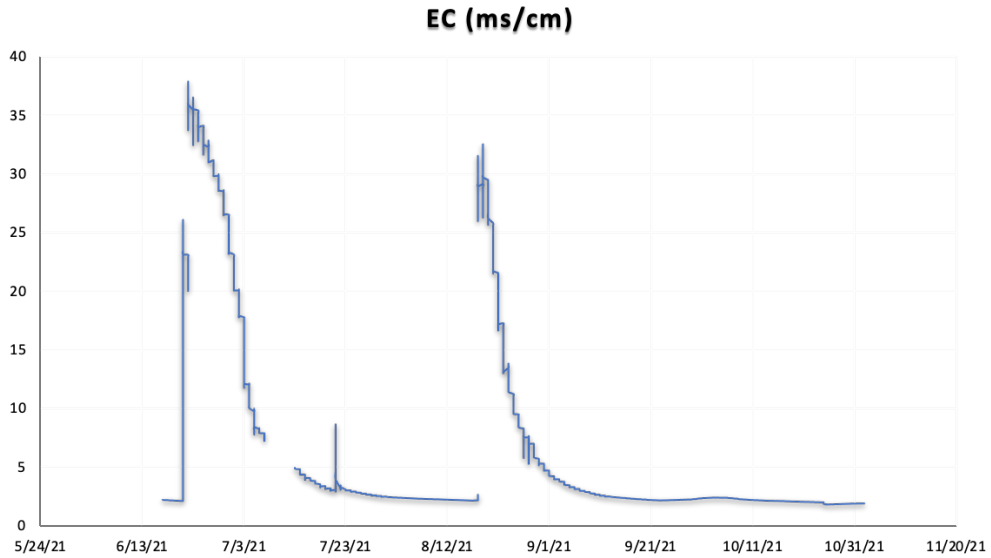


Figure 9. EC in the main body of Topanga Lagoon July – November 2021 by the Hach Hydrolab HL7

Oxygen Reduction Potential (ORP)
ORP is considered to be an important indicator of pollution levels by measuring the oxidizing or reducing potential of water. The voltage between a platinum measuring electrode and a reference electrode can be either positive, which indicates an oxidizing environment or negative, which indicates a reducing environment and is measured in millivolts (mV). ORP is affected by temperature and drinking water is usually between+200-+600 mV. An ORP value of between +300-500 mV is considered healthy. The data from July – November 2021 falls within this range (Figure 10).

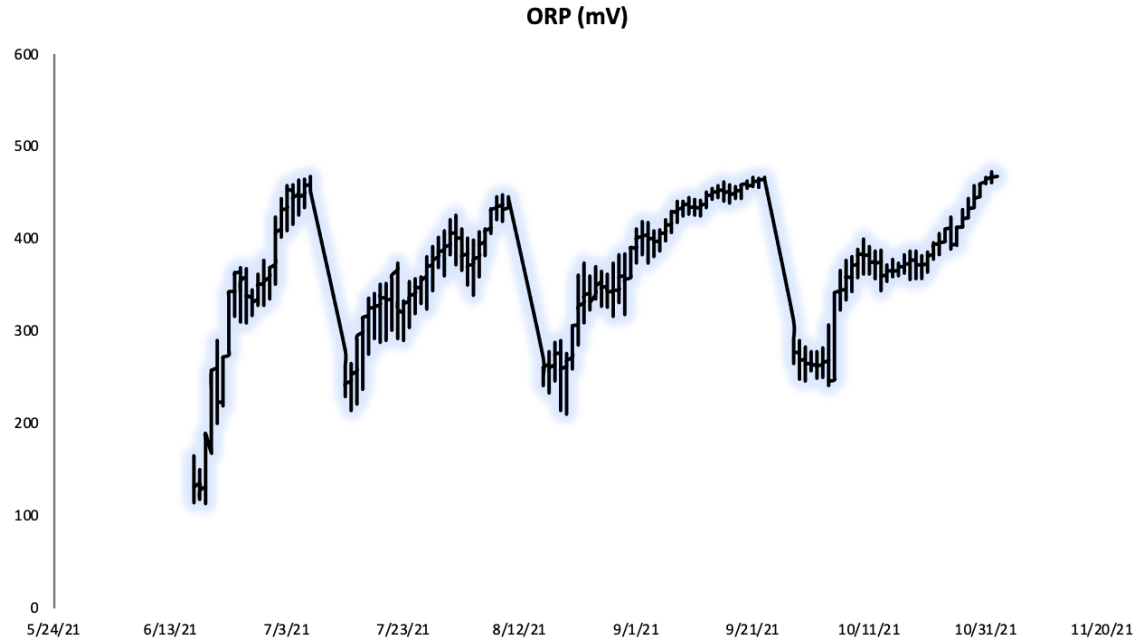


Figure 10. ORP in the main body of Topanga Lagoon July – November 2021 by the Hach Hydrolab HL7

Physical Habitat Characteristics
The lagoon was closed during all seining events. Sediment was primarily sand with some silt overlay in the main lagoon, transitioning to gravel, cobble and boulders moving upstream to the limit of distribution. A summary of all survey dates and data is found in Appendix A.

Observation of submerged aquatic vegetation suggests that seasonal coverage by *Ruppia sp.* throughout much of the lagoon south of PCH occurs annually during the summer. A quantitative study of aquatic vegetation was initiated in 2020, and preliminary results support this observation (RCDSMM unpublished data).

Photo Documentation
A representative sample of photographs documenting survey events is found in Appendix B.

6.0 ALTERNATIVES ANALYSIS

With help from the Topanga Lagoon Restoration Project Technical Advisory Committee (TAC) and community stakeholders, we identified four alternatives to restore the Topanga Lagoon.

The range of alternatives allows us to consider the benefits and challenges of the different restoration approaches. This allows a final alternative to be chosen at the end of the environmental review process that best meets the project's needs.

Alternative 1 is the "No Project/Managed Decline" alternative. This alternative assumes no investment or changes that would require a Coastal Development Permit and associated infrastructure upgrades and costs. As such, this alternative assumes only that limited resource activities such as Arundo removal and current business services would continue, that the condition of the unused Ranch Motel structures would continue to decline, and the Lifeguard and restroom building would remain in its current location subject to continued undermining of its foundation and sea level rise.

The overall project area that is included in restoration of the lagoon, bridge and beach services covers 41.6 acres, excluding the additional area along Topanga Canyon Blvd. that is not yet calculated. Table 2 provides a summary of habitat acreages estimated based on preliminary design, and provides details on how each habitat type is anticipated to change with the implementation of each alternative, and with two future sea level rise (SLR) scenarios considered. Note it does not yet include information about habitat along Topanga Canyon Blvd. however TWG do not extend beyond the lower proposed lagoon restoration area and are therefore not present further upstream to the revised upper project boundary. The relocation of visitor services such as parking, overnight accommodations or business leases to that area will be evaluated as part of the next step in design development.

Table 2. Summary of Habitat Acreage in the Topanga Lagoon Restoration Project Area.

Habitat Type	NO SLR Condition				1.6 ft SLR Condition				6.8 ft SLR Condition			
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 1	Alt 2	Alt 3	Alt 4	Alt 1	Alt 2	Alt 3	Alt 4
Open Water	0.06	0.04	0.08	0.07	1.21	1.19	1.23	1.22	5.07	5.78	5.22	5.14
Seasonal Shallow Open Water	0.42	0.69	0.44	0.38	0.42	0.69	0.44	0.38	0.08	0.32	0.12	0.08
Seasonally Unvegetated Flat	0.16	1.51	0.28	0.27	0.38	1.69	0.28	0.51	0.99	3.87	2.77	2.53
Emergent Marsh	0.47	1.12	0.5	0.5	0.39	1.87	0.5	0.82	0.24	0.94	0.59	0.8
Saltgrass	0.07	N/A	N/A	N/A	0.07	N/A	N/A	N/A	0.01	N/A	N/A	N/A
Riparian	2.46	6.09	6.42	6.36	2.32	5.16	6.42	5.79	1.62	2.59	3.11	3.13
Wetted Area Below Riparian/Upland Transition	**3.6**	**9.5**	**7.7**	**7.6**	**4.8**	**10.6**	**8.9**	**8.7**	**8.0**	**13.5**	**11.8**	**11.7**
Riparian/Upland Transition	6.06	6.14	6.34	6.23	6.06	6.14	6.34	6.23	6.06	6.14	6.34	6.22
Coastal Sage Scrub	3.66	2.98	2.98	2.98	3.66	2.98	2.98	2.98	3.65	2.98	2.98	2.98
Upland	11.16	13.84	14.37	14.49	11.15	13.84	14.37	14.49	11.16	13.84	14.35	14.49
Disturbed Upland/Trails	0.49	N/A	N/A	N/A	0.49	N/A	N/A	N/A	0.49	N/A	N/A	N/A
Riparian/Upland Transition Habitats	21.4	23.0	23.7	23.7	21.4	23.0	23.7	23.7	21.4	23.0	23.7	23.7
Sand (Beach)	4.18	4.39	4.42	4.56	3.05	3.24	3.28	3.41	0.27	0.34	0.35	0.48
TOTAL ALL HABITAT	29.2	36.8	35.8	35.8	29.2	36.8	35.8	35.8	29.6	36.8	35.8	35.9
Roadways/Developed/Landscaped	12.43	4.84	5.78	5.78	12.43	4.84	5.78	5.78	11.99	4.84	5.78	5.78
TOTAL PROJECT AREA	**41.6**	**41.6**	**41.6**	**41.6**	**41.6**	**41.6**	**41.6**	**41.6**	**41.6**	**41.6**	**41.6**	**41.6**

Actions Common to All Project Alternatives.

Alternatives 2-4 are the "Project Alternatives". Each of these alternatives provides a different road map to restoring the lagoon area and adjacent seasonally wetted and riparian habitats, buffering its resources from future sea level rise, providing visitor serving functions and meeting the project goals. However, these Project Alternatives have many things in common.

Under all Project Alternatives the seasonally wetted and riparian habitat areas would be expanded from the existing 3.6 acres to 7.6-9.5 acres, with riparian/transition upland areas changing from 21.4 existing acres of mixed non-native vegetation to between 23.0-23.7 acres of native dominated vegetation, depending on which alternative is selected. This would require removing much of the existing historically imported fill onsite to create a more natural topography and expanded open space areas. The existing wetted lagoon area and riparian habitats would be protected with grading starting at the outer edge of existing riparian trees, preserving the current lagoon banks and the majority of the existing riparian willows and native hardwoods. The natural breaching pattern of the lagoon would be protected by grading outside the footprint of the existing wetted lagoon and the beach berm at its mouth. The current beach by the mouth of the lagoon is approximately 4.18 acres based on area adjacent to potential disturbance and depending on the alternative selected could increase the depth of the beach by an average of up to 30 feet and its area to at least between 4.39 and 4.56 acres under current SLR (Table 1).

The project area would be improved by replacing invasive plants with native wetland, riparian and upland vegetation. Relocation of key buildings, structures and infrastructure and undergrounding of associated utilities would occur to facilitate this.
The length of the existing 79 ft long Caltrans bridge would be expanded to accommodate a widened lagoon riparian area, which would lower flow velocities to improve adult steelhead migration opportunities, increase refugia areas for tidewater gobies and juvenile steelhead and the quantity/quality of lagoon habitats. The primary bridge span would increase to 200 feet, with secondary/side spans of 130 ft on either side, increasing the total bridge span length to 460 feet, depending on the specific alternative chosen.

It should be noted that some of the options included in a specific alternative could be "mixed and matched" between the alternatives to create the best feasible final alternative in the next phase of project design, evaluation and permitting. These include: inclusion of more than one wetted lagoon channel on the west side; implementation of living shoreline elements, alternative emergency access routes to the beach; and final placement of relocated beach facilities. The array of alternatives was chosen to show the full range of options available and the evaluation of each subset will be more fully developed and provided in subsequent design and the CEQA documentation phase.

When the lagoon breaches during storm events, TWG retreat upstream into limited refugia habitat along the creek banks. All Alternatives proposed were evaluated for changes to the breach condition due to altered hydrology. Alternative 2 with the largest lagoon volume is expected to take longer to fill and breach, resulting in fewer events, but

during each event would provide greater refugia and reduced peak flow impacts to TWG. Alternatives 3 and 4 are anticipated to breach similarly to the existing condition (ESA 2022).

Alternative 1: No Project/Managed Decline (0 acres restored, 3.6 wetted acres, 21.4 disturbed riparian/transitional/upland acres and beach 4.18 acres): Under this alternative, existing conditions throughout the project area would remain "as-is" in terms of existing functions (or lack thereof) and conditions. Therefore, there would be no change to the lagoon footprint or habitat quality, and no new bridge would be constructed. Damage to the lifeguard building due to coastal erosion would continue to occur and no relocation is included in this "No Project" alternative. The currently unusable majority of the Topanga Ranch Motel structures would continue to deteriorate without restoration, and existing non-conforming business leases and septic systems would remain in current operation, but may be subject to future restriction or cessation of use in the future by enforcement of recent statewide wastewater policy changes. No improvements to habitat would occur. Sea level rise would continue to reduce beach area available and threaten the integrity of the Pacific Coast Highway.

Anticipated Alternative 1 Impacts:
- Continued limited habitat for tidewater gobies.
- Continued water temperature increases.
- Minimal lagoon habitat to support tidewater gobies.
- Continued impact from storm surges and coastal erosion at high tides reducing beach recreation opportunities
- Eventual loss of additional habitat due to sea level rise.

Alternative 1 Benefits:
- Population of tidewater gobies would remain undisturbed.

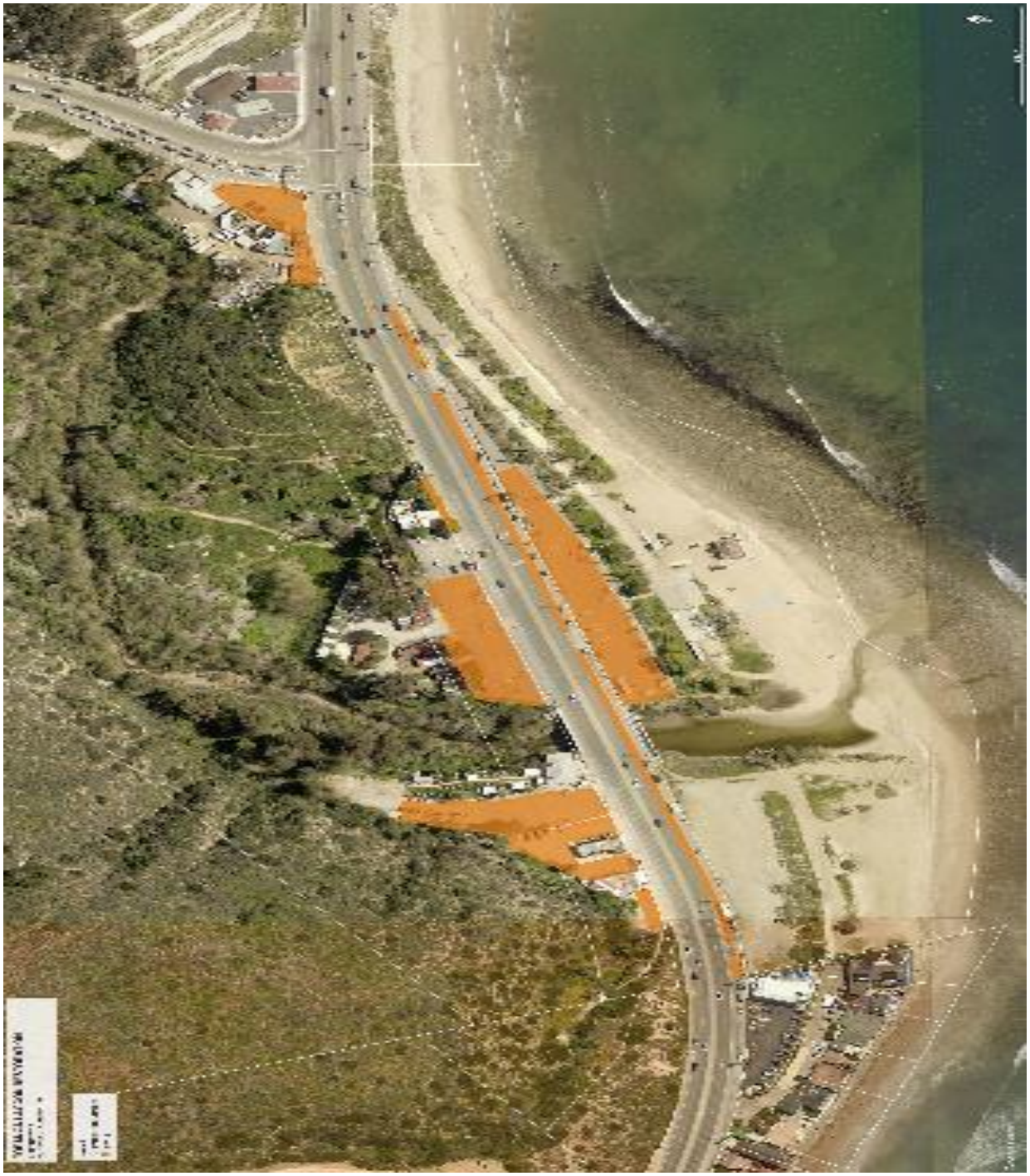


Figure 11. Alternative 1: No Project/Managed Decline (0 acres restored, 3.6 wetted acres, 21.4 disturbed riparian/transitional/upland acres and beach 4.18 acres).

Alternative 2: Maximum Lagoon Habitat, Removal of Motel (9.5 wetted acres, with 27.8 riparian/transitional/upland acres restored and beach expansion to 4.39 acres):
This alternative provides the maximum increase in lagoon, wetland, and riparian bank habitats. It includes restoration of more natural side channels connected to the western side of the existing lagoon based on historic topography and would allow the lagoon system to evolve to accommodate changing sea level and storm surge conditions. The Topanga Ranch Motel and onsite business leases would be removed from the project area and be replaced with riparian and transitional habitats. Partial or full relocation or replacement of public parking, business leases and overnight accommodations from the current location on the north side of PCH to the west side of Topanga Canyon Boulevard (TCB) in the expanded project area will be developed in the next design phase. There is sufficient space along TCB in that location to replace all of the parking that currently exists.

To provide for a wider lagoon and improve fish migration and refugia, the existing Caltrans bridge would be replaced with a longer one along the same road alignment. The span of the new bridge would total 460 feet (200-foot primary span, with secondary/side spans of 120-140 feet). This alternative includes ADA disabled parking spaces on the beach level, with additional recreational parking at the PCH upper level on the south side of PCH only.

The lifeguard building, beach restroom and helipad would be demolished and rebuilt closer to the realigned access road and to each other on the same beach level.

Anticipated Alternative 2 Impacts:
- Existing wetted habitat and riparian vegetation on the banks would be protected during bridge removal, construction and grading using coffer dams or other appropriate tools to minimize any disturbance to water level or water quality.
- Tidewater gobies would be relocated and restricted outside of the work area and unable to use that portion of the lagoon during construction. Assessment of carrying capacity and crowding will be made at the time of relocation to ensure that there is sufficient area to support any fish that are moved.
- Potential for increased turbidity in the lagoon due to construction and demolition is possible but this should not be significant impact as tidewater gobies will be excluded from the area.

Alternative 2 Benefits:
- Improvement of size and quality of lagoon habitat for tidewater gobies and other species. Provides additional resources and buffering from environmental changes.
- Most extensive expansion of potential diverse habitats supporting rearing and refugia habitat for tidewater gobies.
- Potential to accommodate sea level rise and storm surges with additional room for evolution of wetland, marsh, riparian and transitional habitat that supports tidewater gobies.
- Increased management of visitor experience providing opportunities for onsite education about tidewater gobies and other species.

Figure 12. Alternative 2: Lagoon Habitat Maximized, Removal of Motel (9.5. wetted acres, with 27.8 riparian/transitional/upland acres restored and beach expansion to 4.39 acres). The top image shows proposed areas where changes would occur. The lower image shows additional topographical and habitat changes. Potential Parking areas are shown in orange, blue is wetted area and green/tan indicate habitat restoration zones.

Alternative 3: Limited Lagoon Habitat Expansion, Retention of Motel (7.7 wetted acres, with 29.47 riparian/transitional/upland acres restored and beach expansion to 4.42 acres): This alternative also provides expanded lagoon, wetland, riparian and transitional habitat in the west part of the existing creek channel, but allows for only the existing main channel within the lagoon area itself. The remaining Topanga Ranch Motel structures are restored in its historic configuration, including relocation of some of the structures from the west side that is currently experiencing flood and bank erosion. One existing concession would be remodeled and continue operation in place. No other business leases remain. Relocation or replacement of public parking, business leases and overnight accommodations from the current location on the north side of PCH to the west side of Topanga Canyon Boulevard (TCB) in the expanded project area will be developed in the next design phase.

All of the changes to the new 460 ft. Caltrans bridge (200-foot center span, with secondary/side spans of 120-140 feet) are the same as for Alternative 2. However, the access road alignment is kept slightly to the east.

The lifeguard building and beach restroom would be rebuilt closer to the realigned access road moving slightly east to enhance sight lines along the beach, and the helipad would be located at PCH with a gated separation from the west end of the parking lot on the same level.

Alternative 3 Impacts:

- Existing wetted habitat and riparian vegetation on the banks would be protected during bridge removal, construction and grading using coffer dams or other appropriate tools to minimize any disturbance to water level or water quality.
- Tidewater gobies would be relocated and restricted upstream of the work area and unable to use the lagoon during construction. Assessment of carrying capacity and crowding will be made at the time of relocation to ensure that there is sufficient area to support any fish that are moved.
- Potential for increased turbidity in the lagoon due to construction and demolition is possible but this should not be significant impact as tidewater gobies will be excluded from the area.

Alternative 3 Benefits:

- Some improvement of size and quality of lagoon habitat for tidewater gobies and other species. Provides less additional resources and buffering from environmental changes than Alternatives 2 and 4.
- Some expansion of potential diverse habitats supporting rearing habitat for tidewater gobies but less compared to Alternatives 2 and 4.
- Increased potential to accommodate sea level rise and storm surges with limited room for evolution of wetland, marsh, riparian and transitional habitat versus Alternative 1, but less than Alternatives 2 and 4.
- Increased management of visitor experience providing opportunities for onsite education about tidewater gobies and other species.

Figure 13. Alternative 3: Least Lagoon Habitat Expansion, Full Retention of Motel (7.7 wetted acres, with 29.47 riparian/transitional/upland acres restored and beach expansion to 4.42 acres). The top image shows proposed areas where changes would occur. The lower image shows additional topographical and habitat changes. Potential Parking areas are shown in orange, blue is wetted area and green/tan indicate habitat restoration zones.

Alternative 4: Maximum Managed Retreat, Partial Motel Retention (7.6 wetted acres, with 29.48 riparian/transitional/upland acres restored and beach expansion to 4.56 acres): The alignment of PCH moves north expanding the maximum amount of beach area and managed retreat from SLR. The portion of the historic Topanga Ranch Motel east of the current motor court access lane is retained. Adjacent parking is adjusted and a remodeled restaurant lessee would continue to operate. This alternative will provide expanded lagoon, wetland, riparian and transitional habitats, primarily on the west side of the existing channel due to removal of all fill in that western area. No other business leases remain. Relocation of public parking, business leases and overnight accommodations from the current location on the north side of PCH to the west side of Topanga Canyon Boulevard (TCB) in the expanded project area will be developed in the next design phase.

Due to the curve of its alignment, the Caltrans bridge has the greatest length under this alternative, though the actual span lengths are similar to the other alternatives with a total of 460 feet consisting of a 200-foot long center span and a 120-140 ft. side span. This PCH alignment eliminates shoulder parking on the bridge spans, but has the greatest number of beach side parking spaces.

The helipad and lifeguard building are arranged with staff, emergency and ADA disabled parking between these two functions and accommodate sight lines required for the expanded recreational beach area. This alternative maximizes managed retreat, recreational beach area (and/or living shoreline features such as dunes) and provides the most SLR resilience.

Alternative 4 Impacts:

- Existing wetted habitat and riparian vegetation on the banks would be protected during bridge removal, construction and grading using coffer dams or other appropriate tools to minimize any disturbance to water level or water quality.
- Tidewater gobies would be relocated and restricted upstream of the work area and unable to use the lagoon during construction. Assessment of carrying capacity and crowding will be made at the time of relocation to ensure that there is sufficient area to support any fish that are moved.
- Potential for increased turbidity in the lagoon due to construction and demolition is possible but this should not be significant impact as tidewater gobies will be excluded from the area.

Alternative 4 Benefits:

- Some improvement of size and quality of lagoon habitat for tidewater gobies and other species. Provides less additional resources and buffering from environmental changes than Alternatives 2 but more than Alternative 3.
- Some expansion of potential diverse habitats supporting rearing habitat for tidewater gobies but less compared to Alternatives 2 but more than Alternative 3.
- Increased potential to accommodate sea level rise and storm surges with limited room for evolution of wetland, marsh, riparian and transitional habitat versus Alternative 1, but less than Alternatives 2 but more than Alternative 3.

- Increased management of visitor experience providing opportunities for onsite education about tidewater gobies and other species.

Figure 14. Alternative 4: Maximum Managed Retreat, Partial Motel Retention (7.6 wetted acres, with 29.48 riparian/transitional/upland acres restored and beach expansion to 4.56 acres). The top image shows proposed areas where changes would occur. The lower image shows additional topographical and habitat changes. Potential Parking areas are shown in orange, blue is wetted area and green/tan indicate habitat restoration zones.

7.0 SUMMARY

Regionally the scattered populations of tidewater gobies are experiencing impacts from increased predation, declining water quality following the wildfires, competition for food resources and coastal erosion. Current limiting factors for tidewater gobies at Topanga Lagoon are limited wetted area, lack of marsh or emergent vegetation south of the PCH bridge which may limit food availability and provides little shelter from predators, and summer water temperatures at the upper limit of tolerance.

The project has been designed to protect all existing wetted areas and have ground disturbance start outside of the boundaries of the wetted areas and associated native trees. Work within wetted areas will be limited to minor and temporary disturbance associated with removal of the footings of the existing Caltrans bridge and old bridge footings embedded in the fill and potential limited effects associated with adjacent ground disturbing work, vegetation removal, and management of the area until vegetation regrowth has occurred. In the long term, critical habitat will likely be expanded through the expansion of wetted areas and associated increases of the quantity and quality of adjacent native habitat.

Table 3. Comparison of Impacts and Benefits of Proposed Alternatives

DIRECT IMPACTS	**Alternative 1**	**Alternative 2**	**Alternative 3**	**Alternative 4**
Continued water temperature increases.	X			
Limited lagoon habitat	X			
Continued impact from storm surges and coastal erosion at high tides reducing beach recreation opportunities	X			
Existing wetted habitat would be protected during bridge removal, construction and grading using coffer dams or other appropriate tools to minimize any disturbance to water level or water quality.		X	X	X
Tidewater gobies would be relocated and restricted outside the work area and unable to use the lagoon during construction which could result in a temporary adverse affect.		X	X	X
INDIRECT IMPACTS				
Continued water temperature, food resource and refugia habitat limiting tidewater goby abundance.	X			
Eventual loss of additional habitat due to sea level rise.	X			
BENEFITS				
Increase in wetted acres expanding potential for increased biodiversity providing more food and shelter for tidewater gobies	0 acres restored, 3.6 acres existing	9.5 acres	7.7 acres	7.6 acres
Improved refugia habitat due to lower velocity flows and expanded refugia areas	0 acres restored,	9.5 acres	7.7 acres	7.6 acres

	3.6 acres existing			
Potential to accommodate sea level rise and storm surges with additional room for evolution of wetland, marsh, riparian and transitional habitat (1.6 ft SLR)	4.8 acres	10.6 acres	8.9 acres	8.7 acres
Potential to accommodate sea level rise and storm surges with additional room for evolution of wetland, marsh, riparian and transitional habitat (6.8 ft SLR)	8.0 acres	13.5 acres	11.8 acres	11.7 acres
Retains existing native riparian vegetation along the banks	X	X	X	X

Table 3 summarizes the potential direct and indirect impacts and potential benefits associated with each alternative. Note that a project goal and design constraint provided by USFWS required that no impacts to the existing wetted area occur during construction. A formal consultation will be required in order to implement any of the proposed Alternatives.

It is difficult to quantify the benefits provided by increased and functionally restored lagoon habitats, but the existing conditions in Topanga Lagoon while functional, are not optimal. Topanga Lagoon does not currently contain other species besides the invasive red swamp crayfish. Increasing refugia and rearing habitat areas are not anticipated to result in colonization by other non-native species or brackish species as the lagoon will remain freshwater dominated. Potential use by juvenile steelhead could pose a potential threat of a new predator. Alternatives 2, 3 and 4 all provide some benefit by improving these conditions but the wider lagoon, western secondary channel and expanded wetted footprint of Alternative 2 provides the most potential improvement. If the western secondary channel was incorporated into Alternative 3 or 4, that would increase the benefit of those designs.

8.0 RECOMMENDATIONS FOR SPECIES PROTECTION

The following measures will be implemented to reduce temporary impacts to critical habitat to a less than significant level. Additional or modified requirements by USFWS and NMFS as identified during the Section 7 consultation process and USACE, CDFW, RWQCB, and CCC during the project's permitting processes, will be implemented. When conflicts arise, the most protective measure will be implemented

Hydroacoustic Monitoring and Impact Avoidance

The Topanga Lagoon Restoration Project seeks to minimize any potential impacts to the federally endangered TWG (which does not have a swim bladder and are only sensitive to a narrow band of frequencies and particle motion) that reside year-round in the lagoon and creek area to be disturbed.

Avoiding and minimizing any potential hydroacoustic impacts to TWG will be required by Caltrans, USFWS and CDFW. All of the Build Alternatives proposed include

demolition of the existing concrete bridge and installation of new bridge foundations and abutments that span the existing wetted width. In general, maximum water depth in the lagoon is less than 2 meters, averaging less than 1 meter with sandy substrate dominating the wetted area. Adjacent fill slopes are composed of mixed grain size fill materials.

Caltrans (2020) recommends evaluation of pile driving impacts on fish by estimating Peak Sound Pressure Level (SPL), and the accumulated Sound Exposure Level (SEL: constant sound level in 1 second and which has the same total amount of acoustic energy of an event) and their manual provides detailed directions on this process. It is required that a precision sound level monitor be deployed to measure and document the effective pressure associated with any impact equipment or demolition methods that could potentially propagate underwater sound pressure into the water where sensitive fish species are present. This method does not fully account for potential particle motion impacts, which are not easily measured in shallow water. The current criteria is 206 decibels (dB) for fish of all sizes, and an accumulated SEL of no more than 183 dB for fish less than 2 grams such as the tidewater gobies, and less than 187 dB for fish over two grams. Background noise accumulation levels throughout the driving or demolition event under the Effective Quiet of 150dB are not counted against the daily accumulation. The only other fish species observed in Topanga Lagoon juvenile mullet (*Mugil cephalus*), Mississippi silversides (*Menida audens*), topsmelt (*Atherinops affinis*) and arroyo chub (*Gila orcuttii*).

Anticipated permit conditions associated with drilling adjacent to water, pile driving and in-water demolition efforts often include but are not limited to:

- Construction of the bridge foundations and footings will be completed within existing fill material.
- Construction of the temporary bridge will avoid placement of any foundations within or immediately adjacent to the wetted area and any construction will be completed within existing fill material.
- Construction of the coffer dam or other devices within or immediately adjacent to the wetted area associated with removal of the existing bridge will comply with all Caltrans requirements as outlined in the Technical Guidance for Assessment and Mitigation of Hydroacoustic Effects of Pile Driving on Fish (2020).
- Requirements for daily and seasonal timing restrictions
- Exclusion and relocation of any fish from the potential disturbed area
- Pre-construction, construction, demolition and post-construction monitoring by a qualified biologist
- Hydroacoustic monitoring during construction and demolition according to accepted Caltrans and other agency protocols
- Implementation of appropriate insulation and other sound attenuation systems (i.e. dewatered coffer dams, isolation casings with appropriate annular air gap, etc.)
- Mitigation plans for take of any listed species

<u>Pre-Construction</u>

- Continued monthly snorkel surveys, lifecycle monitoring, and storm event breach monitoring.

- Continue water temperature and water quality monitoring to document pre-restoration conditions.
- Identify the general dewatering approach as project hits ground water and where will water be released in coordination with permit requirements.
- Identify an approach for species protection and general filtration method (baker tanks to ocean, upland release, release downstream within lagoon, etc.) in accordance with permit requirements.
- Prepare Adaptive Mitigation and Monitoring Plans that identify goals, metrics for success and actions to take if goals not met.

<u>During Construction</u>

- Implement all required permitting conditions and Best Management Practices (BMPs)to control impacts of soil and dust movement and protect water quality.
- Implement an appropriate hydroacoustic monitoring program and utilize construction, demolition and dewatering BMPs to minimize sound propagation and intensity to remain below required standards of exposure and duration.
- Require biological monitoring required during installation of the coffer dam, any dewatering, existing bridge structure removal, and work adjacent to wetted areas.
- Monitor and establish a plan to relocate to an appropriate upstream location any steelhead from within the work area according to permits with NMFS and CDFW.

To minimize temporary impacts from actions needed in the wetted area, the following measures will be implemented to ensure that impacts are less than significant including but not limited to:

A coffer dam, sediment curtain, and/or other NMFS/USFWS approved method will be used to cordon off the small (80 ft wide x approcimately 100 ft long) area around the existing bridge abutment to both exclude fish and wildlife and contain any materials so they are unable to move out of the work area. Final construction details to accomplish this will meet all permit conditions and be developed by the contractor in coordination with CDPR, Caltrans and DBH.

All TWG will be relocated out of the area by a permitted biologist prior to work within the area and relocated in an approved location. Work will take place during the dry season when lagoon water levels and creek flows are at their minimum to avoid problems with controlling flow, or at other times approved by the regulatory agencies. Assessment of carrying capacity and crowding will be made at the time of relocation to ensure that there is sufficient area to support any fish that are moved. If there is a concern that the number of individuals relocated may cause overcrowding, the supervising biologist will notify USFWS and coordinate a plan to address the problem.

Downstream blocking nets (having no greater than 1/8inch mesh) will be secured to both banks and the bottom to prevent movement downstream of the work area in the main lagoon. Fish will be herded outside the limit of the proposed work area and then seining will continue until all fish are captured. The upstream blocking net will be installed and

secured so that no fish can move back into the work area. Fish that are not herded but captured in the seine nets will be placed in buckets of cool, clean water collected from an undisturbed area of the lagoon with bubblers attached at the sides and then immediately hand carried upstream above the upstream blocking net. Fish will not be crowded or held in buckets for more than 10 minutes. Fish handling will be minimized while the supervising biologist documents the species, number, size class, and condition of release. Individuals handling fish will ensure that their hands are clean and free of potentially harmful substances such as sunscreen, insect repellent, etc. Should there be any mortality, the fish incidentally killed will be preserved whole on ice then frozen, data on species, size and cause of mortality will be documented, and the remains delivered to the appropriate authority. If the limits of incidental take is approached, the supervising biologist will postpone work until the appropriate agency is notified and a plan developed to further reduce potential for further stress or injury.

The restricted work area within the coffer dam will not be fully dewatered until the supervising biologist determines that no fish remain within the area. Dewatering will be done slowly with supervision to ensure that any fish trapped in the area can be captured and relocated reducing the risk of injury or stress. Blocking nets providing a buffer area outside the work zone will remain in place until all work is completed and the coffer dam removed. Silt curtains may also be installed inside the blocking nets to further reduce potential for water quality impacts.

Blocking nets will be inspected at least three times a day (start, middle, end) or more if requested by the supervising biologist. If fish are impinged on the net, or weather/flow conditions change significantly, the supervising biologist can increase inspection efforts.

Pumps for dewatering within the coffer dam enclosed area will be properly screened to prevent fish from entering the intake. Dewatering and flow diversion will comply with permit requirements from USFWS and NMFS in a Biological Opinion. Once the supervising biologist has confirmed that the work area is isolated, all fish are excluded, and there is no risk of entraining fish, then the pump screen may be removed. Water removed from the work area will be directed to an adjacent holding area according to permit requirements before release into the lagoon or ocean downstream of the work area. Water quality testing including turbidity, temperature, salinity, dissolved oxygen, pH, and conductivity, nutrients (and potentially metals if required) will be monitored and documented at the start, middle and end of each day.

If fish upstream are observed in distress, a fish kill occurs, or water quality problems (including equipment leaks or spills) occurs, the supervising biologist will immediately stop work, contact the relevant authorities and work with the contractor to correct the problem.

Upon completion of the removal of the old bridge within the coffer dam area, water quality will be tested within the work area before removal of the walls. Flow will be

restored slowly and fish will remain excluded upstream of the work area pending confirmation that water parameters are suitable for direct release into the lower lagoon. It is anticipated that the old bridge footings embedded in the fill banks can be removed from the land side without requiring dewatering.

The supervising biologist will provide a training to all construction personnel and coordinate with them directly each day to ensure no fish are harmed. The supervising biologist will also maintain documentation in a logbook with date, methods, personnel, water temperature, conductivity, visibility, and other pertinent notes on activities and fish relocation.

To minimize temporary and limited turbidity or pollution impacts from adjacent ground disturbing activities, the following Best Management Practices (BMPs) measures will be implemented:

- Siltation fences installed at edge of area to be graded to avoid movement of soil into wetted areas.
- Vegetation removal will be conducted so that materials are not permitted to fall into wetted area
- Stockpiles will be located away from the creek corridor, and contained by way of standard BMPs such as wattles, tarps, or burlap to ensure materials are not moved into the creek due to wind, rain, gravity or flooding.
- No equipment maintenance will be permitted near the creek to avoid impacts of accidental spills
- Soil will be stabilized in bare areas with mulch, straw matting, hydroseeding or other approved methods during the vegetation restoration period to avoid movement of soil into the wetted areas.

<u>Post-Construction</u>

- Conduct monthly snorkel surveys, lifecycle monitoring, and storm event breach monitoring to document post-restoration changes.
- Conduct water temperature and water quality monitoring to document post-restoration conditions. Five years post- construction monitoring of project area and restoration success.
- Implement the actions recommended by the Adaptive Mitigation and Monitoring Plans, especially if project goals are not met.

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APPENDIX A
SUMMARY OF SURVEY DATA

Date	# Total
4/25/08	156
4/25/08	104
4/25/08	4
5/16/08	500
5/16/08	Present, no total
5/16/08	50-100
2/26/13	2
7/31/09	500
7/31/09	>1,000
2/6/10	300
2/19/10	500-600
3/12/10	<25
5/20/10	>300
6/24/10	1,000's
7/16/10	1,000's
8/20/10	1,000's
10/15/10	100
1/14/11	300+
2/10/11	300
3/9/11	600+
4/11/11	10
5/11/11	1
6/16/11	>1,000
7/11/11	500+
7/11/11	1,000
7/11/11	1,000+
7/11/11	>5,000
8/18/11	Present, no total
10/17/11	100's
11/9/11	100's
11/9/11	<100
3/2/12	Present, no total
4/12/12	6
4/18/12	8
6/21/12	150+
7/13/12	50
7/13/12	100
7/13/12	5
8/15/12	200+
9/12/12	150
10/18/12	500+
10/18/12	500+
10/18/12	350+
10/24/12	6
11/20/12	300+
1/18/13	Present, no total
2/15/13	Present, no total
2/15/13	Present, no total
3/12/13	400+
4/22/2013-4/24/2013	100's
5/10/13	500+
5/10/13	100+
5/31/13	500+
7/12/13	1,000+
8/9/13	1,000+
9/13/13	1,000's
10/18/13	1,000's
11/15/13	1,000's
12/13/13	100's
12/13/13	100's
4/4/14	8
7/11/14	10+
11/2014	500+
11/24/2014	500
12/19/14	30
2/13/15	13
3/3/15	200+
6/11/15	200+
7/10/15	50-100
7/10/15	Present, no total
11/2/15	100's
2/5/16	10
2/5/16	3
2/5/16	2
4/6/16	10
4/28/16	20
5/26/16	1
8/22/16	~20
9/15/16	~50
1/27/17	44
2/1/17	100
2/1/17	3
2/23/17	2
4/13/17	4
6/15/17	500
6/15/17	200
7/17/21	100's
8/14/17	100
8/14/17	100
12/11/17	Present, no total
1/10/18	150
6/1/18	100's
6/1/18	Present, no total
6/25/18	Present, no total
8/24/18	Present, no total
9/17/18	Present, no total
10/15/18	Present, no total
5/10/19	Present, no total
5/16/19	Present, no total
6/13/19	Present, no total
6/27/19	Present, no total
8/6/19	Present, no total
9/6/19	200
10/10/19	167
10/15/19	>1,000
11/7/19	70
11/8/19	>1,000
3/30/20	100+
3/30/20	100+
5/13/20	500
5/13/20	2
6/11/20	1,000+
6/11/20	200
7/2/20	800
11/17/20	Present, no total
11/19/20	373
11/25/20	93
3/11/21	50
2/18/21	4
4/7/21	~100
5/4/21	~100
6/8/21	10
9/20/21	none visible
10/19/21	10
11/16/21	25
12/16/21	none visible

APPENDIX B
PHOTOGRAPHS

Survey Team November 2020

Topanga Lagoon view to ocean from PCH bridge December 2020

APPENDIX C
Resume/Qualifications

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November 2021

Rosi Dagit, Sr. Conservation Biologist for the RCDSMM has coordinated a variety of research projects throughout the Santa Monica Mountains and Bay since 1987. As Principle Investigator for the Santa Monica Bay Steelhead Lifecycle Monitoring project, she has snorkeled the creeks monthly since 2001 to count endangered southern steelhead trout, and monitored changes in abundance and distribution using DIDSON camera, mark-recapture of over 1,000 *O. mykiss*, and instream antenna deployment. She has numerous publications and technical reports summarizing this work.

Ms. Dagit has also been monitoring endangered tidewater gobies and other native fishes throughout the Santa Monica Bay with focused surveys in both Topanga and Malibu Lagoons. She was the tidewater goby biologist of record for the Malibu Lagoon Restoration in 2012. Under a series of contracts from California Department of Parks and Recreation, Ms. Dagit has coordinated a Technical Advisory Committee and a variety of research efforts to document abundance and distribution patterns, as well as examine habitat and predation impacts to tidewater gobies in the Santa Monica Bay.

Since 2014, Ms. Dagit has also been working with Friends of the Los Angeles River (FOLAR) to update the fish study of the upper LA River by surveying in the lower river near the estuary and in the western river drainages of the San Fernando Valley.

Ms. Dagit has coordinated several habitat restoration efforts including the 2008 Rodeo Grounds Berm Removal, the Trancas Lagoon Restoration Feasibility Study (2015) and is currently Project Manager for the Topanga Lagoon Restoration Planning process in collaboration with State Parks.

She holds permits from:

- CA Department of Fish and Game Scientific Collecting Permit #S-200630009-20275001 expires 12/11/2023
- CA Department of Parks and Recreation Scientific Collecting Permit
- NOAA National Marine Fisheries Service Section 10 (a) (1) (A) #15390-2 expires 12/31/2025
- US Fish and Wildlife Permit #TE811188-4 expires 1/4/2024

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Before joining the RCDSMM, Mr. Ibekwe served with at the California Conservation Corps' Los Padres center where he worked in the native plant nursery, helped set up a long-term trail camp in Big Sur, and conducted instream surveys and participated in steelhead restoration projects with the Fisheries Habitat Restoration crew.

Since joining the RCDSMM he has participated in the RCD's educational programs and worked closely with Ms. Dagit monitoring the lagoons of the Santa Monica Mountains and conducting snorkel surveys and redd surveys in Topanga Creek.

APPENDIX
H

TECHNICAL REPORT
Southern Steelhead Trout (*Oncorhynchus mykiss*)
for the Topanga Lagoon Restoration Project

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Preparation date 10.10.22

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TABLE OF CONTENTS

	Page Number
1.0 INTRODUCTION	4
Southern Steelhead in the Santa Monica Bay and Southern CA DPS	5
Evaluation of Limiting Factors for Topanga Creek	6
Role of Topanga Creek and Lagoon	9
2.0 TOPANGA LAGOON RESTORATION PROJECT	10
3.0 SURVEY METHODS	11
Literature Review	11
Field Surveys and Analyses	11
Long-term Monitoring	12
Lifecycle Monitoring	13
Fish Passage Conditions	14
Fish Passage Modeling Methods	14
Genetics Analysis	14
4.0 **SURVEY RESULTS**	15
Long-term Monitoring	15
Snorkel Survey Results	15
Redd Survey Results	17
Lifecycle Monitoring Results	18
Fish Passage Conditions	22
Fish Passage Modeling Results	24
Steelhead Genetics Results	25
5.0 ALTERNATIVES ANALYSIS	31
Actions common to all Alternatives	32
Alternative 1: No Project/Managed Decline	33
Anticipated Alternative 1 Impacts	33
Alternative 1 Benefits	33
Alternative 2	35
Anticipated Alternative 2 Direct Impacts	35
Alternative 2 Indirect Impacts	35
Alternative 3	37
Anticipated Alternative 3 Direct Impacts	37
Alternative 3 Indirect Impacts	37
Alternative 4	39
Anticipated Alternative 4 Direct Impacts	39
Alternative 4 Indirect Impacts	39
Summary Analysis	41
Recommendations for Species Protection	43
Hydroacoustic Monitoring and Impact Avoidance	43
Pre-Construction	44
During Construction	44
Post- Construction	44

Literature Cited	45
Appendix A. Summary of all Snorkel Surveys in Topanga Creek	49
Appendix B. Resumes/Qualifications	57

TABLES	
Table 1. Limiting Factors (x) affecting *O. mykiss* recovery in Topanga Creek (NMFS 2012).	6
Table 2. Fish passage barriers and impediments in Topanga Creek (from CalTrout 2006).	7
Table 3. Average number of *O. mykiss* observed per month in Topanga Creek 2001-2021 (n=# survey months/year).	16
Table 4. Redds observed in Topanga Creek 2010-2021.	18
Table 5. Summary of all *O. mykiss* Lifecycle Monitoring Efforts, 2008-2021	19
Table 6. Passage opportunities for steelhead migration (based on open and passable conditions at lagoon berm and connected lower reach).	22
Table 7. Observations of Other Fish Species in Topanga Lagoon 2010-2021	23
Table 8. Maximum-a-posteriori population assignments. . *(Dagit et al. 2018)*	28
Table 9. Frequency of the anadromous allele at the two loci associated with the Omy5 region amongst all individuals according to sampling location. *(Dagit et al. 2018)*	29
Table 10. Age at spawning amongst recovered parents. *(Dagit et al. 2018)*	31
Table 11. Comparison of Impacts and Benefits of Proposed Alternatives	32
Table 11. Summary of Habitat Acreage in the Topanga Lagoon Restoration Project Area.	42

FIGURES	
Figure 1. Survey Area in Topanga Creek.	13
Figure 2. Number of *O. mykiss* of all size classes observed in monthly snorkel surveys in Topanga Creek, June 2001– December 2021.	16
Figure 3. STRUCTURE plot at k=3. Sections are boxed according to their labels. Yellow= Fillmore Hatchery strains; Blue=native southern California populations; Orange= Topanga Creek population. . *(Dagit et al. 2018)*	27
Figure 4. Neighbor-Joining phylogenetic tree including Topanga and Malibu Creeks, native Southern California populations, and Fillmore Hatchery strains. See Table "pop codes" for population codes. . *(Dagit et al. 2018)*	30
Figure 5. Alternative 1: No Project/Managed Decline (0 acres restored).	34
Figure 6. Alternative 2: Lagoon Habitat Maximized, Removal of Motel (9.5 wetted acres, as part of 11.7 acres restored).	36
Figure 7. Alternative 3: Least Lagoon Habitat Expansion, Full Retention of Motel (7.1 wetted acres, as part of 9.8 acres restored).	38
Figure 8. Alternative 4: Maximum Managed Retreat, Partial Motel Retention (7.1 wetted acres, as part of 10.8 acres restored).	40

1.0 INTRODUCTION

The intent of this document is to provide information on southern steelhead trout *(Onchorhynchus mykiss*) to support preparation of CEQA/NEPA documents and regulatory permits for the Topanga Lagoon Restoration Project (Project). Evaluation of the potential impacts of each proposed restoration alternative are informed by the directives of the Topanga State Park General Plan (2012), and the Santa Monica Mountains Local Coastal Program (LA County 2014).

Due to declining populations, the genetically distinct southern California steelhead trout Evolutionarily Significant Unit (ESU) were listed as federally endangered throughout their range from the Santa Maria River to the US-Mexican border under the Endangered Species Act (NOAA 1997:62 FR 43937; NOAA 2002: 7 FR 21586). In 2006, the National Marine Fisheries Service (NMFS) replaced the use of the ESU and adopted the Distinct Population Segment (DPS) terminology instead. This protected all naturally spawned *O. mykiss* found in freshwater habitats below impassable natural and artificial barriers, as well as any individuals that spawn above the barriers and migrate downstream. The ESA listing mandates that a recovery plan provides goals to ensure that viable populations of anadromous *O. mykiss* are able to persist across the DPS. The Southern California Steelhead Recovery Plan (NMFS Recovery Plan, NMFS 2012) and Fish Bulletin 180 (Adams et al. 2011) provide guidance and a framework for monitoring protocols using four viability metrics (abundance, productivity, spatial structure and diversity) to track population changes over time (NMFS 2016).

At the state level, the southern California Distinct Population Segment (DPS) of steelhead are considered a California Species of Special Concern (SSC). However, California Department of Fish and Wildlife (CDFW) initiated a status review in response to a petition by California Trout to list southern steelhead as endangered under the California Endangered Species Act throughout the southern California DPS to match NMFS listing.

Topanga Lagoon is one of the last remaining coastal systems supporting a reproducing population of southern steelhead trout in the Southern California Distinct Population Unit (DPS). Topanga Creek is identified as a Core 1 priority habitat for southern steelhead trout (NMFS 2012), with replacement of the Pacific Coast Highway (PCH) bridge and expansion of the lagoon identified as recovery actions. Restoration of Topanga Lagoon, including the replacement of the constraining bridge supporting PCH, is listed as the top priority for Caltrans District 7 in the statewide Fish Passage Barrier Removal list (PAD ID#716891). The PCH bridge over Topanga lagoon was identified as a partial Fish Passage Barrier by CalTrout (2006).

Preservation of both life history forms (anadromous steelhead and resident rainbow trout) is considered a high priority in the NMFS Recovery Plan (NMFS 2012). Both anadromous and resident *O. mykiss* have been documented within the Topanga Creek watershed since 2001, although there has been limited opportunity for immigration or emigration from the creek during drought conditions. Because it is difficult to detect the difference between resident and anadromous individuals visually much of the time, we use the term *O. mykiss* in this report to reference both.

Steelhead exhibit a variety of life history strategies and in the Southern CA DPS are more tolerant to both warmer water temperatures as well as responsive to changing watershed conditions by straying from their natal streams. Both anadromous and resident individuals spawn and can interbreed in the late winter-spring, creating redds (nests for eggs) in suitable gravel beds. Redd size is correlated with length of the female, with anadromous redds being substantially larger and holding more eggs (~3,000) than those created by resident females, which in are typically smaller than 1 meter pot size, and typically hold fewer than 500 eggs (McEwan and Jackson 1996, Spina 2007, Sloat and Osterback 2013). Mark–recapture data in Topanga revealed that individuals spawned in multiple years and lived up to six years, with residents often remaining in a limited reach of the creek.

Southern Steelhead in the Santa Monica Bay and Southern CA DPS

Though anadromous *O. mykiss* stocks throughout the Pacific Northwest have been the object of much study, south-central and southern *O. mykiss* populations have only recently been the subject of focused study (Hayes et al. 2008, Bond et al. 2008, Boughton et al. 2007, Spina 2007, Tobias 2006, Stoecker and Kelley 2005, Yedor 2003). Data collected by the Resource Conservation District of the Santa Monica Mountains (RCDSMM) since 2001 on migration patterns, abundance, spatial structure, diet, age and growth, genetics, population dynamics, and habitat preferences of *O. mykiss* in Topanga Creek have provided a long-term dataset documenting the life history of southern *O. mykiss* (Dagit et al 2018, Dagit et al. 2019).

Since 2019, CDFW has continued the lifecycle monitoring in Topanga Creek as well as throughout the southern California DPS, and a variety of other researchers contributed data on the abundance, distribution and population trends throughout the region. Although the level of monitoring efficiency and efforts were extremely variable throughout the DPS and andromous adults are notoriously difficult to detect when numbers are low, Dagit et al. (2020) were able to confirm that only 177 anadromous adults have been observed in 25 years. This probably underestimates the abundance of adults across the DPS, but at no point since steelhead were listed as endangered have the numbers reached the provisional viable population goal of 4,150 annual anadromous spawners in an individual watershed, let alone the entire DPS (Williams et al. 2016).

Resident populations of steelhead in the upper areas of watersheds are important sources for the greater steelhead meta-population. Their loss within watersheds regionally and within the Santa Monica Mountains were documented following the Thomas Fire (2017) and Woolsey Fire (2018). Combined with the effects of the multi-year drought, these habitats have not recovered and no re-colonization has been documented (Kyle Evans and Mary Larson CDFW *pers. comm*.).

The role of colonization and intermittent access of anadromous adults to available habitats is important relative to moderating alteration of spatial structure and mitigating the related risk of regional extinctions (Boughton et al. 2006), but is rarely documented. Challenges to colonization of new or historical habitat in southern California by *O. mykiss* include highly variable flow regimes, high water temperatures, and frequent isolation from the Pacific Ocean by sandbars that develop at the mouths of most coastal streams. Few aquatic species are adapted to surviving in such conditions. *O. mykiss*, however, is a highly plastic species in terms of phenotypic and life-

history variability, capable of exploiting habitats that would not sustain populations of other salmonids.

Evaluation of Limiting Factors for Topanga Creek

The limiting factors identified by the NMFS Recovery Plan for creeks in the Santa Monica Bay include: passage restriction due to culverts; dams and instream crossings; poor water quality associated with urban and agricultural effluents; non-native species impacts; development related impacts; and wildfires (Table 1). It is interesting to note that drought is not listed as one of the threats analyzed in the Recovery Plan, but it continues to play a major role as a limiting factor. Limiting factors are further characterized based on specific impacts to *O. mykiss*.

Table 1. Limiting Factors (x) affecting *O. mykiss* recovery in Topanga Creek (NMFS 2012).

Threat	Topanga Creek
Agricultural development	
Agricultural effluents	
Culverts and road crossings	x
Dams and surface water diversions	
Flood control maintenance	x
Groundwater extraction	
Levees and channelization	x
Mining and Quarrying	
Non-native species	x
Recreational facilities	x
Roads	x
Upslope/upstream activities	x
Urban development	x
Urban effluents	x
Wildfires	x

Culverts and Road Crossings

In 2006, fish passage barriers and impediments in Topanga Creek were identified using CDFW (formerly DFG) FishXing V2 software, which rates barrier severity by color (CalTrout 2006). Table 2 summarizes the barrier analysis for the lagoon and lower creek. Due to accumulation of sediment upstream of the Rodeo Grounds berm, removal of that barrier prior to restoration of the lagoon was recommended.

Table 2. Fish passage barriers and impediments in Topanga Creek (from CalTrout 2006)

Location	RKM	Barrier type	Barrier material	Passage severity rating	Adult habitat quality rating
Bridge at PCH, Topanga Lagoon	0–0.2	Box culvert bridge	Concrete	Gray	Poor
Rodeo Ground Berm (restored in 2008; not yet re-evaluated)	0.5–1.0	fill berm, instream crossing	Lead contaminated fill covered with gunnite	Gray	Good

The PCH bridge over Topanga Creek (#53 0035; PAD ID#716891) is located near the mouth of the creek. It constrains fish passage due to its narrow 79 ft wide span that results in flow velocities that exceed those suitable to support fish passage.

The California Fish Passage Database lists several instream road crossings along Topanga Creek as partial or temporal barriers. The largest of these, Rodeo Grounds Road Berm (PAD ID#716892), was removed in 2008 as it restricted floodplain and channel configuration, caused sediment accumulation and created subsurface flow for approximately 1,000 m of stream channel. The channel at this location has subsequently had longer periods of surface flow, and both spawning and rearing habitat conditions continue to improve along the creek corridor. During the ensuing drought, however, flows returned to sub-surface conditions.

The Arizona crossing at Brookside Dr. (IS#716893) washed out in storms and is no longer a barrier. All other barriers are natural and restricted to low flow conditions.

Flood Control Maintenance

Flood control maintenance activities in Topanga Creek and Lagoon are usually limited to removal of storm generated debris. There is no proactive removal of creek or bank vegetation.

Levees and Channelization

The lower reach of Topanga Creek between mile markers 0.75-2.5 on Topanga Canyon Blvd. (State Highway 27) runs adjacent to the road. Rip-rap and some modified engineered banks line this reach, constraining the creek channel. There are no levees in the Topanga Creek watershed.

Non-native Species

Until 2009, red swamp crayfish (*Procambarus clarkii*) were the only invasive species reproducing in Topanga Creek (Dagit et al. 2019). Red swamp crayfish were initially observed in the main stem of upper Topanga Creek above the limit of anadromy in 2001 but their population remained constrained due to flushing storm events until summer 2011. Between 2011 and December 2016, their population exploded. A targeted removal effort was initiated in 2013 with student volunteers, but the low flow conditions created favorable conditions for reproduction and growth. The flushing flows of winter 2017 appeared to have significantly reduced the population but based on observations since 2018, the population has rebounded with more individuals

observed in more locations. Many refugia pools ranging in average depth from 45 -200 cm are places where *O. mykiss* and crayfish have been consistently documented (Dagit et al. 2019, RCDSMM unpublished data).

The increased crayfish population is a concern. Cox and Davis (2019 in preparation) used this data to develop a mathematical model looking at the impacts of crayfish to the *O. mykiss* population and estimate that at current levels crayfish predation could cause local extirpation in 10+ years if no controls are instituted.

Since 2009, we have also documented a limited population of fathead minnow (*Pimephales promelas*) and the occasional goldfish (*Carassius auratus*).

Recreational Facilities

Recreational activities are concentrated at the mouth of the creek on Topanga Beach. There are currently no recreational facilities along the mainstem of Topanga Creek, however use by un-housed transients who build dams to cross the creek and set fires has become a serious concern.

Roads

Topanga Canyon Blvd. (State Highway 27) follows the creek throughout the anadromous reach, along with various utilities. Due to the geological constraints of the narrow canyon, the creek, road and utilities compete for space and surface flow runoff from the road shoulder drains directly into the creek.

Upslope/Upstream Activities

The Topanga Creek Watershed covers 18 square miles, of which 2/3 is publicly owned, much of it within Topanga State Park. There are an estimated 12,000 residents and 3-4,000 single family residences. There are scattered, small commercial areas and several elementary schools. There are two sub-developments in the upper watershed that have storm drains, but most storm runoff is surface flows that eventually drain into the creek. The percentage of impervious surface throughout the watershed is less than 10% based on aerial estimates (RCDSMM unpublished data). The majority of the watershed is designated as coast live oak woodland and chaparral.

Urban Development

Development in the Topanga Creek Watershed consists primarily of single-family homes that evolved since the 1920's and is constrained by the Santa Monica Mountains Local Coastal Program zoning restrictions.

Urban Effluents

Water temperature limitations are a known problem in southern California creeks. While overall maximum and average water temperatures did not change substantively during the drought, the continued incremental increase in minimum temperatures is reducing the diurnal temperature range and potentially reducing the nocturnal cool period that provides thermal refugia.

Water quality continues to be a concern in Topanga, especially at the beach where there are frequent bacterial exceedances. The most critical factor that sets Topanga Creek apart from others in the Santa Monica Bay is that water quality (nutrient levels, turbidity, pH, conductivity

and temperature) remains suitable to support *O. mykiss* along with many other sensitive aquatic species (Dagit et al. 2014). Sediment movements are entrained as slugs that move through Topanga Creek during rain events, however that process has been altered with the lack of flushing flows during the drought. Maintaining suitable water quality and quantity are critical to the continued survival of the steelhead population in Topanga Creek.

Role of Topanga Creek and Lagoon

Despite the contraction of southern steelhead from their historical range, a sub-population reestablished (i.e., recolonized) in Topanga Creek following some high rain years associated with El Nino events in the mid to late 1990's (Bell et al. 2011). Until 1980, a population of *O. mykiss* of unknown census size was present in Topanga Creek (Moyle et al. 1989, Swift et al. 1993, Bell et al. 2011). It is not clear if this was primarily a resident population or if it included anadromous individuals, though it is likely that anadromy was present when conditions were suitable. Anecdotal stories collected by the RCDSMM from local fishers suggests that until the 1960's it was possible to catch your limit of steelhead in Topanga Creek, although no photographs documenting that have been found (R. Dagit *pers. comm.).* During the 1970-80's, the creek was seasonally dammed at the Camp Wildwood property, which is located upstream of the limit of anadromy, and hatchery trout were released for summer catch. It is thought that some of these may have escaped and potentially provided the hatchery introgression in the creek.

Occasional surveys by CDFW between 1980 and 1997 failed to find any *O. mykiss*. In July 1998, a single 10 cm *O. mykiss* was found approximately 3.2 river kilometers upstream of the ocean by R. Dagit. Distance (km) upstream from the ocean within Topanga Creek will hereafter be referred to as "River Kilometers; RKM." More focused fish surveys were undertaken by the RCDSMM and three adult *O. mykiss* were observed and confirmed by NMFS in April 2000 (Bell et al. 2011).

The RCDSMM initiated more consistent snorkel surveys in 2001, followed by addition of lifecycle monitoring in 2008. Data collected during the entire study period from 2001-2021 provides a snapshot of natural reestablishment and response of a small coastal population to the dynamic and ever-changing conditions related to precipitation, drought, floods and wildfire (Dagit et al. 2018).

The numbers of *O. mykiss* in Topanga Creek have fluctuated annually, but have declined substantively since the onset of the drought in 2012 as reaches of the creek lost surface flows that had previously been stable spring-fed refugia pools. Dagit et al. (2017) summarized the relationship between lower flows, intermittent dry reaches, and declining numbers of *O. mykiss.* The above average rains in 2019 were sufficient to restore base flow for much of the study reach for one season but no anadromous adults were observed. Overall, there have been only 12 anadromous adults documented in Topanga Creek between 2001-2021 (Dagit et al. 2019, St. George and Evans 2021). Subsequent low rainfall has resulted in continued loss of surface flow connectivity.

Topanga Creek is listed as a Core 1 Population (NMFS 2012), which recognizes its significant role in supporting the regional meta-population of southern steelhead.

2.0 TOPANGA LAGOON RESTORATION PROJECT

Review of historic maps indicates that Topanga Lagoon was almost 30 acres in size in the late 1800's. Since the 1930's, the Topanga Lagoon footprint has been less than one acre. It is a naturally bar-built lagoon, meaning it is closed off (disconnected) from the ocean by a beach sand berm for long periods of time. The greater lagoon area is divided into a patchwork of ownerships. The northern portion of the lagoon area is owned by the California Department of Parks and Recreation (CDPR) as part of Topanga State Park. It includes remnants of the historic Topanga Ranch Motel and associated beach parking. Visitor services include a parking lot and restroom along with several businesses that lease space onsite. The aging PCH bridge owned by the California Department of Transportation (Caltrans) bisects the lagoon and constrains the size of its mouth and channel. The lifeguard tower, beach, restrooms, and parking areas south of the PCH are managed by Los Angeles County Department of Beaches and Harbors (DBH) and are currently experiencing significant impacts from coastal erosion and storm surges, which is projected to increase with sea level rise (SLR).

The open water areas of the lagoon are managed by both CDPR and DBH and are significantly degraded due to impaired/limited habitat and water quality concerns; unmanaged human use-syringes, human feces, and trash are commonly encountered. The limited size of the open water area also exposes sensitive species to significant temperature changes with few retreat areas to use during drought, heat waves, and other extreme weather events. There is no coordinated coastal access and visitor services plan for the greater lagoon area, resulting in some facilities contributing to onsite degradation. Improved parking and overnight accommodations are in high demand locally along the coast.

Despite the existing use patterns and problems, Topanga Lagoon still hosts resources considered important at the regional, state, and national levels. In addition to southern steelhead trout, a robust population of the federally endangered and state sensitive tidewater goby (*Eucyclogobius newberryi)* has been documented in the Topanga Lagoon since 2001. A wide range of other important species use the greater area such as protected nesting birds, and state sensitive species like the arroyo chub (*Gila orcuttii*), and two-striped garter snake (*Thamnophis hammondii*), among others. The beach supports a significant run of California grunion *(Leuresthes tenuis*), a locally sensitive species.

USFWS, CDFW and NMFS have all required that the existing wetted (perennial above surface water) area of the lagoon be protected and maintained during proposed construction. Therefore all the alternatives propose expanding wetland, transitional and upland habitat by grading radiating out from the edge of the existing wet limits. There is a balance between protection of existing fish habitat, passage and retaining native riparian trees, with the opportunity for these elements to expand over time in response to changes in sea level inundation.

A key principle in the Topanga Lagoon Restoration Project planning is to maximize long-term resource benefits while minimizing short-term harm. Every effort will be made to avoid negative impacts to sensitive resources during project construction. Adaptive management strategies will be incorporated into the plan and will include measures for assessing and maintaining the area post-restoration to identified standards of success.

The 30% design alternatives being considered during the CEQA/NEPA review were developed to emphasize important target elements of overall project goals that evolved based on extensive public, technical and landowner input. None of the alternatives propose impacting the archaeological resources and all are designed to protect existing lagoon habitat for tidewater gobies. Natural breaching patterns based on rainfall is also preserved. The fill on the west side of the lagoon will be removed and provide opportunity for implementing dune habitat and living shoreline protections.

Additionally, there are design elements that are examined in each alternative that could potentially be incorporated into other alternatives. For example, the dendritic pattern of grading proposed on the west side of Alternative 2 could be used for Alternative 3 or 4 as well.

The following steelhead related objectives must be met to fulfill the purpose of the project:

1. Physical enhancement of the hydrologic function of the bar-built lagoon. This involves maintaining a natural pattern of lagoon mouth breaching, avoiding negative impacts to the surf break and littoral zone, restoration of more natural topography to benefit flood reduction, water quality and a more natural suite of habitat.

2. Biological restoration of the natural gradient of native habitat that considers historic distribution, existing species needs, and future climate impacts. Protect and enhance existing habitat and fish passage for special-status species currently present site (tidewater goby, steelhead trout, grunion), nesting and roosting birds, and other special status species. Incorporate living shoreline and dune habitats that could potentially support snowy plover.

3.0 SURVEY METHODS

Literature Review

A query of the California Natural Diversity Database (CNDDB) was conducted on 10 June 2021 to confirm that southern steelhead trout are listed as present. Review of the NMFS Recovery Plan (2012) confirmed continued status as a Core 1 population. A complete list of references are attached.

Field Surveys and Analyses

As discussed above, intensive and nearly monthly surveys of Topanga Creek within the limits of steelhead anadromy have been completed by the RCDSMM on an ongoing basis since 2001. This body of long-term monitoring and research provides a detailed level of information about steelhead trout within Topanga Lagoon and Creek. We also completed project several specific analyses to inform us how the proposed Topanga Lagoon Restoration Project and its alternatives could affect steelhead trout. These project specific studies are detailed in the *Topanga Lagoon Restoration Technical Report for Hydraulics, Sediment Transport and Sea Level Rise Analysis* (Moffatt & Nichol 2022) and the *Topanga Lagoon Restoration Ecohydrology Report: Fish Passage, Fish Habitat Suitability and Habitat Zone Elevations* (ESA 2022).

Long-term Monitoring

Long-term monitoring provides an important lens through which to examine abundance and distribution population trends. By documenting changes in these metrics in combination with recording rainfall, lagoon-ocean connectivity, sedimentation impacts on spawning gravel and base flow, as well as catastrophic events like floods and wildfires, it is possible to get a better understanding of the dynamic biological responses exhibited.

All methods for snorkel surveys (2001-2021), redd surveys (2010-2021), lifecycle monitoring (2008-2021) including pit tagging, weir trap deployment, instream antenna, DIDSON surveys, tissue sampling and analysis) were conducted based on California Department of Fish and Wildlife (CDFW) and National Marine Fisheries Service (NMFS) protocols and Coastal Monitoring Program (CMP) methodologies (Adams et al. 2011). The goal of the CMP is to provide a statistically robust framework to characterize the abundance, productivity, diversity, and spatial distribution of salmon and steelhead. These parameters are used to help assess the viability of a population.

Trained field crews reliably documented fish in a consistent way as per O'Neal (2007). A team of at least two people (one or more snorkeling and one recording and observing from the bank with polarized sunglasses) walked the creek, snorkeling in all possible locations of any habitat type with enough depth to support fish.

Young of the year *O. mykiss* without clear parr marks were not counted, to avoid counting arroyo chub by mistake. Size of fish were estimated and provided to the data recorder independently, to have repeated counts to verify numbers of fish in each size class. If there were any inconsistencies between divers, a repeat pass was made.

Numbers of *O. mykiss*, size and life stage/ maturation were recorded according to both size class and the Juvenile Steelhead Life-Stage Rating Protocol developed by the IEP Steelhead Project Work Team. Habitat characteristic data including habitat type, maximum and average depth, percent canopy cover, dominant substrate, percent cover with algae, percent of instream cover, and shelter value were noted at each location where *O. mykiss* were observed. Presence of any Additional details on survey methods are found in Dagit et al. (2018) and Dagit et al. (2019).

Beginning in 2010, surveys for redds were conducted during snorkel surveys, as well as during additional focused spawner surveys conducted one or more days (if young of the year observed) monthly between December and May. Using the survey protocol developed by NMFS (2012) and updated by McLaughlin and Christianson (MFS 2017), data on location, length, width, depth, substrate size, presence of adult fish or young of the year, and approximate age of the redd was recorded.

All surveys were conducted under permits from CDFW (#S-200630009-20275-001, expires 12/11/2023), NMFS (Section 10 (a)(1)(A) #15390-2R, expires12/31/2025, and CDPR Right of Entry and Scientific Collection Permits (expire in 2023). All surveys were conducted by RCDSMM biologists with assistance from CDFW and NMFS staff, as well as Stillwater Sciences Consultants.

Surveys started at the ocean and extended to the limit of anadromy as shown in Figure 1. The study area was divided into three reaches based on distance from the lagoon and PCH bridge and named by CDFW for integration into the CMP statewide database. The survey area covers both the areas directly affected by the restoration project, but also upstream areas that the species rely upon.

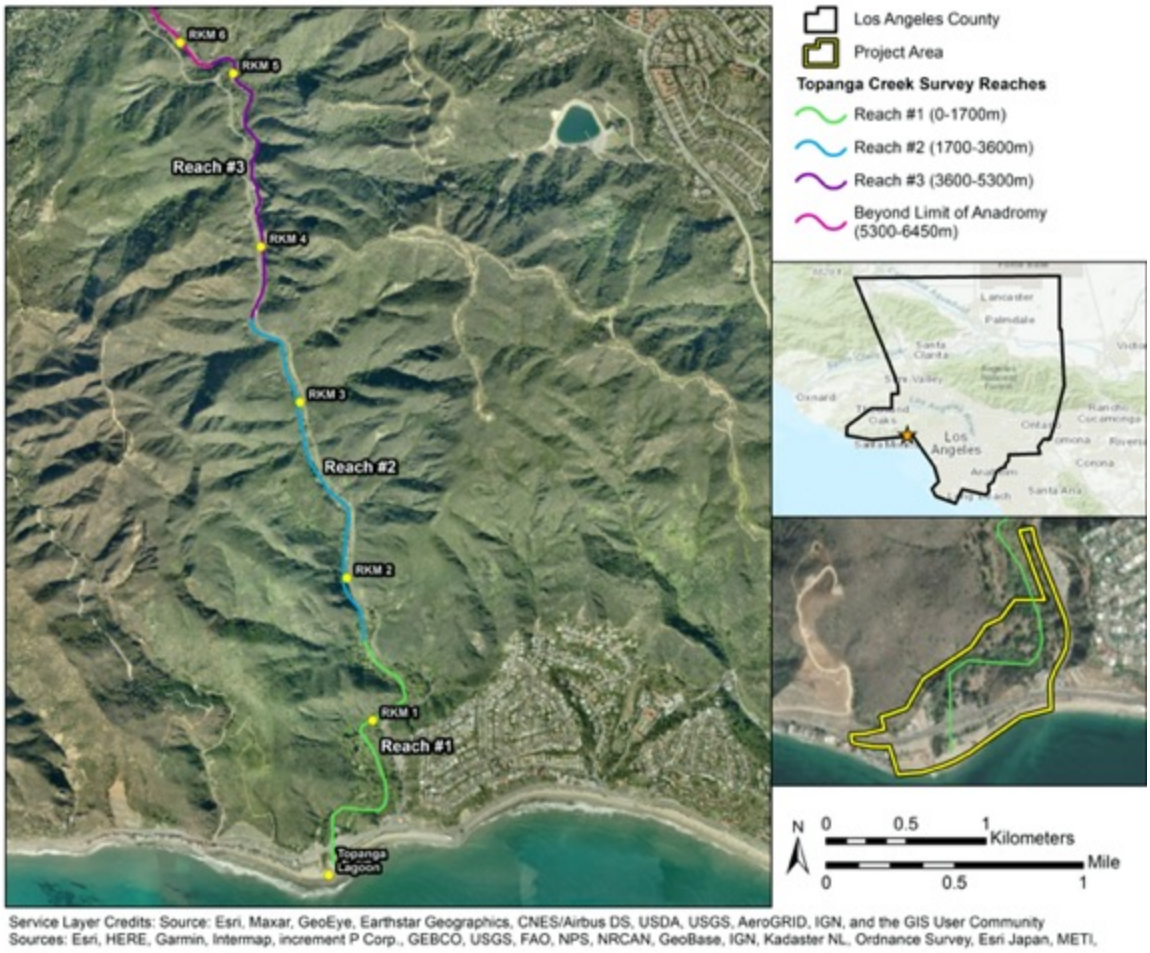

Figure 1. Survey Area in Topanga Creek

Lifecycle Monitoring

To address critical uncertainties regarding the life history of *O. mykiss* in Topanga Creek, as well as address the needs of the Coastal Monitoring Program (CMP) and NMFS Recovery Plan, between 2008 and 2018, the RCDSMM implemented a Lifecycle Monitoring Station including a program to capture, tag, and monitor *O. mykiss*, conduct redd surveys, deploy an instream antenna system capable of detecting half-duplex tags, DIDSON camera station and storm event weir trapping in lower Topanga Creek to monitor outmigration and return of tagged anadromous adults. CDFW has continued to conduct pit tagging, manage the instream antenna and deploy the DIDSON camera as conditions allow since 2019. Details on the specific methods used are found in Dagit et al. (2018).

Fish Passage Conditions
For smolts to migrate out of Topanga Creek or for adult anadromous *O. mykiss* to migrate into and upstream in Topanga Creek, two key variables have to be aligned. First, the lagoon entrance needs to be open and passable to the ocean. Second, the base stream flow level needs to be high enough to ensure surface flow connectivity in areas with minimal depth and to provide sufficient depth for fish to pass natural low flow barriers and impediments.

Fish migration conditions have been monitored in Topanga Creek since 2001 by monitoring storm event connectivity at the lagoon-ocean interface and monitoring base flow connectivity throughout the lower reaches of the creek subject to sub-surface flow conditions. Rainfall patterns were variable, with storm events scattered throughout the rainy season between December and March. This resulted in a wide annual variation in the timing and duration of potential anadromous adult or smolt migration opportunities.

These data records were used to both validate and calibrate hydrologic and fish passage models. Details on that are found in in the *Topanga Lagoon Restoration Technical Report for Hydraulics, Sediment Transport and Sea Level Rise Analysis* (Moffatt & Nichol 2022) and the *Topanga Lagoon Restoration Ecohydrology Report: Fish Passage, Fish Habitat Suitability and Habitat Zone Elevations* (ESA 2022).

The entire lagoon was seined in spring each year to check for presence of smolts using two teams with 3m x 1m seines pulling the nets for 10-20 meters at various spots within the lagoon up as far as the PCH bridge. All fish captured were moved into buckets of clean, cold water standing by each net. Types of algae were noted. Fish were identified and Fork Length (FL) measured, then they were released.

Fish Passage Modeling Methods
Using the results of the 2D Hydrological Model (Moffatt and Nichol 2022a), RCDSMM data, detailed fish passage analysis was modeled by ESA and the specific details of that modeling are found in ESA (2022). The depth and velocity criteria used in the model to examine the conditions associated with each proposed restoration alternative were based on standards developed by National Marine Fisheries Service (NMFS 2007) which identified a minimum passable depth for juveniles as six inches, and twelve inches for adults, with velocities ranging between 1-6 ft/second, and California Department of Fish and Wildlife (CDFW 2004) criteria which suggests juveniles can pass with a minimum of 0.3 ft and adults require only 0.8 ft, with velocities of 1.5 – 6 ft/sec. ESA applied a velocity of 1.5 ft/sec. to their model, which then was validated to estimate lagoon mouth condition, compare velocity and depths at points along cross-sections for each alternative design, and identify the number and duration of opportunities for passage.

Genetics Analysis
In order to identify relatedness within the Topanga population as well as examine relatedness to other anadromous populations regionally, material was collected both opportunistically from carcasses and systematically via electrofishing and weir trapping from all captured *O. mykiss* in Topanga as part of the Lifecycle Monitoring project from 2008-2019. Samples therefore include representatives from various age and size classes. All fin clips were dried in Rite in the Rain

paper, placed in envelopes with associated data (fork length, condition, direction of travel, time and date), and sent to the NMFS Genetic Tissue Laboratory, in Santa Cruz, CA. Tissue samples were digested in Proteinase K lysis buffer and extracted on a QIAGEN BioRobot 3000, following the DNeasy 96 Tissue Kit protocol (QIAGEN Inc., Hilden, Germany). Additional details on specific methods used are found in Dagit et al. (2018).

4.0 SURVEY RESULTS

Long-term Monitoring
Based on over 20 years of consistent monitoring, abundance of the genetically distinct population of *O. mykiss* in Topanga Creek is extremely variable. The synergistic effects of drought, limited fish passage opportunities, and potential impacts from invasive red swamp crayfish as well as other stressors, including rising minimum stream temperatures may also play a role in this variability.

Snorkel Survey Results
Snorkel surveys between 2001-2021 provide information on relative steelhead abundance and size, as well as conditions of the stream where individuals were documented. Although snorkel surveys have identified biases, repeating these visual surveys monthly with does enable comparison between years and to see trends. Figure 2 summarizes abundance by size class, Table 3 provides a summary of average abundance and size class, and Appendix A provides detailed information by survey date.

Based on plotting the scaled relative abundance of juvenile (<100 mm fork length (FL); also referred to as young-of-the-year), intermediate (100 - 250 mm FL), and adult (> 250 mm FL) *O. mykiss*, it appears that the relative abundance for all age classes fluctuates substantially among years. The pattern of *O. mykiss* relative abundance varied seasonally, though the number of *O. mykiss* counted during surveys may be affected by water clarity limitations (especially following storm events) and algal cover. Not surprisingly, surveys in spring and early summer (April–June) generally documented juveniles when young of the year are most abundant, except in 2005, when stream flow was high and very few small fish were observed. The highest number of juveniles was observed in June 2008, when 590 small *O. mykiss* were counted.

As the summer progressed, the numbers of fish in this size class typically decreases and the numbers in the intermediate size class increase (indicating growth from juvenile to intermediate), although the total population numbers decrease overall. Based on growth rate analysis it appears that growth is occurring year-round during all years assessed, with substantially higher growth rates during the winter period of November to March for fish of most sizes.

Adults, presumably residents, have consistently been observed each year, although their overall abundance has apparently been declining since 2006. Drought conditions lasting from 2012 through 2016, and contributed to low numbers in all size classes, but normal rainfall in 2017 resulted in a bump in juvenile numbers and passage opportunities for anadromous fish which were observed. O. *mykiss* numbers remain low overall as a result of the low flow years of 2018-2021.

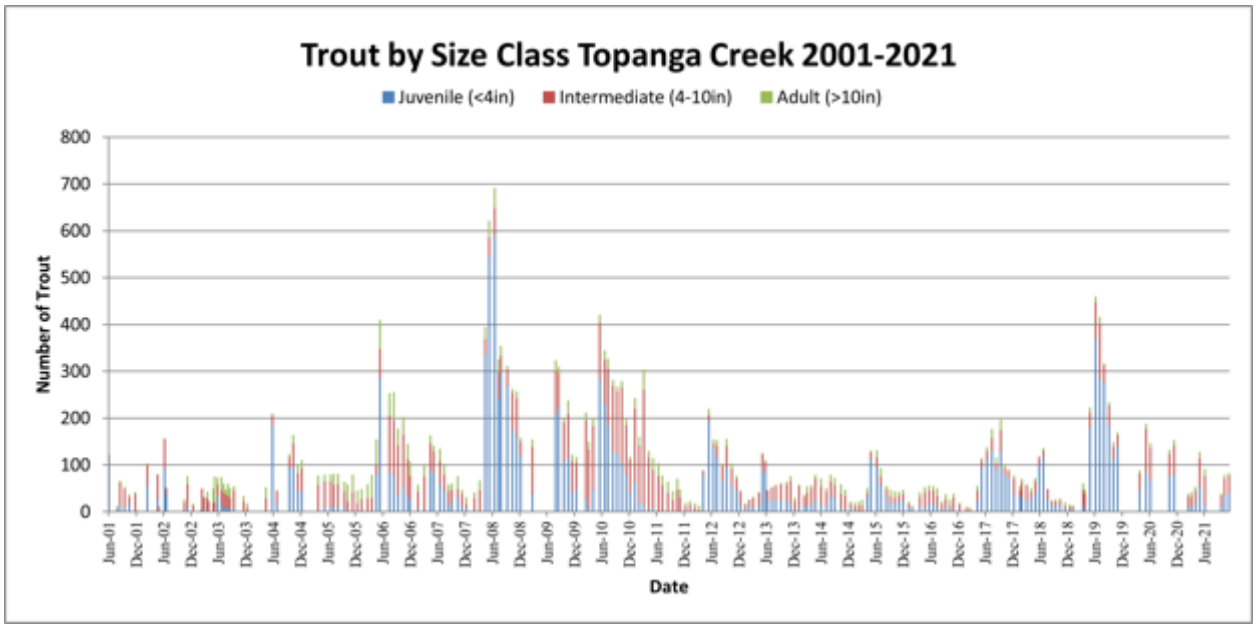

Figure 2. Number of *O. mykiss* of all size classes observed in monthly snorkel surveys in Topanga Creek, June 2001– December 2021.

Table 3. Average number of *O. mykiss* observed per month in Topanga Creek 2001-2021 (n=# survey months/year)

Year	Average Total Per Size Class				Size Range (mm)	Smolts Observed	Anadromous Adults Observed	Rainfall* (inches)
	Juvenile (<100mm)	Intermediate (100-250mm)	Adult (>250mm)	Average Total of all individuals (n=# survey months/year)				
2001	25	25	3	8 (n=7)	76-508	0	1	28.16
2002	34	56	6	10 (n=10)	50-508	0	2	9.9
2003	6	34	19	4 (n=16)	76–432	14	1	18.71
2004	46	50	12	14 (n=8)	50–457	0	0	13.16
2005	6	46	20	8 (n=9)	50–431	0	0	61.58
2006	62	68	40	15 (n=11)	38–508	9	1	21.98
2007	35	37	16	8 (n=11)	25–431	0	2	7.17
2008	250	48	18	29 (n=11)	25–508	1	1	23.08
2009	112	82	15	30 (n=7)	50–508	1	0	15.16

2010	115	128	13	34 (n=11)	25-508	1	1	24.34
2011	9	85	20	10 (n=12)	50-508	1	0	31.50
2012	68	21	7	8 (n=12)	25-457	0	1	16.22
2013	28	26	2	4 (n=13)	25-356	4	0	9.99
2014	16	31	9	5 (n=12)	13-483	0	0	6.85
2015	35	14	9	5 (n=12)	25-508	0	0	13.49
2016	9	18	7	3 (n=13)	51-508	0	0	10.54
2017	70	20	8	9 (n=11)	25-711	0	2	26.34
2018	35	16	4	4 (n=13)	25-457	1	0	9.91
2019	115	37	8	32 (n=12)	25-508	0	0	32.55
2020	71	62	8	28 (n=5)	25-431	0	0	22.58
2021	23	34	7	9 (n=8)	13-457	0	0	5.66

Redd Survey Results

Most of the redds observed during the 2010-2021 surveys were fairly small, suggesting that predominantly resident *O. mykiss* were reproducing (McEwan and Jackson 1996), which is consistent with observations of fish between 130-230 mm FL either milling around redds, or having eggs or milt when captured. Because of the low flow conditions between 2005 and 2016, no anadromous adults were observed. Following the high flows in January – March 2017, two anadromous adults were observed, but no redds from those adults were found.

Between 1 and 9 redds have been observed per year in Topanga Creek (Table 4). However redds in Topanga Creek are difficult to observe, as they are typically relatively small and tend to deteriorate quickly. Several redds observed one week were difficult to find just one week later as they were covered with sediment and diatoms. A large cohort of juveniles was observed in a pool where one anadromous adult was restricted in the summer 2017, indicating that spawning had occurred there but no redd was found.

Table 4. Redds observed in Topanga Creek 2010-2021

Date	Number of Redds	Rainfall (inches)
2001	0	28.16
2002	0	9.9
2003	0	18.71
2004	0	13.16
2005	0	61.58
2006	3	21.98
2007	0	7.17
2008	0	23.08
2009	0	15.16
2010	4	24.34
2011	7	31.50
2012	2	16.22
2013	9	9.99
2014	9	6.85
2015	1	16.06
2016	0	10.54
2017	3	26.34
2018	4	9.91
2019	0	32.55
2019-2020*	5	22.58
2020-2021*	4	5.66
2021-2022	ND**	1.64**

ND=No Data
** Data provided courtesy of CDFW*
***Rain year and surveys ongoing*

Lifecycle Monitoring Results
A summary of lifecycle monitoring results for 2008-2021 are found in Table 5. This information is excerpted from Dagit et al. (2018) with additional information from 2019-2021 provided by CDFW (St. George and Evans 2020, 2021). For several years (2011-2013) we conducted mark-recapture events in both March and November, but for the purpose of this report these results have been totaled rather than shown as individual efforts. Cells with no numbers indicate that either these activities were not conducted or that no captures were made.

Age of fish in Topanga Creek most years ranges from 0-4+ years based on scale and pit tag analysis. In 2016 following several years of drought when fish were trapped in the creek with no opportunities for outmigration, we documented fish up to 6+ years (Dagit et al. 2018).

Table 5. Summary of all *O. mykiss* Lifecycle Monitoring Efforts, 2008-2021

Events	Category	Nov 2008	Nov 2009	Nov 2010	Mar / Nov 2011	Nov 2011	Mar / Nov 2012	Nov 2012	Mar / Nov 2013	Nov 2013	Nov 2014	Nov 2015	Nov 2016	Nov 2017	Nov 2019	Nov 2020	Dec 2021	Total
Electro-fishing	**TOTAL CAPTURES**	**220**	**179**	**259**	**84**	**136**	**50**	**210**	**174**	**50**	**58**	**104**	**36**	**129**	**54**	**54**	**TBD**	**1792**
	Total captured electrofishing	214	176	255	84	136	50	210	174	50	58	104	36	129	54	54	TBD	**1792**
	Total captured angling	--	--	3	--	--	--	--	--	--	--	--	--	--	--	--	--	**3**
	Total captured dip net (night)	2	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**2**
	Total captured dip net (day)	0	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**2**
	Total captured hoop-net traps	4	1	1	--	--	--	--	--	--	--	--	--	--	--	--	--	**6**
	Full duplex or small half duplex tags deployed	50	7	41	35	2	0	81	33	4	23	6	14	26	46	43	TBD	**411**
	Large Half duplex tags deployed	26	64	157	48	97	25	37	83	10	18	23	18	12	8	11	TBD	**637**
	PIT tag recaptures	--	1	15	18	36	25	22	48	22	13	21	14	4	0	2	2	**243**
	PIT Tags recovered that were deployed initially in this year			6	4	15	6	10	24	1	8	7	NA	NA	NA	NA	NA	**NA**

Table 5. Summary of all *O. mykiss* Lifecycle Monitoring Efforts, 2008-2021

Events	Category	Nov 2008	Nov 2009	Nov 2010	Mar / Nov 2011	Nov 2011	Mar / Nov 2012	Nov 2012	Mar / Nov 2013	Nov 2013	Nov 2014	Nov 2015	Nov 2016	Nov 2017	Nov 2019	Nov 2020	Dec 2021	Total
	Scale samples collected	101	94	170	83	134	32	144	166	40	46	53	34	84	0	0	TBD	**1181**
	Fin clips collected	101	93	166	64	97	25	122	116	28	33	28	18	119	0	0	TBD	**1010**
	Branded	1	2	0	18	16	9	3	14	0	2	3	2	0	0	0	TBD	**70**
	Mortality	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0		**3**
Event	**Category** (2004-2005)	**2002 - 2003**	**2005 - 2006**	**2007 - 2008**	**2008 - 2009**	**2009 - 2010**	**2010 - 2011**	**2011 - 2012**	**2012 - 2013**	**2013 - 2014**	**2014 - 2015**	**2015 - 2016**	**2016 - 2017**	**2017 - 2018**	**2018 - 2019**	**2019 - 2020**	**2020-2021**	**Total**
Trapping	**TOTAL CAPTURES**	**15**	**10**	**1**	**1**	**11**	**12**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**--**	**--**	**--**	**50**
	Total captured DS fyke net (2002-2010)	14	9	1	1	10	--	--	--	--	--	0	--	--	--	--	--	**35**
	Total captured DS weir trap (2010-2014)	--	--	--	--	--	10	_	_	_	_	_	--	--	--	--	--	**10**
	Total captured US weir trap	1	1	0	0	1	2	_	_	_	_	_	_	_	--	--	--	**5**
Antenna Detections	**TOTAL DETECTIONS**				**1**	**6**	**41**	**2**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**6**	**0**	**58**
	Outmigrating US – DS				1	6	20	2	0	2	0	0	0	0	0	6	0	**37**
	Immigrating DS – US				0	0	2	0	0	0	0	0	0	0	0	0	0	**2**

Table 5. Summary of all *O. mykiss* Lifecycle Monitoring Efforts, 2008-2021

Events	Category	Nov 2008	Nov 2009	Nov 2010	Mar / Nov 2011	Nov 2011	Mar / Nov 2012	Nov 2012	Mar / Nov 2013	Nov 2013	Nov 2014	Nov 2015	Nov 2016	Nov 2017	Nov 2019	Nov 2020	Dec 2021	Total
	Unknown direction				0	0	19	0	0	0	0	0	0	0	0	0	0	**19**
DIDSON Camera	Number of hours deployed							39	39	49	0**	21	96.5	0	488	0	ND	**732.5**
	Number of *O. mykiss* moving downstream							1 (initially recorded as 2)	0	ND	0	2	0	0	>6	0	ND	**9**
	Number of *O. mykiss* moving upstream							0	0	ND	0	0	0	0	1?	0	ND	**1**

***only deployed for training purposes.*

ND=No data, because files were corrupted and recovery failed. Fish passage did occur during this event however, based on Antenna data.

Fish Passage Results

For smolts to migrate out of Topanga Creek or for adult anadromous *O. mykiss* to migrate into and upstream in Topanga Creek, two key variables have to be aligned. First, the lagoon entrance needs to be open and passable to the ocean. Second, the base stream flow level needs to be high enough to ensure surface flow connectivity in areas with minimal depth and to provide sufficient depth for fish to pass natural low flow barriers and impediments.

Between 2001 and 2021 the lagoon entrance remained closed to the ocean for most of the year, opening only when rainfall, sometimes augmented by high tides was sufficient to breach the berm (sandbar) at the lagoon-ocean interface (Table 6). These brief openings created a limited time window for *O. mykiss* to enter or leave Topanga Creek, except in 2005, when the large amounts of rainfall and high flows kept the connection open for over 200 days.

Table 6. Passage opportunities for steelhead migration (based on open and passable conditions at lagoon berm and connected lower reach).

Water Year (Oct 1 – Sept 30)	Potential migration opportunity (days)	Annual total Rainfall (inches)
2001	10	28.16
2002	1–2	9.9
2003	~20	18.71
2004	20-30	13.16
2005	>200	61.58
2006	45	21.98
2007	<5	7.17
2008	ND	23.08
2009	<5	15.16
2010	~20	24.34
2011	<5	31.44
2012	<5	16.22
2013	<5	9.99
2014	<5	6.85
2015	<5	13.76
2016	<5	10.54
2017	36	26.34
2018	1	9.96
2019	~95	32.55
2020	61	22.58
2021	0	5.66
2022	27	19

Rainfall patterns are variable, with storm events typically scattered throughout the rainy season between December and March. This results in a wide annual variation in the timing and duration

of potential anadromous adult or smolt migration opportunities. Dry years in 2001–2004, 2012-2016. 2018-2021 provided few times when passage was possible. The high flow year of 2005 represented the other end of the extreme, with the ocean-creek connection providing suitable passage conditions for most of the year. A slightly above average rain year in 2017 also provided multiple windows of opportunity for migration into or out of the creek with adequate connection throughout the reach and at the ocean.

Sediment deposited into the lagoon following most rain events restricted passage further by reducing depth at the mouth to just a few centimeters during both high and low tides for much of the period when the lagoon berm was open. A narrow channel forms through the sediment deposits for brief periods of time, but was typically quite shallow (< 1 m) and quickly refilled with sediments. Movement by *O. mykiss* into and out of the lagoon itself was limited by water depth and occurred mostly during high tide conditions, even during and immediately following storm events when creek flow was more constant.

Depths in Topanga Lagoon are extremely variable depending on rainfall and sedimentation and the lagoon provides little cover for *O. mykiss.* When not connected to the ocean, the lagoon conditions were characteristic of a fresh water pond. Water quality in Topanga Lagoon has been monitored primarily using grab samples. Salinity in the lagoon is generally low (i.e., fresh water). Brackish conditions were noted rarely (Dagit et al. 2018).

No *O. mykiss* were captured or observed in the lagoon during seining efforts. Seining was suspended in 2015-2016 due to low water levels reducing the lagoon to a shallow pool. The only fishes captured during these seining surveys were tidewater gobies (*Eucyclogobius newberryi*) and grunion (*Leuresthes tenuis*), however as shown in Table 7, smolts were observed during snorkel events in 2010, when presence of juvenile mullet (*Mugil cephalus*), Mississippi silversides (*Menida audens*), topsmelt (*Atherinops affinis*) and arroyo chub (*Gila orcuttii*) were also documented. No voucher specimens were collected, but identification of photographs was confirmed by Dr. Camm Swift. The storm event pattern during the 2010-2011 water year resulted in greater connection to the ocean.

Table 7. Observations of Other Fish Species in Topanga Lagoon 2010-2021

DATE	Species Observed	Number of Individuals	Survey Type
2/6/2010	juvenile mullet	nd	Snorkel
	Mississippi silversides	nd	Snorkel
2/19/10	Topsmelt, horsehair worm	nd	Snorkel
3/12/10	*O. mykiss* smolts	28	Snorkel
	Topsmelt	nd	Snorkel
4/9/10	*O. mykiss* smolts	25	Snorkel
	Topsmelt	nd	Snorkel
6/24/10	Grunion	50	Snorkel
7/16/10	Arroyo chub	1	Snorkel
1/14/11	*O. mykiss*	4 16-18”	Snorkel
2/10/11	*O. mykiss*	1-14”, 2-18”	Snorkel

11/9/11	Arroyo chub	500+	Snorkel
4/12/12	Arroyo chub	1	Snorkel
7/13/12	Red swamp crayfish	30+	Visual
9/17/18	Larval fish sp unknown	100+	Visual
6/27/19	Arroyo Chub	6	Seine
10/15/19	Arroyo Chub	No number	Seine
	CA Killifish	No number	Seine
11/19/20	Red swamp crayfish	No number	Seine
4/24/21	Arroyo Chub	1	Seine
	Red swamp crayfish	33	Seine

Downstream migration appears to occur from early January to early April and is a function of instream flows and rain events, since the lower reach of Topanga Creek (0.5–1.5 RKM) is often dry from May through November. In general, *O. mykiss* migrating downstream were larger than 100 mm FL and smaller than 250 mm FL, with a few exceptions. Fish migrating downstream in early January were generally larger than 150 mm FL, whereas fish migrating a few weeks later in the end of January tended to be smaller than 150 mm FL (Dagit et al. 2019).

Many of the downstream migrants were observed moving downstream and then back upstream repeatedly at the PIT tag antenna and the DIDSON camera before finally migrating downstream, suggesting a protracted migration (Dagit et al. 2018, St. George and Evans 2020, 2021). It is possible that these fish were continuing to grow and would enter the ocean at a larger size than documented at the outmigrant trap (1.3 RKM), however the size and condition of the lagoon is such that it likely does not promote rapid growth, and based on the low number of fish ever observed in the lagoon, it's likely that fish do not spend too much time in the lagoon, but rather move through it quickly into the ocean.

Fish Passage Modeling Results

The results of modeling for adult steelhead indicates that despite potentially longer closure times (larger lagoon volume takes more rain to fill to cause a breach), Alternative 2 increases the time and opportunity for passage during and after storm events, while Alternatives 3 and 4 provide the same or worse opportunity as the existing conditions (Alternative 1) (ESA 2022). This benefit is due to the combination of expanded bridge span and habitat, which lowers flow velocities by spreading them out as compared to Alternatives 3 and 4 which have only the increased bridge span and limited wetted lagoon habitat expansion.

None of the alternatives show substantive improvements for increasing fish passage opportunities based on modeling results for sea level rise of 1.6 ft, where they perform consistent with present sea level. However Alternative 2 could provide more benefit under the 6.8 ft SLR scenario as the lagoon will have greater space to accommodate and adjust the thalweg and passage opportunities under the PCH bridge.

The ESA model (2022) also examined the implications of restoration for juvenile smolts outmigrating or seeking refugia in the lagoon. Again, Alternative 2 by virtue of the larger restored wetted area provides the most benefit, but both Alternative 3 and 4 also provide some juvenile benefits as compared to existing conditions (Alternative 1).

In addition to examining opportunities for passage, ESA (2022) modeled changing habitat elevations and examined the potential benefits of increasing habitat variety and acres for each alternative. The larger restoration area of Alternative 2 provides for increased acres of open water, un-vegetated mud flats, emergent marsh, and riparian banks, but a bit less riparian/upland transitional habitat both under current conditions and potential SLR scenarios as compared to Alternatives 3 and 4. Expansion of these wetted habitat types is associated with increasing benthic macroinvertebrate as well as plant diversity, both of which are beneficial to all life stages of steelhead. Additional details on habitat changes will be provided in the Alternatives Analysis Report (Moffatt and Nichol 2022b).

Steelhead Genetics Results

Analysis of the tissue samples collected in the Santa Monica Bay creeks from 2001-2018, allowed us to examine patterns of ancestry and population genetic structure with respect to two major lineages: native coastal steelhead lineage and hatchery rainbow trout lineage in Southern California (Abadía-Cardoso et al. 2016, Nuetzel et al. in review).

With the genetic data available it appears most likely that Topanga Creek is of mixed ancestry, which is supported by admixture between Fillmore Hatchery – Coleman and Topanga Creek in the STRUCTURE plot, and the grouping of Fillmore Hatchery strains and Topanga Creek on the phylogeographic tree. How long ago the founder steelhead or rainbow trout acquired hatchery lineage and the contribution of mutation and forces such as genetic drift are unknown factors, although the primary assignment of individuals to the hatchery ancestry are approximately 15.6% of all samples. There have been no hatchery fish introduced into Topanga Creek since the mid-1980's.

This holistic and high-resolution investigation of population genetic structure and ancestry, paired with parentage and family structure analyses, confirms the important role the Santa Monica Mountains Biogeographic Population Group (BPG) plays in contributing to the long-term viability of the Southern California DPS. While hatchery introgression was detected in Topanga Creek, population genetic diversity and genetic markers for anadromy suggest Topanga Creek contributes important genetic resources towards the development of a sustainable network of *O. mykiss* populations in southern California.

The Southern California Steelhead Recovery Plan (NMFS 2012) explicitly calls for discrete population restoration to create a network of genetically diverse populations, which express all potential life history strategies. The identification of a putatively native population (Malibu Creek) and mixed ancestry population (Topanga Creek) addresses this objective and demonstrates the value of protecting both anadromous and resident forms in these systems. Therefore, efforts to protect and rehabilitate populations in the Santa Monica Mountains, alongside populations within the remaining systems of the Southern California Steelhead Recovery planning area, will facilitate connectivity, resilience and recovery of endangered steelhead throughout southern California.

The STRUCTURE clustering constraint that appears to most cleanly describe population structuring amongst the Southern California populations, including Topanga Creek and Malibu Creek, and Fillmore Hatchery strains is k = 3 (Figure 3). At k=3, the individuals from Topanga

Creek are consistently placed into a group distinct from the native populations and hatchery strains (represented by orange color). The hatchery strains likewise represent another distinct group (represented by yellow color), but there is evidence of admixture with hatchery strains in several native groups (i.e. groups 14, 15, and 25), as well as some Topanga Creek individuals. However, the Malibu Creek individuals (group 8) appear to be more genetically similar to the native populations (represented by blue color).

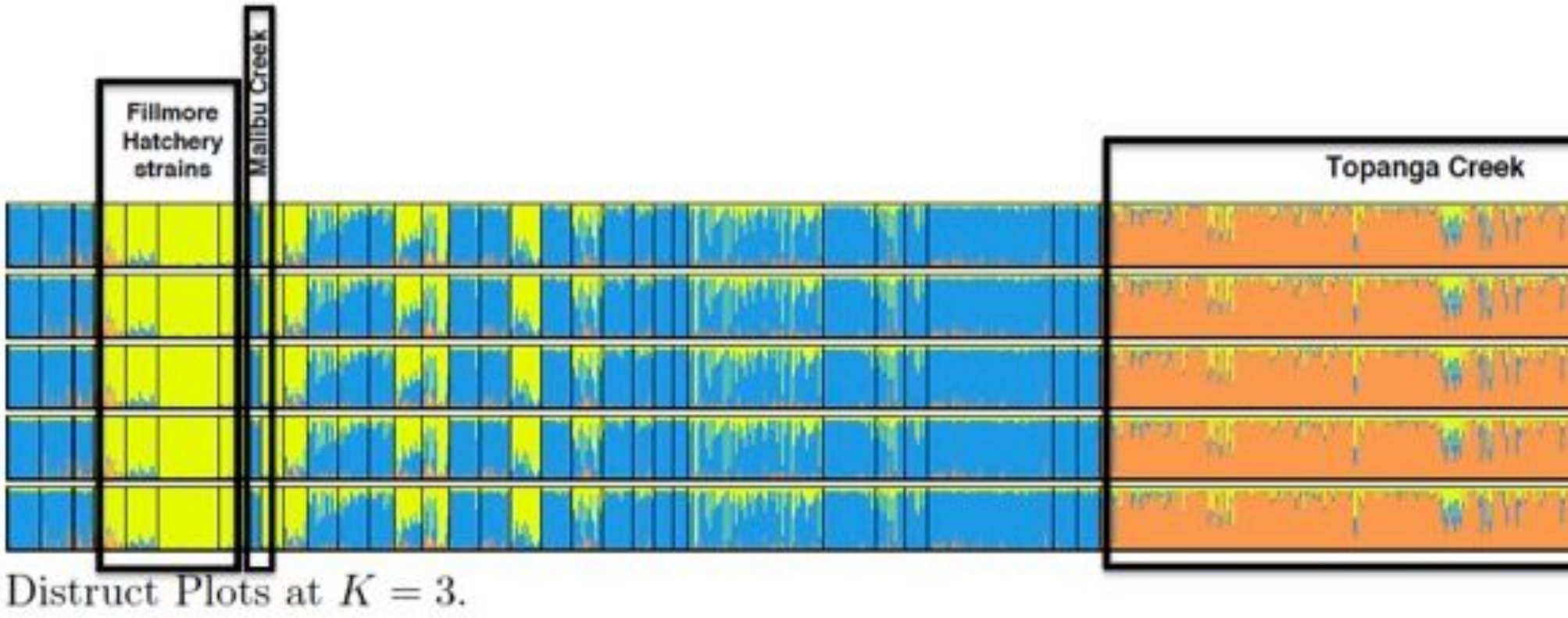

Figure 3. STRUCTURE plot at k=3. Sections are boxed according to their labels. Yellow= Fillmore Hatchery strains; Blue=native southern Californ Creek population.

The results of the individual genetic assignment via mixture analysis repeatedly inferred the Santa Ynez – Hilton Creek population to be the population of origin for individuals sampled in Topanga Creek (Table 8). Given the distribution of *O. mykiss* throughout California and its propensity to stray between basins, which allows for gene flow between populations, within-basin population level assignment should be interpreted cautiously (Clemento et al. 2009; Abadía-Cardoso et al. 2016).

Therefore, although we cannot conclude Topanga Creeks to be most closely related to Santa Ynez – Hilton Creek, we can suggest that the genetic lineage of Santa Ynez – Hilton Creek is likely most similar to that of Topanga Creek. Hilton Creek in the Santa Ynez drainage is a routinely monitored system with unimpeded access to the ocean, and which supports a small, but persistent population of *O. mykiss* (Clemento and Garza 2018). For many years, Hilton Creek was subject to fairly regular hatchery stocking events due its direct proximity to Bradbury Dam (Garza and Clemento 2008). However even with this documented association of hatchery presence, recent investigations of population genetic structure and ancestry in this drainage found individuals were predominately of coastal steelhead ancestry, with low levels of hatchery introgression (Clemento and Garza 2018). Topanga appears to be illustrating similar patterns, although there has been almost no direct hatchery input into this watershed for over 30 years. This would therefore suggest Topanga and Malibu creeks are also predominately of native steelhead ancestry but present some degree of hatchery introgression. These individual-based assignment analyses suggest this hatchery introgression is more prevalent amongst Topanga Creek individuals.

Table 8. Maximum-A-Posteriori Population Assignments *(Dagit et al. 2018)*

Sampling Location	Inferred Population	n	Mean Posterior Probability
Malibu Creek	**SYnzMain**	**8**	0.9923743
Malibu Creek	ArGrMain	2	0.9996096
Topanga Creek	**SYnzHilt**	**110**	0.979241
Topanga Creek	SYnzMain	69	0.9804813
Topanga Creek	SaMaRey	26	0.9850259
Topanga Creek	SaGaWFork	42	0.9868019
Topanga Creek	FilHaCole	14	0.9788209
Topanga Creek	SalTjera	15	0.9780428
Topanga Creek	SanSim	5	0.9792152
Topanga Creek	ArGrMain	3	0.9679961
Topanga Creek	SYnzSals	1	0.9890839

Presents the number of individuals from each sampling location assigned to each respective source population. The most common inferred population for each sampling location is bolded. Results derived from mixture analysis implemented in rubias, and filtered by Posterior Prob >= 0.95. (Dagit et al. 2018)

Topanga Creek individuals retain greater than 65% frequency of the anadromous allele at both Omy5 loci and examination of smolts outmigrating from Topanga Creek supported this observation as shown in Table 9. This high level of retention may be due to the re-colonization of Topanga Creek in the 1980s by anadromous steelhead following extirpation (Bell et al. 2011) and subsequent additional influence from anadromous adults in 2010 and 2017 when spawning was documented. Ultimately, while possession of the anadromous allele does not necessarily guarantee anadromy in an individual, it does reflect how the population could respond to restoration attempts and how selection has impacted the population thus far. These allele frequencies therefore suggest individuals in Topanga Creek have the capacity to express the anadromous phenotype should opportunities for migration arise.

Table 9. Frequency of the anadromous allele at the two loci associated with the Omy5 region amongst all individuals according to sampling location. *(Dagit et al. 2018)*

Population	n	Frequency of anadromous allele at OmyR04944	Frequency of anadromous allele at SH114448-87	Mean freqeuency of anadromous alleles at SH114448-87
Arroyo Sequit Creek	2	0	0	---
Malibu Creek	18	85.29%	81.25%	---
Topanga Creek	435	67.17%	66.78%	---
Fillmore Hatchery Strains	190	---	---	41.28%

The estimates of heterozygosity provide further insight into the genetic diversity and ancestry of the Santa Monica Mountains populations. Observed heterozygosity in the Topanga Creek population is comparable to the Southern California populations, and while not significantly different (p-value = 0.105), it still exceeds the mean observed heterozygosity amongst all Fillmore Hatchery strains. Thus, Topanga Creek appears to harbor a level of genetic diversity comparable to that seen amongst populations of predominately native steelhead lineage.

In addition to a STRUCTURE analysis, the regional population structure was assessed using phylogenetic inference. A neighbor-joining tree was constructed in POPTREEW, with 1000 bootstrap replications (Figure 4). For ease of description, the resulting phylogenetic tree can be roughly divided into two sections: 1) Fillmore Hatchery strains at the top right and 2) native Southern California populations at the bottom left. However, there are a few native populations that appear to be more closely related to the Fillmore Hatchery strains, such as the North Fork of San Jacinta – Santa Ana River (SaAnNFSaJa) and San Antonio – Santa Ana River (SaAnSaAnt). Individuals from Topanga Creek fall essentially between these two clusters, whereas individuals from Malibu Creek group more closely with the cluster of native Southern California populations.

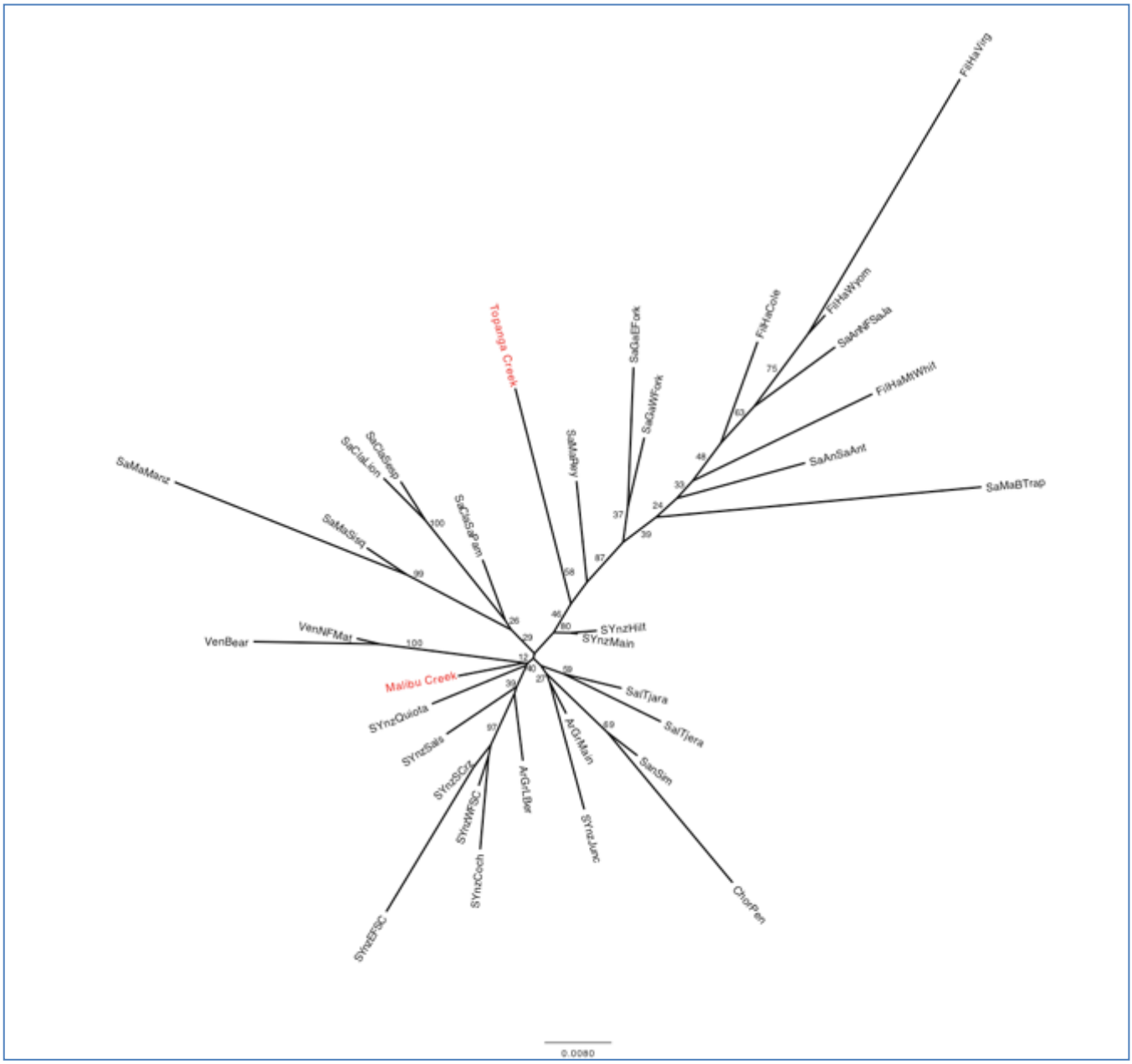

Figure 4. Neighbor-Joining phylogenetic tree including Topanga and Malibu Creeks, native Southern California populations, and Fillmore Hatchery strains. ***(Dagit et al. 2018)***

The recovery of more female iteroparous (repeated) spawners aligns with findings in other natural steelhead populations (Keefer et al. 2008; Seamons and Quinn 2010). Amongst anadromous salmonids, female repeat spawners have been historically more common than males, potentially due to increased post-spawning mortality amongst males by competition (Fleming and Gross 1994; Keefer et al. 2008; Seamons and Quinn 2010). The SNP-based pedigree reconstruction analysis provided estimates of sex and age-distribution and iteroparity amongst spawning adults in Topanga Creek. We must acknowledge, however, that these biological inferences are only a reflection of the individuals sampled, and then amongst those sampled, only

those that reproduced successfully. Therefore, the incidences of iteroparity recovered by this analysis are undoubtedly a subset of all iteroparous spawning attempts in any given year. Nonetheless, the general trends are informative, especially since explicit, formal analyses of these life history characteristics have not been undertaken in the focal populations. Additionally, the finding that males most commonly spawn between ages 2-3, while females are more likely to spawn between ages 3-4 as shown in Table 8 is consistent with previous studies of hatchery steelhead in California (Abadía-Cardoso et al. 2013).

Table 10. Age at spawning amongst recovered parents *(Dagit et al. 2018)*

Age at spawning	n	No. Males	No. Females
1	11	8	3
2	15	11	4
3	27	11	16
4	21	8	13
5	10	5	5
6	4	3	1

5.0 ALTERNATIVES ANALYSIS

With help from the Topanga Lagoon Restoration Project Technical Advisory Committee (TAC) and community stakeholders, we identified four alternatives to restore the Topanga Lagoon.

The range of alternatives allows us to consider the benefits and challenges of the different restoration approaches. This allows a final alternative to be chosen at the end of the environmental review process that best meets the project's needs.

Alternative 1 is the "No Project/Managed Decline" alternative. This alternative assumes no investment or changes that would require a Coastal Development Permit and associated infrastructure upgrades and costs. As such, this alternative assumes only that limited resource activities such as Arundo removal and current business services would continue, that the condition of the unused Ranch Motel structures would continue to decline, and the Lifeguard Headquarters and restroom building would remain in its current location subject to continued undermining of its foundation and sea level rise.

The overall project area that is included in restoration of the lagoon, bridge and beach services covers 41.6 acres, excluding the additional area along Topanga Canyon Blvd. that is not yet calculated. Table 1 provides a summary of habitat acreages currently, and provides details on how each habitat type is anticipated to change with the implementation of each alternative, and with two future sea level rise (SLR) scenarios considered. Note it does not yet include information about habitat along Topanga Canyon Blvd. The relocation of visitor services such as parking, overnight accommodations or business leases to that area will be evaluated as part of the next step in design development.

Table 11. Summary of Habitat Acreage in the Topanga Lagoon Restoration Project Area.

Habitat Type	NO SLR Condition				1.6 ft SLR Condition				6.8 ft SLR Condition			
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 1	Alt 2	Alt 3	Alt 4	Alt 1	Alt 2	Alt 3	Alt 4
Open Water	0.06	0.04	0.08	0.07	1.21	1.19	1.23	1.22	5.07	5.78	5.22	5.14
Seasonal Shallow Open Water	0.42	0.69	0.44	0.38	0.42	0.69	0.44	0.38	0.08	0.32	0.12	0.08
Seasonally Unvegetated Flat	0.16	1.51	0.28	0.27	0.38	1.69	0.28	0.51	0.99	3.87	2.77	2.53
Emergent Marsh	0.47	1.12	0.5	0.5	0.39	1.87	0.5	0.82	0.24	0.94	0.59	0.8
Saltgrass	0.07	N/A	N/A	N/A	0.07	N/A	N/A	N/A	0.01	N/A	N/A	N/A
Riparian	2.46	6.09	6.42	6.36	2.32	5.16	6.42	5.79	1.62	2.59	3.11	3.13
Wetted Area Below Riparian/Upland Transition	3.6	9.5	7.7	7.6	4.8	10.6	8.9	8.7	8.0	13.5	11.8	11.7
Riparian/Upland Transition	6.06	6.14	6.34	6.23	6.06	6.14	6.34	6.23	6.06	6.14	6.34	6.22
Coastal Sage Scrub	3.66	2.98	2.98	2.98	3.66	2.98	2.98	2.98	3.65	2.98	2.98	2.98
Upland	11.16	13.84	14.37	14.49	11.15	13.84	14.37	14.49	11.16	13.84	14.35	14.49
Disturbed Upland/Trails	0.49	N/A	N/A	N/A	0.49	N/A	N/A	N/A	0.49	N/A	N/A	N/A
Roadways/Developed/Landscaped	12.43	4.84	5.78	5.78	12.43	4.84	5.78	5.78	11.99	4.84	5.78	5.78
Above Riparin/Upland Transition	33.8	27.8	29.47	29.48	33.79	27.8	29.47	29.48	33.35	27.8	29.45	29.47
Sand (Beach)	4.18	4.39	4.42	4.56	3.05	3.24	3.28	3.41	0.27	0.34	0.35	0.48
TOTAL PROJECT AREA	41.6	41.6	41.6	41.6	41.6	41.6	41.6	41.6	41.6	41.6	41.6	41.6

Actions Common to All Project Alternatives.

Alternatives 2-4 are the "Project Alternatives". Each of these alternatives provides a different road map to restoring the lagoon area and adjacent seasonally wetted and riparian habitats, buffering its resources from future sea level rise, providing visitor serving functions and meeting the project goals. However, these Project Alternatives have many things in common.

Under all Project Alternatives the seasonally wetted and riparian habitat areas would be expanded from the existing 3.6 acres to 7.6-9.5 acres, with riparian/transition upland areas changing from 21.4 existing acres of mixed non-native vegetation to between 23.0-23.7 acres of native dominated vegetation, depending on which alternative is selected. This would require removing much of the existing historically imported fill onsite to create a more natural topography and expanded open space areas. The existing wetted lagoon area and riparian habitats would be protected with grading starting at the outer edge of existing riparian trees, preserving the current lagoon banks and the majority of the existing riparian willows and native hardwoods. The natural breaching pattern of the lagoon would be protected by grading outside the footprint of the existing wetted lagoon and the beach berm at its mouth. The current beach is 4.18 acres and depending on the alternative selected could increase the depth of the beach by an average of up to 30 feet and its area to between 4.39 and 4.56 acres under current SLR (Table 1).

The project area would be improved by replacing invasive plants with native wetland, riparian and upland vegetation. Relocation of key buildings, structures and infrastructure and undergrounding of associated utilities would occur to facilitate this.

The length of the existing 79 ft long Caltrans bridge would be expanded to accommodate a widened lagoon riparian area, which would lower flow velocities to improve adult steelhead migration opportunities, increase refugia areas for tidewater gobies and juvenile steelhead and the quantity/quality of lagoon habitats. The primary bridge span would increase to 200 feet, with secondary/side spans of 130 ft on either side, increasing the total bridge span length to 460 feet, depending on the specific alternative chosen. These measurements are revised from the 2004 PSR/PDS document and by eliminating the emergency services underpass could be subject to change based on the evolution of the plans

It should be noted that some of the options included in a specific alternative could be "mixed and matched" between the alternatives to create the best feasible final alternative in the next phase of project design, evaluation and permitting. These include: expanded Caltrans bridge built on the same alignment or expanding the beach area by realigning the bridge further inland; retention of the Topanga Ranch Motel in whole or in part and some onsite business leases or concessions; inclusion of more than one wetted lagoon channel on the west side; implementation of living shoreline elements, alternative emergency access routes to the beach; and final placement of relocated beach facilities. The array of alternatives was chosen to show the full range of options available and the evaluation of each subset will be more fully developed and provided in subsequent design and the CEQA documentation phase.

Alternative 1: No Project/Managed Decline (0 acres restored, 3.6 wetted acres, 33.8 riparian/transitional/upland acres and beach 4.18 acres): Under this alternative, existing conditions throughout the project area would remain "as-is" in terms of existing functions (or lack thereof) and conditions. Therefore, there would be no change to the lagoon footprint or habitat quality, and no new bridge would be constructed. Damage to the lifeguard headquarters due to coastal erosion would continue to occur and no relocation is included in this "No Project" alternative. The currently unusable majority of the Topanga Ranch Motel structures would continue to deteriorate without restoration, and existing non-conforming business leases and septic systems would remain in current operation, but may be subject to future restriction or cessation of use in the future by enforcement of recent statewide wastewater policy changes. No improvements to habitat would occur. Sea level rise would continue to reduce beach area available and threaten the integrity of the Pacific Coast Highway.

Anticipated Alternative 1 Impacts:

- Continued fish passage opportunities limited by seasonal rainfall and short time windows when conditions are suitable to allow adult steelhead access.
- Continued water temperature increases.
- Minimal lagoon habitat to support *O. mykiss* transition from fresh to salt water.
- Continued impact from storm surges and coastal erosion at high tides reducing beach recreation opportunities
- Continued decline of southern steelhead abundance in Topanga Creek due to limited anadromous influence.
- Eventual loss of additional habitat due to sea level rise.

Alternative 1 Benefits:

None

Figure 5. Alternative 1: No Project/Managed Decline (0 acres restored).

Alternative 2: Maximum Lagoon Habitat, Removal of Motel (9.5 wetted acres, with 27.8 riparian/transitional/upland acres restored and beach expansion to 4.39 acres): This alternative provides the maximum increase in lagoon, wetland, and riparian bank habitats. It includes restoration of more natural side channels connected to the western side of the existing lagoon based on historic topography and would allow the lagoon system to evolve to accommodate changing sea level and storm surge conditions. The Topanga Ranch Motel and onsite business leases would be removed from the project area and be replaced with riparian and transitional habitats. Partial or full relocation or replacement of public parking, business leases and overnight accommodations from the current location on the north side of PCH to the west side of Topanga Canyon Boulevard (TCB) in the expanded project area will be developed in the next design phase. There is sufficient space along TCB in that location to replace all of the parking that currently exists.

To provide for a wider lagoon and improve fish migration and refugia, the existing Caltrans bridge would be replaced with a longer one along the same road alignment. The span of the new bridge would total 460 feet (200-foot primary span, with secondary/side spans of 130 feet each), plus an additional span to accommodate an emergency services underpass on the east side if that is included in the next phase of design development. This alternative includes ADA disabled parking spaces on the beach level, with additional recreational parking at the PCH upper level on the south side of PCH only.

The lifeguard headquarters, beach restroom and helipad would be demolished and rebuilt closer to the realigned access road and to each other on the same beach level.

Anticipated Alternative 2 Impacts:
- It will take longer for the lagoon to fill and breach and the model anticipates fewer breaches as SLR occurs compared to Alternatives 1, 3 and 4.
- Existing wetted habitat and riparian vegetation on the banks would be protected during bridge removal, construction and grading using coffer dams or other appropriate tools to minimize any disturbance to water level or water quality.
- Steelhead would be restricted upstream of the work area and unable to use the lagoon during construction.
- Potential for increased turbidity in the lagoon due to construction and demolition but this should not be significant impact as steelhead will be excluded from the area.
- Potential for increased visitor impacts due to greater accessibility.

Alternative 2 Benefits:
- Although it will take longer to breach, once breached there is both an increased time window for fish passage opportunities due to lower velocity flows and increased area of lower flow refugia areas.
- Improvement in size and quality of wetted lagoon habitat. Provides additional resources and buffering from environmental changes.
- Most extensive expansion of potential diverse habitats supporting rearing habitat for juvenile steelhead.
- Highest potential to accommodate sea level rise and storm surges with additional room for evolution of wetland, marsh, riparian and transitional habitat.

- Increased management of visitor experience providing opportunities for onsite education about steelhead and other species.
- Retains existing native riparian vegetation along the banks.

Figure 6. Alternative 2: Lagoon Habitat Maximized, Removal of Motel (9.5. wetted acres, with 27.8 riparian/transitional/upland acres restored and beach expansion to 4.39 acres). The top image shows proposed areas where changes would occur. The lower image shows additional topographical and habitat changes. Potential Parking areas are shown in orange, blue is wetted area and green/tan indicate habitat restoration zones.

Alternative 3: Limited Lagoon Habitat Expansion, Retention of Motel (7.7 wetted acres, with 29.47 riparian/transitional/upland acres restored and beach expansion to 4.42 acres):
This alternative also provides expanded lagoon, wetland, riparian and transitional habitat in the west part of the existing creek channel, but allows for only the existing main channel within the lagoon area itself. The remaining Topanga Ranch Motel structures are restored in its historic configuration, including relocation of some of the structures from the west side that is currently experiencing flood and bank erosion. One existing concession (restaurant lessee) would be remodeled and continue operation in place. No other business leases remain. If the emergency underpass is removed as the design evolves, this would provide additional parking on the North side of PCH. Partial or full relocation or replacement of public parking, business leases and overnight accommodations from the current location on the north side of PCH to the west side of Topanga Canyon Boulevard (TCB) in the expanded project area will be developed in the next design phase. There is sufficient space along TCB in that location to replace all of the parking that currently exists.

All of the changes to the new 460 ft. Caltrans bridge (200-foot center span, with secondary/side spans of 130 feet each) are the same as for Alternative 2. However, the access road alignment is kept slightly to the east. This might change if no underpass is included.

The lifeguard headquarters and beach restroom would be rebuilt closer to the realigned access road moving slightly east to enhance sight lines along the beach, and the helipad would be located at PCH with a gated separation from the west end of the parking lot on the same level.

Anticipated Alternative 3 Impacts:
- Less fill removal on the east side will continue to constrain the lagoon but allows retention of the Topanga Ranch Motel.
- Existing wetted habitat and riparian vegetation on the banks would be protected during bridge removal, construction and grading using coffer dams or other appropriate tools to minimize any disturbance to water level or water quality.
- Steelhead would be restricted upstream of the work area and unable to use the lagoon during construction.
- Potential for increased turbidity in the lagoon due to construction and demolition but this should not be significant impact as steelhead will be excluded from the area.
- Potential for increased visitor impacts.

Alternative 3 Benefits:
- Expansion of potential diverse habitats supporting rearing habitat for juvenile steelhead compared to Alternatives 1 and 4, but less than Alternative 2.
- If the west bank was graded to provide a second low flow area that would improve conditions compared to Alternative 1, but still be less than Alternative 2. Further analysis is needed to examine this compared to Alternative 4.
- Fish passage opportunities remain consistent with Alternative 1, slightly better than Alternative 2, and consistent with Alternatives 4 due to lower velocity flows from the wider bridge, but fill on east side remains a constraint and reduces amount of lower flow resting areas.
- Slightly increased potential to accommodate sea level rise and storm surges with limited

room for evolution of wetland, marsh, riparian and transitional habitat versus Alternatives 1 and 4, but less than Alternatives 2.

- Retains existing native riparian vegetation along the banks.

Figure 7. Alternative 3: Least Lagoon Habitat Expansion, Full Retention of Motel (7.7 wetted acres, with 29.47 riparian/transitional/upland acres restored and beach expansion to 4.42 acres). The top image shows proposed areas where changes would occur. The lower image shows additional topographical and habitat changes. Potential Parking areas are shown in orange, blue is wetted area and green/tan indicate habitat restoration zones.

Alternative 4: Maximum Managed Retreat, Partial Motel Retention (7.6 wetted acres, with 29.48 riparian/transitional/upland acres restored and beach expansion to 4.56 acres): The alignment of PCH moves north expanding the maximum amount of beach area and managed retreat from SLR. The portion of the historic Topanga Ranch Motel east of the current motor court access lane is retained. Adjacent parking is adjusted and a remodeled restaurant lessee would continue to operate. This alternative will provide expanded lagoon, wetland, riparian and transitional habitats, primarily on the west side of the existing channel due to removal of all fill in that western area. No other business leases remain. Partial or full relocation or replacement of public parking, business leases and overnight accommodations from the current location on the north side of PCH to the west side of Topanga Canyon Boulevard (TCB) in the expanded project area will be developed in the next design phase. There is sufficient space along TCB in that location to replace all of the parking that currently exists.

Due to the curve of its alignment, the Caltrans bridge has the greatest length under this alternative, though the actual span lengths are similar to the other alternatives with a total of 460 feet consisting of a 200-foot long center span and a 130 ft. side span on each side. This PCH alignment eliminates shoulder parking on the bridge spans, but has the greatest number of beach side parking spaces.

The helipad and lifeguard headquarters are arranged with staff, emergency and ADA disabled parking between these two functions and accommodate sight lines required for the expanded recreational beach area. This alternative maximizes managed retreat, recreational beach area (and/or living shoreline features such as dunes) and provides the most SLR resilience.

Anticipated Alternative 4 Impacts:
- Less fill removal on the east side will continue to constrain the lagoon as compared to Alternative 2, but is better than Alternatives 1 and 3 as it allows retention of a portion of the Topanga Ranch Motel.
- Existing wetted habitat and riparian vegetation on the banks would be protected during bridge removal, construction and grading using coffer dams or other appropriate tools to minimize any disturbance to water level or water quality.
- Steelhead would be restricted upstream of the work area and unable to use the lagoon during construction.
- Potential for increased turbidity in the lagoon due to construction and demolition but this should not be significant impact as steelhead will be excluded from the area.
- Potential for increased visitor impacts.

Alternative 4 Benefits:
- Moves the roadway north providing some managed retreat from SLR impacts to the roadway and increases opportunity for implementing Living shoreline and other natural solutions to reduce coastal erosion and provides some opportunity for the wetted areas to evolve in response to SLR.
- Moderate expansion of potential diverse habitats supporting rearing habitat for juvenile steelhead.
- Expansion of potential diverse habitats supporting rearing habitat for juvenile steelhead compared to Alternatives 1 and 3, but less than Alternative 2.

- Fish passage opportunities remain consistent with Alternative 1, slightly better than Alternative 2, and consistent with Alternatives 3 due to lower velocity flows from the wider bridge but fill on east side remains a constraint.
- If the west bank was graded to provide a second low flow area that would improve conditions compared to Alternative 1, but still be less than Alternative 2. Further analysis is needed to examine this compared to Alternative 3.
- Slightly increased potential to accommodate sea level rise and storm surges with limited room for evolution of wetland, marsh, riparian and transitional habitat versus Alternatives 1 and 3, but less than Alternatives 2.

Figure 8. Alternative 4: Maximum Managed Retreat, Partial Motel Retention (7.6 wetted acres, with 29.48 riparian/transitional/upland acres restored and beach expansion to 4.56 acres). The top image shows proposed areas where changes would occur. The lower image shows additional topographical and habitat changes. Potential Parking areas are shown in orange, blue is wetted area and green/tan indicate habitat restoration zones.

Summary

Populations of southern steelhead trout are declining throughout the region, and the primarily resident population remaining in Topanga Creek provides an important source of smolts for the metapopulation. The Southern California Steelhead Recovery Plan (NMFS 2012) recommends a series of integrated actions to recover the species including habitat restoration, fish passage improvements, threat and risk reduction. Given the threat of catastrophic loss of the population due to wildfire, and the on-going threat posed to these fish due to drought conditions, each and every action we can take to provide improved habitat and migration opportunities is critical to the survival of this genetically distinct species.

Since 2008, we have monitored the population of *O. mykiss* in Topanga Creek by monthly snorkel surveys augmented by a lifecycle monitoring station. The Topanga Creek subpopulation of the southern California DPS has been postulated to be a "satellite" population based on a relatively small abundance of smolts observed and limited ability to outmigrate. Although satellite populations are more prone to extinction (as demonstrated by the temporary extirpation in the 1980s), they provide important buffers for the metapopulation from disturbance events, can serve to increase metapopulation viability, and may become a source population in the future (Boughton et al. 2006).

In general, the subpopulation seems to be persisting with limited anadromous adult influx despite high summer water temperatures, poor habitat conditions in the lagoon, and a multi-year period of low rainfall and reduced flows. However, as the drought conditions persist, continued monitoring focusing on the response variables responsible for supporting persistence of the subpopulation need to be carefully studied.

Our data suggest that limited ocean connectivity, perennial instream flows, and intact riparian habitat are ecological conditions that favor the long-term persistence of resident life-history, however this is subject to reduced quality due to the drought. Impacts to *O. mykiss* from chronically warm water temperatures in southern California can be ameliorated by high food availability, which is related to both instream flows and input from a healthy riparian ecosystem. Both water temperature changes and benthic macro invertebrate community shifts have occurred during the drought, resulting in lower abundances of *O. mykiss*. It is not possible with our data to further pull apart the synergistic effects of these multiple factors.

Our data suggest that critical ecological conditions to support the anadromous life history form of adult and smolt fish migration is missing due to restricted opportunities for passage when the sand bar is breached due to high flow velocities and drought reduced instream flows. In addition, freshwater habitat conditions that ameliorate high water temperatures and that are also critical for anadromous juveniles to grow to sufficient sizes to smolt and survive the marine environment may be affected by the drought.

In light of these metrics, analysis of the impacts and benefits associated with each of the project alternatives is summarized in Table 9. Note that a project goal was that the design alternatives breach at least as much as present, since the system is driven by natural rainfall events and increased precipitation is not anticipated. It is difficult to quantify the benefits provided by

increased and functionally restored lagoon habitats, but the existing conditions in Topanga Lagoon are not supporting juvenile rearing due to high summer water temperatures, lack of food resources and limited shelter from predators. Alternatives 2, 3 and 4 all provide some benefit by improving these conditions but the wider lagoon, western lobe and expanded wetted footprint of Alternative 2 provides the most potential improvement. Storm events are the natural driver of lagoon breaching and that would continue to be the case with any of the alternatives. However, expanding the window of time when flow conditions allow adult steelhead in-migration and smolt outmigration increases with Alternative 2.

Table 11. Comparison of Impacts and Benefits of Proposed Alternatives

	Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**
DIRECT IMPACTS				
Continued limited fish passage opportunities.	X			
Continued water temperature increases.	X			
Minimal lagoon habitat to support *O. mykiss* transition from fresh to salt water.	X			
Continued impact from storm surges and coastal erosion at high tides reducing beach recreation opportunities	X			
Existing wetted habitat would be protected during bridge removal, construction and grading using coffer dams or other appropriate tools to minimize any disturbance to water level or water quality.		X	X	X
Steelhead would be restricted upstream of the work area and unable to use the lagoon during construction.		X	X	X
INDIRECT IMPACTS				
Continued decline of southern steelhead abundance.	X			
Eventual loss of additional habitat due to sea level rise.	X		X	X
BENEFITS				
Area of wetted acres (Moffatt & Nichol 2022b)	3.5 acres	9.5 acres	7.7 acres	7.6 acres
Expansion of potential diverse habitats supporting rearing habitat for juvenile steelhead.	0 acres	2.2 acres	2.7 acres	3.7 acres
Expansion of potential diverse habitats supporting rearing habitat for juvenile steelhead if western lobe is implemented.	0 acres	possible	possible	possible
Modeled existing breach events providing fish passage opportunities at Mean High High Water and Mean Low Low Water at the PCH bridge (ESA 2022a)	13 breach events at each	13 breach events at each	13 breach events at each	13 breach events at each
Modeled existing passable area (sq ft) during breach events providing fish passage opportunities at Mean High High Water and Mean Low Low Water at the PCH bridge (ESA 2022a)	1290/1249	1459/1422	1326/1290	1227/1193
Potential area to accommodate 1.6 ft SLR	4.8 acres	10.6 acres	8.9 acres	8.7 acres

and storm surges with additional room for evolution of wetland, marsh, riparian and transitional habitat.				
Potential area to accommodate 6.8 ft SLR and storm surges with additional room for evolution of wetland, marsh, riparian and transitional habitat.	8.0 acres	13.5 acres	11.8 acres	11.7 acres
Retains existing native riparian vegetation along the banks.	X	X	X	X
Expands wetland, emergent marsh, and riparian/upland transition habitat.		X	X	X

By implementing Alterative 2, there will be expanded juvenile rearing habitat, as well as potentially increased food resources within the lagoon. However, the larger volume of the lagoon could result in requiring more rainfall to initiate a breach, although the hydrological analysis suggests that once breached, the connection would be sustained for longer and provide more suitable velocities and low flow areas to increase fish passage opportunities overall.

If the wider lagoon footprint is implemented in either Alternative 3 or 4, then they would become comparable. That opportunity will be further evaluated at the next stage of design development.

6.0 RECOMMENDATIONS

The following measures will be implemented to reduce temporary impacts to critical habitat to a less than significant level. Additional or modified requirements by USFWS and NMFS as identified during the Section 7 consultation process and USACE, CDFW, RWQCB, and CCC during the project's permitting processes, will be implemented. When conflicts arise, the most protective measure will be implemented

Hydroacoustic Monitoring and Impact Avoidance

The Topanga Lagoon Restoration Project seeks to minimize any potential impacts to the federally endangered tidewater goby (which does not have a swim bladder and are only sensitive to a narrow band of frequencies and particle motion) that reside year-round in the lagoon and creek area to be disturbed.

Avoiding and minimizing any potential hydroacoustic impacts to TWG will be required by Caltrans, USFWS and CDFW. All of the Build Alternatives proposed include demolition of the existing concrete bridge and installation of new bridge foundations and abutments that span the existing wetted width. In general, maximum water depth in the lagoon is less than 2 meters, averaging less than 1 meter with sandy substrate dominating the wetted area. Adjacent fill slopes are composed of mixed grain size fill materials.

Caltrans (2020) recommends evaluation of pile driving impacts on fish by estimating Peak Sound Pressure Level (SPL), and the accumulated Sound Exposure Level (SEL: constant sound level in 1 second and which has the same total amount of acoustic energy of an event) and their manual provides detailed directions on this process. It is required that a precision sound level monitor be deployed to measure and document the effective pressure associated with any impact

equipment or demolition methods that could potentially propagate underwater sound pressure into the water where sensitive fish species are present. This method does not fully account for potential particle motion impacts, which are not easily measured in shallow water. The current criteria is 206 decibels (dB) for fish of all sizes, and an accumulated SEL of no more than 183 dB for fish less than 2 grams such as the tidewater gobies, and less than 187 dB for fish over two grams. Background noise accumulation levels throughout the driving or demolition event under the Effective Quiet of 150dB are not counted against the daily accumulation. The only other fish species observed in Topanga Lagoon juvenile mullet (*Mugil cephalus*), Mississippi silversides (*Menida audens*), topsmelt (*Atherinops affinis*) and arroyo chub (*Gila orcuttii*).

Anticipated permit conditions associated with drilling adjacent to water, pile driving and in-water demolition efforts often include but are not limited to:

- Construction of the bridge foundations and footings will be completed within existing fill material.
- Construction of the temporary bridge will avoid placement of any foundations within or immediately adjacent to the wetted area and any construction will be completed within existing fill material.
- Construction of the coffer dam or other devices within or immediately adjacent to the wetted area associated with removal of the existing bridge will comply with all Caltrans requirements as outlined in the Technical Guidance for Assessment and Mitigation of Hydroacoustic Effects of Pile Driving on Fish (2020).
- Requirements for daily and seasonal timing restrictions
- Exclusion and relocation of any fish from the potential disturbed area
- Pre-construction, construction, demolition and post-construction monitoring by a qualified biologist
- Hydroacoustic monitoring during construction and demolition according to accepted Caltrans and other agency protocols
- Implementation of appropriate insulation and other sound attenuation systems (i. e. dewatered coffer dams, isolation casings with appropriate annular air gap, etc.)
- Mitigation plans for take of any listed species

<u>Pre-Construction</u>

- Continued monthly snorkel surveys, lifecycle monitoring, and storm event breach monitoring.
- Continue water temperature and water quality monitoring to document pre-restoration conditions.
- Identify the general dewatering approach as project hits ground water and where will water be released in coordination with permit requirements.
- Identify an approach for species protection and general filtration method (baker tanks to ocean, upland release, release downstream within lagoon, etc.) in accordance with permit requirements.
- Prepare Adaptive Mitigation and Monitoring Plans that identify goals, metrics for success and actions to take if goals not met.

<u>During Construction</u>

- Implement all required permitting conditions and Best Management Practices (BMPs)to control impacts of soil and dust movement and protect water quality.
- Implement an appropriate hydroacoustic monitoring program and utilize construction, demolition and dewatering BMPs to minimize sound propagation and intensity to remain below required standards of exposure and duration.
- Require biological monitoring required during installation of the coffer dam, any dewatering, existing bridge structure removal, and work adjacent to wetted areas.
- Monitor and establish a plan to relocate to an appropriate upstream location any steelhead from within the work area according to permits with NMFS and CDFW.

To minimize temporary impacts from actions needed in the wetted area, the following measures will be implemented to ensure that impacts are less than significant including but not limited to:

A coffer dam, sediment curtain, and/or other NMFS/USFWS approved method will be used to cordon off the small (80 ft wide x no more than 100 ft long) area around the existing bridge abutment to both exclude fish and wildlife and contain any materials so they are unable to move out of the work area. Final construction details to accomplish this will meet all permit conditions and be developed by the contractor in coordination with CDPR.

All tidewater gobies will be relocated out of the area by a permitted biologist prior to work within the area and relocated in an approved location upstream. Work will take place during the dry season when lagoon water levels and creek flows are at their minimum to avoid problems with controlling flow. Downstream blocking nets (having no greater than 1/8inch mesh) will be secured to both banks and the bottom to prevent movement downstream of the work area in the main lagoon. Fish will be herded upstream above the limit of the proposed work area and then seining will continue until all fish are captured. The upstream blocking net will be installed and secured so that no fish can move back into the work area. Fish that are not herded but captured in the seine nets will be placed in buckets of cool, clean water collected from an undisturbed area of the lagoon with bubblers attached at the sides and then immediately hand carried upstream above the upstream blocking net. Fish will not be crowded or held in buckets for more than 10 minutes. Fish handling will be minimized while the supervising biologist documents the species, number, size class, and condition of release. Individuals handling fish will ensure that their hands are clean and free of potentially harmful substances such as sunscreen, insect repellent, etc. Should there be any mortality, the fish incidentally killed will be preserved whole on ice then frozen, data on species, size and cause of mortality will be documented, and the remains delivered to the appropriate authority. If the limits of incidental take is approached, the supervising biologist will postpone work until the appropriate agency is notified and a plan developed to further reduce potential for further stress or injury.

The restricted work area within the coffer dam will not be fully dewatered until the supervising biologist determines that no fish remain within the area. Dewatering will be done slowly with supervision to ensure that any fish trapped in the area can be captured and relocated reducing the risk of injury or stress. Blocking nets providing a buffer area outside the work zone will remain

in place until all work is completed and the coffer dam removed. Silt curtains may also be installed inside the blocking nets to further reduce potential for water quality impacts.

Blocking nets will be inspected at least three times a day (start, middle, end) or more if requested by the supervising biologist. If fish are impinged on the net, or weather/flow conditions change significantly, the supervising biologist can increase inspection efforts.

Pumps for dewatering within the coffer dam enclosed area will be properly screened to prevent fish from entering the intake. Dewatering and flow diversion will comply with permit requirements from USFWS and NMFS in a Biological Opinion. Once the supervising biologist has confirmed that the work area is isolated, all fish are excluded, and there is no risk of entraining fish, then the pump screen may be removed. Water removed from the work area will be directed to an adjacent holding area according to permit requirements before release into the lagoon or ocean downstream of the work area. Water quality testing including turbidity, temperature, salinity, dissolved oxygen, pH, and conductivity, nutrients (and potentially metals if required) will be monitored and documented at the start, middle and end of each day.

If fish upstream are observed in distress, a fish kill occurs, or water quality problems (including equipment leaks or spills) occurs, the supervising biologist will immediately stop work, contact the relevant authorities and work with the contractor to correct the problem.

Upon completion of the removal of the old bridge within the coffer dam area, water quality will be tested within the work area before removal of the walls. Flow will be restored slowly and fish will remain excluded upstream of the work area pending confirmation that water parameters are suitable for direct release into the lower lagoon.

The supervising biologist will provide a training to all construction personnel and coordinate with them directly each day to ensure no fish are harmed. The supervising biologist will also maintain documentation in a logbook with date, methods, personnel, water temperature, conductivity, visibility, and other pertinent notes on activities and fish relocation.

To minimize temporary and limited turbidity or pollution impacts from adjacent ground disturbing activities, the following Best Management Practices (BMPs) measures will be implemented:

- Siltation fences installed at edge of area to be graded to avoid movement of soil into wetted areas.
- Vegetation removal will be conducted so that materials are not permitted to fall into wetted area
- Stockpiles will be located away from the creek corridor, and contained by way of standard BMPs such as wattles, tarps, or burlap to ensure materials are not moved into the creek due to wind, rain, gravity or flooding.

- No equipment maintenance will be permitted near the creek to avoid impacts of accidental spills

Soil will be stabilized in bare areas with mulch, straw matting, hydroseeding or other approved methods during the vegetation restoration period to avoid movement of soil into the wetted areas.

Post-Construction:

- Conduct monthly snorkel surveys, lifecycle monitoring, and storm event breach monitoring to document post-restoration changes.
- Conduct water temperature and water quality monitoring to document post-restoration conditions. Five years post- construction monitoring of project area and restoration success.
- Implement the actions recommended by the Adaptive Mitigation and Monitoring Plans, especially if project goals are not met.

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APPENDIX A
Summary of all Snorkel Surveys in Topanga Creek

DATE	Total Trout	JUV (<10cm)	INT (11-25cm)	ADULT (>25cm)	#Locations	#Smolts	#Adults (>50cm)
2001							
6/6/2001	122	121	0	1	27	0	1
7/31/2001	12	6	1	5	3	0	1
8/20/2001	65	14	49	2	18	0	1
9/17/2001	52	9	41	2	13	0	1
10/18/2001	37	18	14	5	15	0	1
11/27/2001	41	1	38	2	16	0	1
12/12/2001	2	0	0	2	2	0	0
Avg	**47**	**24**	**20**	**3**	**13**	**0**	**1**
2002							
2/15/2002	102	56	45	1	21	0	0
4/25/2002	80	28	51	1	25	0	2
5/3/2002	11	2	9	0	8	0	0
6/12/2002	156	92	63	1	43	0	0
6/24/2002	51	37	13	1	10	0	1
10/21/2002	23	0	20	3	10	0	0
10/22/2002	26	2	19	5	12	0	0
11/12/2002	75	10	50	15	43	0	0
12/18/2002	8	0	8	0	12	0	0
12/19/2002	16	0	15	1	9	0	0
Avg	**55**	**23**	**29**	**3**	**0**	**0**	**0**
2003							
2/10/2003	6	0	5	1	6	0	0
2/16/2003	49	9	40	0	27	9	0
3/2/2003	31	4	26	1	20	0	1
3/23/2003	42	0	31	11	24	5	0
4/1/2003	24	2	20	2	13	0	0
5/2/2003	49	0	20	29	32	0	0
5/11/2003	63	3	19	52	37	0	0
6/1/2003	72	34	25	13	37	0	0
6/27/2003	73	17	31	25	33	0	0
7/11/2003	59	8	33	18	37	0	0
7/25/2003	47	11	27	9	27	0	0
8/8/2003	59	7	29	23	37	0	0
8/22/2003	50	8	21	21	23	0	0
9/19/2003	53	7	39	7	22	0	0
11/21/2003	33	2	21	10	21	0	0
12/12/2003	17	0	10	7	14	0	0
Avg	**45**	**7**	**25**	**14**	**25.63**	**1**	**0**
2004							
3/21/2004	59	1	0	0	30	0	0
4/18/2004	51	0	29	22	21	0	0

DATE	Total Trout	JUV (<10cm)	INT (11-25cm)	ADULT (>25cm)	#Locations	#Smolts	#Adults (>50cm)
5/30/2004	209	184	21	4	27	0	0
6/30/2004	46	18	26	2	9	0	0
9/21/2004	122	96	22	4	49	0	0
10/15/2004	163	96	51	16	55	0	0
11/16/2004	98	46	37	15	38	0	0
12/14/2004	109	44	50	15	40	0	0
Avg	**107**	**60.63**	**30**	**9.75**	**33.63**	**0**	**0**
2005							
4/2/2005	76	5	53	18	40	0	0
5/13/2005	78	10	55	13	40	0	0
6/24/2005	79	11	55	13	45	0	0
7/15/2005	80	12	47	21	29	0	0
8/11/2005	80	11	49	20	35	0	0
9/23/2005	63	11	34	18	29	0	0
10/14/2005	57	0	23	34	23	0	0
11/18/2005	78	2	41	35	37	0	0
12/16/2005	49	2	17	25	28	0	0
Avg	**71**	**7**	**42**	**22**	**34**	**0**	**0**
2006							
1/13/2006	48	0	27	21	26	6	0
2/24/2006	58	0	29	29	27	0	0
3/24/2006	78	0	30	48	38	0	0
4/25/2006	154	80	22	52	46	3	0
5/19/2006	409	287	62	60	80	0	1
7/21/2006	252	85	121	46	62	0	1
8/18/2006	254	79	118	57	80	0	0
9/15/2006	177	37	106	34	49	0	0
10/20/2006	202	53	113	36	46	0	0
11/17/2006	144	34	79	31	47	0	0
12/14/2006	107	27	50	30	39	0	0
Avg	**171**	**62**	**69**	**40**	**49**	**1**	**0**
2007							
1/26/2007	57	7	37	13	34	0	3
3/9/2007	101	6	70	25	38	0	3
4/20/2007	162	89	58	15	49	1	1
5/11/2007	140	84	46	10	45	0	0
6/22/2007	131	61	48	24	54	0	4
7/20/2007	98	44	36	18	43	0	5
8/17/2007	57	15	31	11	31	0	5
9/7/2007	60	23	25	12	33	0	4
10/19/2007	75	31	19	25	36	0	4
11/16/2007	46	14	25	7	31	0	1

DATE	Total Trout	JUV (<10cm)	INT (11-25cm)	ADULT (>25cm)	#Locations	#Smolts	#Adults (>50cm)
12/14/2007	30	7	10	13	23	0	1
Avg	**87**	**35**	**37**	**16**	**38**	**0**	**3**
2008							
2/8/2008	40	5	25	10	25	0	3
3/14/2008	66	3	45	18	34	0	4
4/18/2008	393	337	33	23	72	0	3
5/16/2008	621	546	41	34	101	0	5
6/20/2008	691	590	59	42	94	0	5
7/18/2008	324	242	57	25	61	0	2
8/1/2008	353	297	37	20	73	0	5
9/12/2008	310	269	36	5	58	0	1
10/17/2008	261	177	78	6	61	0	0
11/14/2008	256	162	81	13	65	0	2
12/12/2008	157	120	31	6	42	0	1
Avg	**316**	**250**	**48**	**18**	**62**	**0**	**3**
2009							
2/27/2009	156	39	102	15	74	0	4
7/31/2009	323	208	96	21	84	0	3
8/21/2009	309	223	75	11	74	0	0
9/25/2009	201	108	84	7	65	0	2
10/23/2009	237	117	93	27	69	0	2
11/20/2009	121	42	67	12	48	0	3
12/18/2009	117	49	58	9	43	0	3
Avg	**209**	**112**	**82**	**15**	**65**	**0**	**2**
2010							
2/19/2010	211	28	169	14	103	6	0
3/12/2010	174	11	149	15	77	1	0
4/9/2010	200	49	135	16	71	0	0
5/21/2010	420	283	122	15	113	0	2
6/24/2010	343	232	93	18	98	0	0
7/16/2010	326	185	122	19	77	0	0
8/20/2010	281	130	140	11	93	0	0
9/17/2010	266	123	135	8	96	0	0
10/15/2010	278	105	161	12	83	0	0
11/12/2010	197	82	104	11	60	0	0
12/10/2010	117	40	73	4	45	0	0
Avg	**256**	**115**	**128**	**13**	**83**	**1**	**0**
2011							
1/14/2011	242	62	159	21	91	0	0
2/11/2011	159	18	125	16	68	0	0
3/11/2011	303	15	246	42	118	0	0
4/15/2011	129	4	113	12	70	0	0

DATE	Total Trout	JUV (<10cm)	INT (11-25cm)	ADULT (>25cm)	#Locations	#Smolts	#Adults (>50cm)
5/13/2011	113	9	81	23	56	0	0
6/17/2011	103	1	76	26	40	0	0
7/12/2011	76	1	57	18	39	0	0
8/19/2011	63	0	41	22	38	0	0
9/23/2011	43	0	26	17	24	0	0
10/21/2011	70	0	48	22	37	0	0
11/9/2011	47	0	31	16	35	0	0
12/16/2011	18	0	13	5	15	0	0
Avg	**114**	**9**	**85**	**20**	**53**	**0**	**0**
2012							
1/13/2012	22	0	16	6	20	0	0
2/17/2012	17	0	10	7	13	0	0
3/16/2012	13	0	5	8	9	0	2
4/12/2012	88	82	5	1	45	0	0
5/18/2012	219	195	13	11	80	0	2
6/21/2012	154	136	10	8	53	0	2
7/13/2012	152	115	27	10	60	0	1
8/17/2012	102	67	32	3	48	0	0
9/14/2012	155	94	48	13	63	0	4
10/19/2012	102	58	35	9	46	0	0
11/20/2012	76	46	26	4	42	0	0
12/14/2012	45	17	26	2	22	0	0
Avg	**95**	**68**	**21**	**7**	**42**	**0**	**1**
2013							
1/18/2013	17	6	10	1	10	0	0
2/15/2013	25	14	11	0	18	0	0
3/12/2013	31	9	21	1	20	0	0
4/19/2013	40	15	25	0	22	0	0
5/10/2013	125	92	30	3	45	0	0
5/31/2013	109	84	23	2	40	0	0
6/14/2013	45	21	24	0	25	0	0
7/12/2013	51	27	24	0	28	0	0
8/9/2013	57	25	30	2	36	0	0
9/13/2013	61	26	33	2	30	0	0
10/18/2013	63	25	34	4	35	0	0
11/15/2013	75	20	46	9	49	0	0
12/13/2013	29	1	23	5	19	0	1
Avg	**56**	**28**	**26**	**2**	**29**	**0**	**0**
2014							
1/10/2014	57	11	45	1	37	0	0
2/14/2014	36	14	19	3	32	0	0
3/7/2014	53	14	27	12	35	0	2

DATE	Total Trout	JUV (<10cm)	INT (11-25cm)	ADULT (>25cm)	#Locations	#Smolts	#Adults (>50cm)
4/4/2014	56	15	36	5	33	0	1
5/1/2014	78	25	47	6	38	0	0
6/6/2014	70	16	39	15	43	0	1
7/11/2014	51	13	31	6	32	0	0
8/8/2014	84	33	37	14	40	0	0
9/5/2014	72	31	27	14	40	0	1
10/17/2014	58	7	28	19	37	0	1
11/14/2014	46	5	30	11	31	0	0
12/19/2014	21	10	7	4	12	0	0
Avg	**57**	**16**	**31**	**9**	**34**	**0**	**1**
2015							
1/16/2015	18	4	9	5	14	0	0
2/13/2015	20	3	11	6	19	0	0
3/6/2015	25	1	14	10	18	0	0
4/10/2015	50	32	8	10	24	0	0
5/2/2015	130	112	16	2	34	0	0
6/12/2015	130	97	21	13	48	0	0
7/10/2015	95	58	18	16	48	0	0
8/14/2015	54	33	16	5	29	0	0
9/10/2015	50	17	18	12	31	0	0
10/8/2015	43	19	13	11	27	0	0
11/6/2015	42	23	13	6	27	0	0
12/4/2015	46	23	16	7	25	0	0
Avg	**59**	**35**	**13**	**13**	**29**	**0**	**0**
2016							
1/11/2016	21	10	7	4	15	0	0
2/4/2016	13	8	1	4	12	0	0
3/28/2016	40	15	17	8	25	0	0
4/28/2016	51	9	33	9	33	0	0
5/27/2016	55	17	29	9	30	0	0
6/24/2016	54	16	31	7	34	0	0
7/21/2016	49	13	22	14	39	0	1
8/19/2016	22	4	13	5	17	0	0
9/16/2016	37	10	17	10	23	0	0
10/14/2016	25	0	15	10	19	0	0
11/7/2016	38	9	22	7	21	0	0
12/15/2016	14	4	12	2	12	0	0
Avg	**35**	**10**	**17**	**7**	**23**	**0**	**0.1**
2017							
1/31/2017	10	2	6	2	8	0	0
2/23/2017	8	0	6	2	6	0	0
3/10/17	5	0	5	0	2	0	0

DATE	Total Trout	JUV (<10cm)	INT (11-25cm)	ADULT (>25cm)	#Locations	#Smolts	#Adults (>50cm)
4/14/2017	54	23	23	8	21	0	2
5/11/2017	115	94	16	4	22	0	0
6/16/2017	137	112	19	6	27	0	1
7/21/2017	176	132	26	18	40	0	4
8/18/2017	115	88	16	11	31	0	4
9/15/2017	169	131	45	20	32	0	1
10/13/2017	98	80	15	6	29	0	0
11/6/2017	90	73	15	2	22	0	0
12/14/2017	76	39	32	5	15	0	4
Avg	**96**	**70**	**20**	**8**	**23**	**0**	**1.3**
2018							
1/23/2018	54	31	16	7	16	0	3
2/5/2018	70	35	29	6	22	0	2
3/8/2018	58	23	32	3	15	1	0
4/5/2018	48	29	15	6	25	0	0
5/3/2018	71	39	27	5	18	0	2
5/31/2018	118	99	17	2	24	0	0
6/28/2018	135	118	14	3	23	0	0
7/26/2018	48	26	22	0	23	0	0
8/24/2018	24	15	8	1	9	0	0
9/20/2018	26	12	11	3	12	0	1
10/18/2018	27	16	9	2	12	0	0
11/19/2018	19	6	7	6	11	0	1
12/20/2018	15	8	4	3	11	0	0
Avg	**55**	**35**	**16**	**4**	**17**	**0.08**	**0.7**
2019							
1/10/2019	13	6	6	1	9	0	0
3/21/2019	60	16	31	13	20	0	2
4/1/2019	47	6	34	7	21	0	0
5/6/2019	222	174	34	9	32	0	6
6/10/2019	459	370	78	11	36	0	0
7/12/2019	416	284	119	13	80	0	0
8/6/2019	316	277	37	2	48	0	0
9/5/2019	233	147	28	7	30	0	0
10/7/2019	147	112	28	7	30	0	0
11/4/2019	168	139	25	4	32	0	0
Avg	**208**	**157**	**43**	**7**	**35**	**0**	**4**
2020							
3/30/2020	87	47	36	4	24	0	
5/14/2020	187	84	94	9	46	0	
6/11/2020	145	67	70	8	51	0	
10/15/2020	132	76	48	8	57	0	

Technical Memo Southern Steelhead Trout

DATE	Total Trout	JUV (<10cm)	INT (11-25cm)	ADULT (>25cm)	#Locations	#Smolts	#Adults (>50cm)
11/15/2020	153	80	63	10	68	0	
Avg	**141**	**71**	**62**	**8**	**49**	**0**	
2021							
2/18/2021	38	12	21	5	25	0	
3/11/2021	41	10	23	8	25	0	
4/7/2021	52	18	28	6	25	0	
5/5/2021	127	54	61	12	44	0	
6/9/2021	90	15	62	13	38	0	
9/25/2021	38	12	24	2	23	0	
10/20/2021	78	35	36	7	29	0	
11/16/2021	82	40	38	4	38	0	
12/20/21	32	12	14	6	15	0	
Avg	**64**	**23**	**34**	**7**	**29**	**0**	

APPENDIX B Resume/Qualifications

Rosi Dagit
Senior Conservation Biologist
RCD of the Santa Monica Mountains
540 S. Topanga Canyon Blvd.
Topanga, CA 90290
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rdagit@rcdsmm.org

November 2021

Rosi Dagit, Sr. Conservation Biologist for the RCDSMM has coordinated a variety of research projects throughout the Santa Monica Mountains and Bay since 1987. As Principle Investigator for the Santa Monica Bay Steelhead Lifecycle Monitoring project, she has snorkeled the creeks monthly since 2001 to count endangered southern steelhead trout, and monitored changes in abundance and distribution using DIDSON camera, mark-recapture of over 1,000 *O. mykiss*, and instream antenna deployment. She has numerous publications and technical reports summarizing this work.

Ms. Dagit has also been monitoring endangered tidewater gobies and other native fishes throughout the Santa Monica Bay with focused surveys in both Topanga and Malibu Lagoons. She was the tidewater goby biologist of record for the Malibu Lagoon Restoration in 2012. Under a series of contracts from California Department of Parks and Recreation, Ms. Dagit has coordinated a Technical Advisory Committee and a variety of research efforts to document abundance and distribution patterns, as well as examine habitat and predation impacts to tidewater gobies in the Santa Monica Bay.

Since 2014, Ms. Dagit has also been working with Friends of the Los Angeles River (FOLAR) to update the fish study of the upper LA River by surveying in the lower river near the estuary and in the western river drainages of the San Fernando Valley.

Ms. Dagit has coordinated several habitat restoration efforts including the 2008 Rodeo Grounds Berm Removal, the Trancas Lagoon Restoration Feasibility Study (2015) and is currently Project Manager for the Topanga Lagoon Restoration Planning process in collaboration with State Parks.

She holds permits from:

- CA Department of Fish and Game Scientific Collecting Permit #S-200630009-20275001 expires 12/11/2023
- CA Department of Parks and Recreation Scientific Collecting Permit
- NOAA National Marine Fisheries Service Section 10 (a) (1) (A) #15390-2 expires 12/31/2025
- US Fish and Wildlife Permit #TE811188-2 expires December 2024

APPENDIX
I

Technical Memo

Stream Survey for the Topanga Lagoon Restoration Project

Prepared by: Katy Semple Delaney, wildlife ecologist, Santa Monica Mountains National Recreation Area, katy_delaney@nps.gov

August 19, 2021

Introduction

Amphibians are in peril worldwide and have been facing extinctions and population declines for at least four decades (Blaustein & Wake 1990; Houlahan et al. 2000; Stuart et al. 2004; BeeBee & Griffiths 2005; Grant et al. 2016). A recent report estimates that 40% of amphibian species are at risk of extinction worldwide (IPBES 2019). Conservation efforts to undo these declines can help to reverse one of the greatest threats to biodiversity.

Creation of restored riparian habitat at the Topanga Lagoon site is likely to increase amphibian biodiversity, which can be an indicator of stream health. Currently, suitable habitat for amphibians is lacking. Trash and discarded building materials litter the creek. Human activity on stream banks is heavy, possibly disturbing amphibian recovery. On site are invasive red swamp crayfish (*Procambarus clarkii*), predators of all life stages of amphibians. Stream bank habitat is dominated by invasive giant reed (*Arundo donax),* which is unsuitable habitat for foraging amphibians. Restoration of the riparian area will vastly improve habitat for amphibians, particularly Pacific treefrogs (*Pseudacris regilla*).

Because the area of the creek we surveyed did not have structured step pools and boulders, we found it unsuitable for two other native amphibians, the California treefrog (*Pseudacris cadaverina*) and the California newt (*Taricha torosa*). Notably, these sensitive species are present upstream in Topanga creek.

Potential Special-Status Species

Table 1 lists the special-status wildlife species recorded as occurring in the Topanga quadrangle (USGS) and the 8 surrounding 7.5 minute quads, according to CNDDB (search conducted June 10, 2021). It also identifies species considered locally sensitive. The habitat requirements for each species listed was assessed with respect to the vicinity of the Topanga Lagoon project area, and the likelihood of occurrence is presented in the table.

Table 1. Potentially Occurring Special-Status Aquatic Species.

Common name	Species name	Fed. Status	State Status	Local habitat and range	Potential for occurrence
arroyo toad	*Anaxyrus californicus*	Endangered	CDFW_SSC	Rivers with sandy banks and bottoms, willows, cottonwoods, and sycamores.	Does not occur in the SMMs, habitat unsuitable
California red-legged frog	*Rana draytonii*	Threatened	CDFW_SSC	Requires 25 weeks of permanent water for larval development. Must have access to estivation habitat.	Does not occur in Topanga, however does occur in streams in the SMMs with similar habitats
western spadefoot	*Spea hammondii*	None	CDFW_SSC	Vernal pools are essential for breeding and egg-laying.	Habitat does not occur in the SMMs
California newt	*Taricha torosa*	None	CDFW_SCC	Rocky streams with deep enough pools for breeding and larval development	Occurs in suitable habitat upstream, but habitat on site is not suitable.
western pond turtle	*Emys marmorata*	None	CDFW_SSC	Thoroughly aquatic. Needs basking sites and sandy banks or grassy open field upland habitat for egg-laying.	Occurs throughout SMMs, suitable habitat exists in the creek on site.
California treefrog	*Pseudacris cadaverina*	None	none	Streams with boulders, pools for breeding and larval development.	Occurs throughout the SMMs, suitable habitat does not exist on site. Occurs in suitable found upstream.

Survey Methods

Survey was conducted by Dr. Katy Delaney, wildlife ecologist, and Sarah Wenner, biological technician, on June 10, 2021.

This survey followed the "intensive" protocol of the National Park Service Mediterranean Coast Network's Inventory and Monitoring Program, which completes 58 stream surveys each year in the Santa Monica Mountains in collaboration with RCD Santa Monica Mountains, Pepperdine University, and US Geological Survey (Delaney et al. 2011).

During intensive sampling, a team of at least two surveyors begins at the designated starting point, travels upstream for 250 m and collects physical and biological stream data as outlined below. To confirm observations, dip nets ~~and~~ are used to find and capture larvae and adults and to verify species identification. Undersides of rocks, submerged logs and floating vegetation are searched for amphibian egg masses. Banks, exposed rocks and floating vegetation are also scanned for juvenile and adult amphibians.

The field crew measures physical variables of each habitat along the length of the 250 m stream transect. Habitat is categorized into one of four types: pool (slow to non-moving bodies of water); riffle (quick, shallow moving water); run (deeper, slow moving water);

and dry. Every change in habitat is considered a “stop” and is recorded as a number sequentially on the field data form. Length and depth of habitat are recorded for the stream segment between stops. Length (m) is measured using a 50 m tape-measure, and depth (cm) is taken at the deepest point in the habitat segment using a meter stick.

For each target amphibian species, the following are determined and recorded at each stop:

- Abundance estimates using indices (<5, 5-20, 21-100, 101-500, >500) for larvae and juveniles; complete counts for adults and egg masses.
- Age class counts (egg, larvae, juvenile, adult).

For each non-amphibian species, the following are determined at each stop and recorded:

- Presence/absence of fish.
- Presence/absence of crayfish.
- Abundance estimates using indices (<5, 5-20, 21-100, 101-500, >500) of adult and juvenile crayfish and fish.

Table 2. Survey date and personnel.

Date/Time (2021)	**Observers**	**Conditions**	**Purpose of visit**
June 10 from 12:25 – 2:15 PM	Katy Delaney Sarah Wenner	70°F, 15-20 mph, sunny	Stream survey for aquatic amphibians, fish, and invasive species.

Figure 1. Map of the area surveyed.

Survey Results
We did not observe any amphibians during our survey. We observed tidewater goby (*Eucyclogobius newberryi*), other types of non-native fishes, and red swamp crayfish (*Procambarus clarkii*) in the surveyed 250m stretch of Topanga lagoon and creek. We are not fish experts, however, we were able to identify hundreds of tidewater goby, an endangered species, at the first stop of our survey (see description of methods and the attached data sheet, Appendix A).

Pacific treefrogs, the most widespread and common stream breeding amphibian in the Santa Monica Mountains, was not observed during our surveys. Based on their ubiquity and tolerance for many habitat types, it is likely that this species occurred on site in the past. Pacific treefrog numbers decrease in areas with invasive aquatic species (e.g. red swamp crayfish, NPS pers. comm.), such as the present-day Topanga lagoon. In the mid 1980s, California newts and California treefrogs were observed in "Lower Topanga Creek", however, the exact location is not known so it is unclear if this included the lagoon area (De Lisle et al. 1987). Present-day habitat does not support these species but it is unknown if past conditions would have supported populations of these sensitive species.

Potential Direct Impacts
If alternative 1 is adopted then there is little to no possibility of restoring native amphibians to the freshwater habitat in the study area. Alternatives 2, 3, and 4 all will expand lagoon, wetland, riparian and transitional habitat which allows for the reestablishment of native amphibians. Alternative 2 would provide the most direct benefits for restoring native amphibians to the site in that it includes restoration of side channels of different elevations which would be resilient to sea level changes. Through our long-term monitoring, we have found that side channels are important "safe zones" for breeding Pacific treefrogs (*Pseudacris regilla*) when non-native fish and red-swamp crayfish are present in the main part of the creek, as is true in Topanga Creek. Side channels act as refugia for treefrog eggs and tadpoles where these non-native predators exist.

Potential Indirect Impacts
If alternatives 2, 3, and 4 are adopted, the creation of expanded wetland and riparian habitat may have the indirect effect of attracting native amphibians to re-colonize the area. Pacific treefrogs are the most likely to quickly return after restoration as they exist in many kinds of habitats and are very common throughout the area.

There are two other native amphibians that are present upstream in Topanga Creek, the California treefrog (*Pseudacris cadaverina*) and California newt (*Taricha torosa*). Specific habitat considerations, such as the addition of boulders, could be taken when restoring the riparian area under alternatives 2, 3, and 4 that would make the area attractive to these sensitive species.

Recommendations for Protection during construction
No amphibians were observed during the survey, however, it is possible that they may occur during construction. During Pacific treefrog breeding season (March – August) daytime visual

encounter surveys should be done in the immediate construction area (fresh water) to look for egg masses or larvae, which should be moved to safety at least 500m upstream. Treefrogs of all life stages can be captured with dip nets. Tadpoles and egg masses can moved using clean plastic bags or Tupperware type containers filled with creek water. Adults can be moved in damp, but not submerged, condition. All should be transported immediately, no longer than 30 minutes in containers.

Summary

Alternatives 2, 3, and 4 would benefit amphibians by creating complex riparian habitat. Alternative 2 would create the largest amount of habitat for stream-breeding amphibians. Pacific treefrogs could be restored to abundant and healthy population sizes. Further modification to include boulders could create complex habitat that could be suitable for California treefrogs and California newts.

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APPENDIX A

Data form and data for the stream survey (attached).

Santa Monica Mountains National Recreation Area

Stream Survey Field Form

STREAM NAME Topanga Lagoon **DATE** 6 / 10 / 21 **Start Time** 12 : 25p

Field Crew K Delaney, S. Werner

Coordinates: X _____ Y _____ Datum _____ Accuracy ____ m Elevation _____ m

Flow _____ m^3/s = W _____ m x Avg D _____ m x Flow _____ m/s

Notes / Comments _____

Occupancy Sampling

- ☐ **BUFO** (western toad)
- ☐ **HYRE** (pacific tree frog)
- ☐ **HYCA** (california tree frog)
- ☐ **TATO** (california newt)
- ☒ **CRAY** (crayfish)
- ☒ **FISH** _____ species
- ☐ **OTHER** _____ species

Notes / Comments _____

Intensive Sampling: Habitat and Species Observations

HABITAT: Pool, Riffle, Run, Dry L = length (m), D = depth (m) POPULATION CLASS: <5, 5-20, 21-100, 101-500, >500

BOULDERS: Yes / No VEGETATION: oak (o), willow (w), mulefat (mf), chaparral (ch), coastal sage (cs)

SPECIES:	Adult (A)	Juvenile (J)	Larvae (L)	Egg (E)
All Frogs and Toads (BUBO, HYCA, HYRE, RAAU, RACA*)	Exact	Popn Class	Popn Class	NA
TATO	Exact	Exact	Exact	Exact
CRAY* and FISH (native and nonnative)	Popn Class	Popn Class	NA	NA

Stop #	Habitat	L	D	Species	Popn Class / # of Ind.	Age	Boulders	Vegetation	Notes / Comments
1	Run	111.0	120	CRAY	101-500	A			some parts poor visibility
				FISH	101-500	A			goby
2	Riffle	5.5	8	—	—	—			
3	Run	13.4	5	CRAY	5-20	A			tiny riffle between runs
4	run	25.7	81	FISH	<5	A			
				CRAY	5-20	A			
5	riffle	1.5	10	—	—	—			
6	run	11.0	18	—	—	—			
7	riffle	6.6	7	—	—	—			
8	run	29.6	36	—	—	—			

APPENDIX B
Resumes/Qualifications

KATY SEMPLE DELANEY

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EXPERIENCE

NATIONAL PARK SERVICE, SANTA MONICA MOUNTAINS NATIONAL RECREATION AREA (2010-PRESENT)
Wildlife Ecologist

- Project lead for terrestrial herpetofauna monitoring using pitfall trap arrays: Installation of traps, training interns, biweekly monitoring including capturing and marking reptiles, amphibians, and small mammals, data analysis and manuscript preparation.
- Project lead for aquatic herpetofauna monitoring: Conducting streams surveys for amphibians and invertebrates, data analysis and manuscript preparation.
- Project lead for re-establishment of Federally Threatened California red-legged frogs to the Santa Monica Mountains.
- Project lead for land bird monitoring using volunteer birders who conduct point counts with distance sampling, in partnership with the Western Foundation of Vertebrate Zoology.
- Supervisor to 2 full-time interns (6 month terms, year-round) and 1 biotechnician.

UCLA INSTITUTE OF THE ENVIRONMENT AND SUSTAINABILITY (2007-2009)
Environmental Research Scientist, Santa Monica Mountains Conservancy

- Created a novel and new Land Protection Plan for the Conservancy.
- The Conservancy could use the GIS-based Plan to prioritize parcels of land for acquisition based on ecological importance (e.g. increase the size of already protected parkland, improved landscape connectivity via a wildlife corridor).

UCLA DEPT. OF ECOLOGY AND EVOLUTIONARY BIOLOGY (2003-2006)
Post-doctoral Scientist, Dr. Seth Riley, National Park Service, advisor

- Effect of urbanization and habitat fragmentation on the population genetics of wide-ranging birds and lizards in the Santa Monica Mountains: Collected samples (mist-netted birds), identified genetic markers and genotyped hundreds of samples, coordinated and trained interns and student researchers, analyzed population genetic data, prepared manuscripts and annual reports for the National Park Service and United States Geological Society (funding source).
- Non-invasive monitoring of bobcats in the Santa Monica Mountains: Genotyped bobcat DNA extracted from scats to determine if routine scat collection and genetic screening was a reliable method for non-invasive population monitoring.

UCLA DEPARTMENT OF ECOLOGY AND EVOLUTIONARY BIOLOGY
Graduate student (1995-2003)
Dr. Robert Wayne & Dr. Gregory Grether, co-advisors

- Dissertation title: Evolution and behavior of Island Scrub-Jays (*Aphelocoma insularis*), Western Scrub-Jays (*Aphelocoma californica*) and sage grouse (*Centrocerus urophasianus*).
- Examination of genetic, behavioral and morphological differences between Island and Western Scrub-Jays to make inferences about the adaptations of Island Scrub-Jays to life on Santa Cruz Island. Fieldwork included population monitoring, nest finding, territory size and quality determination, nest site and territory vegetation mapping, trapping and banding birds.

Graduate student researcher (2001-2003)
Dr. Tom Smith, employer

- Microsatellite DNA library for the Black-bellied seedcracker (*Pyrenestes ostrinus*): Developed a genomic library to look for polymorphic microsatellite markers in this species which were used to asses population genetic structure and bill morphology.
- Genetic Identification of Management Units for Watershed-Dependent Species of Special Concern: Helped to identify new markers and used existing markers to genotype individuals sampled from the Central Valley of California of four bird species.

EDUCATION

- Ph.D., Ecology and Evolutionary Biology (2003), University of California, Los Angeles.
- B.Sc., Biology (1992), University of California, San Diego.

SELECTED PUBLICATIONS

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ADDITIONAL EXPERIENCE & PARTNERSHIPS

- Participation in local conservation planning: Member of The Nature Conservancy's Scientific Advisory Group for ¡BAILA! (Biodiversity in Los Angeles) and SALSA (Stormwater and Landscape Spatial Analysis), member of the Expert Council for the City of Los Angeles' Biodiversity planning, consultant for the Los Angeles County Sustainability Plan.

- Interpretation and education: Regular engagement with visitors and staff at the Park communicating science. Community outreach through public speaking to Southwest Herpetological Society, Santa Susana Mountains Pass Association, Audubon Los Angeles, Audubon San Fernando Valley, Audubon Ventura, Audubon Conejo, and City of Calabasas. Presentations to scientific audiences at Pepperdine University, UC Los Angeles, US Fish & Wildlife Service Ventura, International Urban Wildlife Conference, The Wildlife Society Meeting, Amphibian Populations Task Force Meeting, and George Wright Society Conference.

- Grad student committee member: CSU Northridge (Sarah Wenner & Robert Hogg), University of Georgia (Micah Miles), UCLA (Joseph Curti). Postdoctoral researcher advisor: UC Los Angeles (Gary Bucciarelli).

- Partners and collaborators: California State Parks, Mountains Recreation and Conservation Authority, Santa Barbara Zoo, California State Coastal Conservancy, Santa Monica Bay Restoration Commission, Santa Monica Mountains Conservancy, U.S. Fish and Wildlife Service, U.S. Geological Survey, Natural History Museum of Los Angeles, The Nature Conservancy, Los Angeles County, City of Los Angeles, UC Los Angeles, Pepperdine University, CSU Northridge, Mountains Restoration Trust, Conejo Open Space Conservation Authority, Resource Conservation District of the Santa Monica Mountains, Heal the Bay, Western Foundation of Vertebrate Zoology.

APPENDIX
J

Technical Memo

Terrestrial Reptile and Amphibian Surveys for the Topanga Lagoon Restoration Project

Prepared by: Katy Semple Delaney, wildlife ecologist, Santa Monica Mountains National Recreation Area, katy_delaney@nps.gov

August 31, 2021

Introduction

Terrestrial reptiles and amphibians are an important part of the ecosystem of the Santa Monica Mountains. Because large swaths of open space have been designated as park land (local, state, and federal) within the Santa Monica Mountains National Recreation Area, native biodiversity of reptiles has mostly been preserved in the area. However, some species, such as Blainville's horned lizard (*Phrynosoma blainvillii*) and arboreal salamanders (*Aneides lugubris*) have historically declined in the Santa Monica Mountains and are considered rare (National Park Service, unpublished data). Common species, such as western fence lizards (*Sceloporus occidentalis*) and alligator lizards (*Elgaria multicarinata*), have been shown to be negatively impacted by stressors common in the area such as urbanization and roads (Delaney et al. 2010, 2021). In addition, all herpetofauna, as ectotherms, are likely to be affected by climate change and the resulting change in fire regime, drought, and other extreme weather events. It is important to restore acreage of degraded habitat to mitigate for these detrimental effects on reptile and amphibian populations.

The proposed restoration site is highly impacted by invasive weeds, human activity, parking lots, and the Pacific Coast Highway. Currently, the site is degraded and does not appear to support robust populations of even some of the most common lizard and snake species. Planting new riparian and coastal sage scrub vegetation and restoring soils by weed removal would benefit the herpetofauna community greatly. The slopes of intact and protected scrub directly adjacent to the site are likely to support robust communities of herpetofauna. This area would provide an excellent source for drawing native terrestrial reptiles and amphibians to a newly restored Topanga Lagoon.

Potential Special-Status Species

Table 1 lists the special-status wildlife species recorded as occurring in the Topanga quadrangle (USGS) and the 8 surrounding 7.5 minute quads, according to CNDDB (search conducted June 10, 2021). It also identifies species considered locally sensitive (NPS).

Legless lizard species designation is complicated. Using genetics to examine the *Anniella* species complex, it appears there are more species of legless lizards in Southern California than previously thought (Papenfuss & Parham 2013). However, species

designation is not agreed upon in the scientific community, therefore it is possible that more than one species of legless lizard could be present at Topanga Lagoon but it cannot be determined at this time. Through long-term monitoring using pitfall traps, we at Santa Monica Mountains National Recreation Area have detected *Anniella stebbinsi*, albeit rarely (Delaney et al. 2021).

Coastal whiptails, ringneck snakes, and two-striped garter snakes are found throughout the Santa Monica Mountains (Delaney & Riley 2019; Delaney et al. 2021). While these species are not rare they require more habitat specificity than the most common species. For example, NPS detects coastal whiptails most often in chaparral and two-striped garter snakes in non-urbanized riparian areas and streams (Delaney & Riley 2019).

Blainville's horned lizard populations have declined in the area, however, can be found and can be locally common where open space and their food supply has been protected (Fisher et al. 2002). Through our long-term monitoring and collaboration with CSUN graduate student Sarah Wenner, we know that Blainville's horned lizards can be found throughout Topanga State Park.

Arboreal salamanders are extremely rare in the Santa Monica Mountains with only a few sightings recorded over 22 years of monitoring (NPS pers. comm.). In addition, a search for all herpetofauna species in the Santa Monica Mountains revealed that the species was already rare in the mid-1980s (De Lisle et al. 1987).

Table 1. Potentially Occurring Special-Status Wildlife Species. The habitat requirements for each species listed was assessed with respect to the vicinity of the Topanga Lagoon project area, and the likelihood of occurrence is presented in the table.

Common name	Species name	Fed. Status	State Status	Local habitat and range	Potential for occurrence
California legless lizard	*Anniella spp.*	None	CDFW_SSC	Lives in a variety of open habitats, prefers loose soil.	Legless lizards occur in SMMs, Simi Hills, however, this species designation is yet to be determined.
Southern California legless lizard	*Anniella stebbinsi*	None	CDFW_SSC	Occurs in sandy or loose loamy soils under sparse vegetation.	"San Diegan" legless lizard occurs in SMMs, potentially could occur on site.
Coastal whiptail	*Aspidoscelis tigris stejnegeri*	None	CDFW_SSC	Found in deserts and semi-arid areas with sparse vegetation and open areas. Also found in woodland & riparian areas.	Occurs throughout the SMMs. Suitable habitat on site, especially on hillsides north and west of site.
Blainville's horned lizard	*Phrynosoma blainvillii*	None	CDFW_SSC	Open areas for sunning, bushes for cover, patches of loose soil for burial, and abundant supply of ants and other insects.	Occurs throughout SMMS. Habitat on site is marginal. Nearby open space is suitable habitat. Many records for this species throughout Topanga State Park.
Two-striped gartersnake	*Thamnophis hammondii*	None	CDFW_SSC	Highly aquatic, found in or near permanent fresh water. Often along streams with rocky beds and riparian growth.	Occurs throughout SMMs, suitable habitat exists in the creek on site.
Coast patch-nosed snake	*Salvadora hexalepis virgultea*	None	CDFW_SSC	Coastal sage scrub and chaparral, burrows in loose soils.	Rare in the SMMs but may be present in the suitable habitat adjacent to the site.
Coast mountain kingsnake	*Lampropeltis multifasciata*	None	None	Wooded areas near streams with rock outcrops. Riparian, oak woodland, coastal sage scrub.	Occurs throughout SMMs, mostly in shady areas with oaks or riparian habitat. A confirmed sighting was made on site by RCDSMM in 2021
Arboreal salamander	*Aneides legubris*	None	None	Coastal oak woodland in moist microhabitats, riparian habitat.	Was already rare in the SMMs in the 1980s with few sightings. Riparian habitat and adjacent oak woodland may be suitable habitat.
San Bernardino ringneck snake	*Diadophis punctatus modestus*	None	None	Most common in open, relatively rocky areas. Often in somewhat moist microhabitats near intermittent streams.	Occurs throughout the SMMs. Suitable habitat on and near site.

Survey Methods

Between June 24, 2021 and August 16, 2021, we deployed 25 coverboards (Grant et al. 1992) over the study area in various habitat types to survey for a variety of terrestrial herpetofauna that could possibly be present on site. Coverboards were approximately 2ft x 2.5ft in size and made from ¼ inch plywood. Each board had a sign identifying the purpose and contact information of the lead researcher. On site, boards were marked with unique numbers using a large Sharpie as they were each deployed.

Coverboards were deployed subjectively and in places thought to optimize the chances of finding terrestrial reptiles and amphibians. We placed boards near shrubs, under trees in leaf litter, near rocky outcrops or piles of sticks (Appendix A). Coverboards were initially left in place for animals to become habituated to them. They were not checked or moved for this 26-day "curing" period.

Coverboards act as a refugia for lizards, snakes, and amphibians to hide from predators or to regulate temperature. To check coverboards, we quickly flipped the board over, made observations, and if present, tried to hand capture animals resting underneath. In cool weather, reptiles and amphibians will often be sluggish and captures can be relatively easy. When animals are roaming and not found under coverboards, they are more difficult to hand capture due to increased speed and mobility from a heated environment.

Each coverboard and the surrounding area was checked 5 times over a 5-week period (Table 2). Coverboard checks were performed mid-morning and lasted 1-2 hours. NPS herpetofauna interns, Randy Viola and Lindsay Nason visited each coverboard, flipped it over quickly, and made observations of any animals underneath. On some occasions, Claire Sanders, Watershed Stewardship Program member, accompanied them to assist. In addition, they performed a visual encounter survey the entire time they were on site and made a note of any terrestrial reptiles or amphibians encountered. A total of 5 hours of survey time was conducted onsite.

Table 2. Survey Dates and Personnel.

Date & Time (2021)	Observers	Conditions	Purpose of visit
July 20 from 9:50 – 10:50 AM	Randy Viola, Lindsay Nason	Partly cloudy	Check coverboards
July 22 from 9:45 – 10:30	Randy Viola, Lindsay Nason, Claire Sanders	Sunny	Check coverboards
August 3 from 9:38 – 10:17	Randy Viola, Lindsay Nason	Sunny	Check coverboards
August 5 from 9:30 – 10:00	Randy Viola, Lindsay Nason, Claire Sanders	Sunny	Check coverboards
August 16 from 10:00 – 10:45	Randy Viola, Lindsay Nason	Sunny	Check coverboards

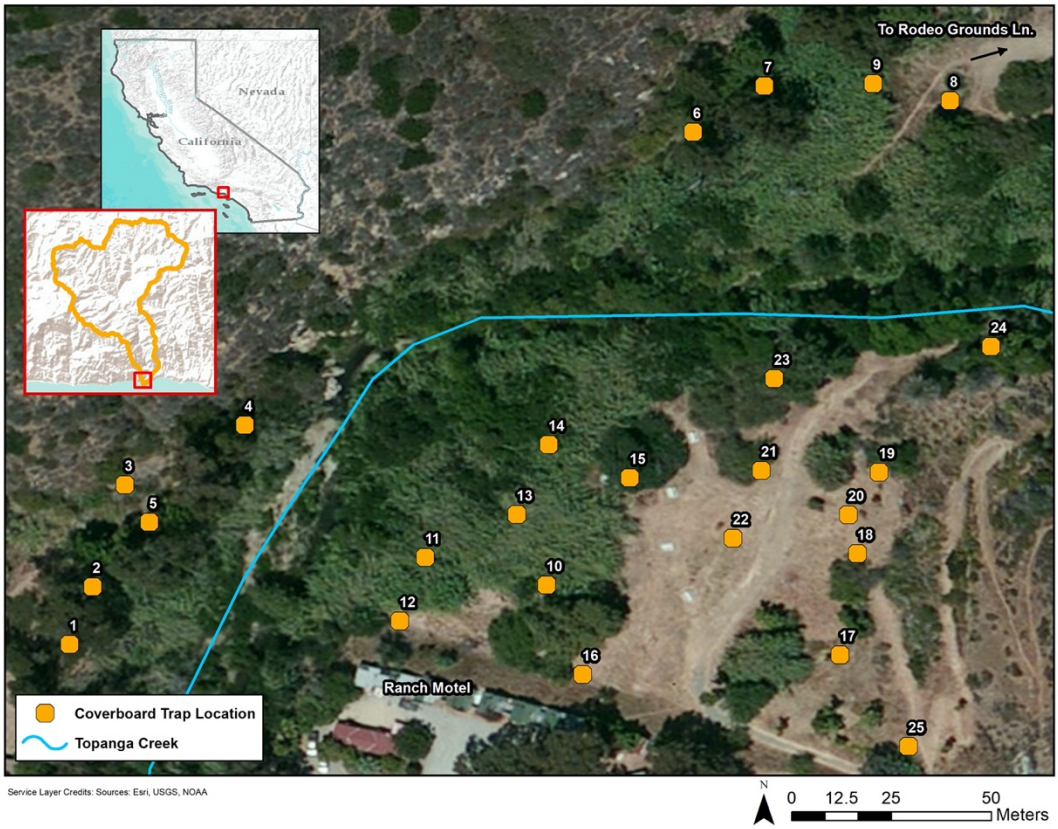

Figure 1. Map showing area surveyed and coverboard locations.

Survey Results

Over the survey period (see Table 1) there were two coverboards that disappeared from the study area and were not recovered. They were 1) coverboard 8 not found on July 20; and 2) coverboard 5 not found on August 3. Missing coverboards were not replaced.

We did not detect any reptiles or amphibians under the coverboards. We also only detected one species, the western fence lizard (*Scelporus occidentalis*). Western fence lizards are the most common species in Santa Monica Mountains and surrounding area. There were 16 observations of western fence lizards over 5 surveys (Table 3). Because they were not found under coverboards, they were not captured and marked.

Coverboards are a passive method to detect terrestrial reptiles and amphibians. The success of this method depends on the amount of time the boards are present on site, the suitability of habitat, and population abundance of targeted species. It was most like a combination of these factors that contributed to the failure of the boards to produce observations.

We only observed western fence lizards although the site has habitat characteristics that would be suitable for generalists such as Southern Pacific rattlesnake (*Crotalus oreganus helleri*), gopher snake (*Pituophis catenifer*), and alligator lizard. That we did not detect

these species was expected due the poor habitat at the site and the general transient movement of these species, especially the large snakes.

Table 3. Species observation data for coverboard surveys at Topanga Lagoon

Date	Coverboard Number	Species code	Species Name	Age	Sex	Notes
7/20/2021	near 9	SCOC	*Sceloporus occidentalis*	A	M	Under shrubbery across path
7/20/2021	near 25	SCOC	*Sceloporus occidentalis*	A	F	Running up tree across path
7/22/2021	near 10	SCOC	*Sceloporus occidentalis*	A	U	On large tree
7/22/2021	near 21	SCOC	*Sceloporus occidentalis*	A	U	In brush
7/22/2021	near 24	SCOC	*Sceloporus occidentalis*	A	M	Running across path
8/3/3021	near 25	SCOC	*Sceloporus occidentalis*	A	U	
8/3/3021	near 23	SCOC	*Sceloporus occidentalis*	A	U	
8/3/3021	near 9	SCOC	*Sceloporus occidentalis*	A	U	Jerusalem cricket in mouth
8/3/3021	near 24	SCOC	*Sceloporus occidentalis*	A	U	
8/5/2021	near motel	SCOC	*Sceloporus occidentalis*	A	U	
8/5/2021	near 7	SCOC	*Sceloporus occidentalis*	A	U	
8/16/2021	near 10	SCOC	*Sceloporus occidentalis*	A	F	
8/16/2021	very close to 11	SCOC	*Sceloporus occidentalis*	A	U	
8/16/2021	near 21	SCOC	*Sceloporus occidentalis*	A	U	
8/16/2021	near 6	SCOC	*Sceloporus occidentalis*	A	M	
8/16/2021	near 17	SCOC	*Sceloporus occidentalis*	A	F	

Potential Direct and Indirect Impacts of Alternatives

If **Alternative 1** is chosen, the terrestrial reptile and amphibian biodiversity of the Topanga Lagoon will continue to be very low. The results of our surveys showed that only one species was detected, western fence lizards. Western fence lizards are the most common species in the Santa Monica Mountains and are habitat generalists. To increase reptile and amphibian biodiversity of the area, one of the other alternatives must be chosen.

Alternative 2 provides for the largest total amount of restored habitat. However, **Alternatives 3 and 4** also provide for restoration of a higher percentage of terrestrial habitat. Any of these alternatives are favorable over **Alternative 1** for increasing herpetofaunal biodiversity. However, the removal of the Topanga Ranch Motel, in full, or partially would provide the most quality habitat for terrestrial herpetofauna (**Alternatives**

2 and 4). If left, the Topanga Ranch Motel buildings could provide some habitat for generalists such as western fence lizards, gopher snakes (*Pituophis catenifer*), and rattlesnakes (*Crotalus oreganus*) but does not provide quality habitat for other species.

Alternative 2 would provide more acreage of wetted area than other alternatives. Although the focus of this report is terrestrial reptiles and amphibians, many species prefer riparian and stream habitat, such as western pond turtles. Restored riparian vegetation will be attractive to alligator lizards, ringneck snakes, ensatina (*Ensatina eschscholtzii*), and coast mountain kingsnakes (*Lampropeltis multifasciata*). The stream itself will be highly suitable habitat for two-striped garter snakes. During most of the year, some of the stream channels will be partially dry with natural wash areas and sandy soils. This habitat would be attractive to several rare species, legless lizards and Blainville's horned lizards. Open habitat is preferred by one of the area's most common reptiles, the side-blotched lizard (*Uta stansburiana*).

Recommendations for Protection During Construction

Breeding season for reptiles and amphibians in the Santa Monica Mountains is generally springtime. For terrestrial reptiles, some, such as western fence lizard, lay eggs in moist soils and some live birth their offspring. Construction activities around moist soils and vegetation could disturb eggs.

Snakes, although not detected during our surveys are likely to be using the site intermittently. During crepuscular hours, snakes may be actively hunting or basking. Snakes and lizards should be able to avoid machinery. Often snakes will use underground burrows (e.g. ground squirrel burrows) to regulate temperature during the heat of the day. Legless lizards live most of the time in soft soils. Digging with large equipment could disrupt these animals.

We recommend that biological monitors should be on site to remove and relocate any reptiles or amphibians that are disturbed. If reptile eggs are discovered, they should be gently moved to a protected site with the same cover and soil moisture level.

Summary

Alternatives 2 and 4 are preferred because they provide the most acreage for restoration. Terrestrial herpetofauna will benefit from the riparian vegetation, stream channels, and adjacent banks. Habitat restoration of the flat areas adjacent and in the footprint of the motel will attract species from the nearby coastal sage scrub hillsides. These alternatives provide the best opportunity for increasing herpetofauna biodiversity at the site.

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APPENDIX A: Site locations and habitat descriptions of coverboards.

Coverboard Number	Habitat Notes	WGS 84 Decimal Degrees Latitude	Longitude	UTM Latitude	Longitude
1	Near eucalyptus north of rosenthals between slope and mega eupcalyptus	34.04024001	-118.5832517	353846	3767744
2	In same open area as trap 1; further north, north of giant eucalyptus in grass	34.04036985	-118.5831997	353857	3767764
3	Near Laurel Sumac on north side slope, next to path down to creek.	34.04060016	-118.5831276	353863	3767789
4	Just before slope/trail down to creek.	34.04073463	-118.5828571	353886	3767803
5	East of tiled cement floor.	34.04051584	-118.583072	353871	3767780
6	NW corner near W slope by eucalyptus and 2 sycamores	34.04139469	-118.5818484	353978	3767862
7	North of 6, W of massive eucalyptus by slope	34.04149883	-118.5816876	353996	3767888
8	NW corner by lemonaid berry and agave.	34.0414656	-118.5812694	354035	3767883
9	West of 8; Between two mega eucalyptus; in grass/euphorbia	34.04150427	-118.5814426	354020	3767888
10	NW of giant sycamore and N of willow	34.04037423	-118.5821779	353949	3767762
11	At Willows; N (in line with) the last Topanga hotel house	34.04043652	-118.5824513	353925	3767768
12	At the bottom of slope from ranch motel W side of hotel	34.04029262	-118.5825082	353921	3767752
13	N of mule fat in the middle of euphoriba patch	34.04053316	-118.582245	353945	3767779
14	Edge of willows near faun carcass	34.0406908	-118.5821731	353949	3767799
15	S of large Willow	34.040616	-118.5819907	353966	3767792
16	SE of giant sycamore under SE edge of drip line	34.04017219	-118.5820971	353957	3767741
17	E of small oak and sycamore on E side of project site	34.04021681	-118.5815176	354010	3767743
18	N of large elderberry	34.04044529	-118.5814784	354015	3767772
19	W of stone wall, On cement wall	34.04062809	-118.5814292	354020	3767791
20	Under sycamore, SW of laurel sumac	34.04053204	-118.5814989	354015	3767779
21	S of mega elderberry	34.04063206	-118.581695	353993	3767790
22	Under sycamore on W side of road	34.04047941	-118.5817588	353987	3767774
23	Under elderberry on W side of road	34.04083948	-118.5816653	353996	3767813
24	NE corner of study area behind weeds; S of palm trees.	34.04091157	-118.5811773	354043	3767821
25	N of the king snake eucalyptus. NW of the yellow gate up on raised area.	34.0400106	-118.5813635	354026	3767721

APPENDIX B

Photo: Western fence lizard at Topanga Lagoon proposed restoration site with a Jerusalem cricket in its mouth.

APPENDIX C: Coverboard Datasheets

Date: 7/20/21	Start time: 9:50
General weather: partly cloudy	End time: 10:50

Observers: Randy Viola, Lindsay Nason

Coverboards checked (mark box after each is checked)

1 ✓	2 ✓	3 ✓	4 ✓	5 ✓	6 ✓	7 ✓	8 ✓ missing?	9 ✓	10 ✓
11 ✓	12 ✓	13 ✓	14 ✓	15 ✓	16 ✓	17 ✓	18 ✓	19 ✓	20 ✓
21 ✓	22 ✓	23 ✓	24 ✓	25 ✓					

Data: If species are detected and/or captured, enter data in table below.

Board Number	Species Code	Age	Sex	SVL (mm)	Weight (g)	Notes
Near 9	SCOC	A	M	–	–	Under shelter across path
Near 25	SCOC	A	F	–	–	running up tree across path

Date: 7/22/21	Start time: 9:45
General weather: Sunny	End time: 10:30

Observers: Randy, Lindsay, Claire

Coverboards checked (mark box after each is checked)

1 ✓	2 ✓	3 ✓	4 ✓	5 ✓	6 ✓	7 ✓	8 X	9 ✓	10 ✓
11 ✓	12 ✓	13 ✓	14 ✓	15 ✓	16 ✓	17 ✓	18 ✓	19 ✓	20 ✓
21 ✓	22 ✓	23 ✓	24 ✓	25 ✓					

Data: If species are detected and/or captured, enter data in table below.

Board Number	Species Code	Age	Sex	SVL (mm)	Weight (g)	Notes
Near 10	SCOC	A	–	–	–	on large tree
Near 21	SCOC	A	–	–	–	In brush
Near 24	SCOC	A	M	–	–	Running across path

Date: 08/03/21	Start time: 9:38
General weather: Sunny	End time: 10:17

Observers: Randy, Claire

Coverboards checked (mark box after each is checked)

1	2	3	4	is 5 gone	6	7	is 8 gone	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25					

Data: If species are detected and/or captured, enter data in table below.

Board Number	Species Code	Age	Sex	SVL (mm)	Weight (g)	Notes
Near 25	SCOC	A	—	—	—	
Near 23	SCOC	A	—	—	—	
Near 9	SCOC	A	—	—	—	Jerusalem cricket in mouth
Near 14	SCOC	A	—	—	—	

Date: 08/05/21	Start time: 9:30
General weather: Sunny	End time: 10:00

Observers: Randy, Lindsay, Claire

Coverboards checked (mark box after each is checked)

1 ✓	2 ✓	3 ✓	4 ✓	gone 5	6 ✓	7 ✓	gone 8	9 ✓	10 ✓
11 ✓	12 ✓	13 ✓	14 ✓	15 ✓	16 ✓	17 ✓	18 ✓	19 ✓	20 ✓
21 ✓	22 ✓	23 ✓	24 ✓	25 ✓					

Data: If species are detected and/or captured, enter data in table below.

Board Number	Species Code	Age	Sex	SVL (mm)	Weight (g)	Notes
Near metal	SCOC	Adult	Unk	–	–	–
Near 7	SCOC	Adult	Unk	–	–	–

Date: 6/16/21	Start time: 10:00
General weather: Sunny	End time: 10:45

Observers: Randy, Lindsay

Coverboards checked (mark box after each is checked)

1 ✓	2 ✓	3 ✓	4 ✓	5 X	6 ✓	7 ✓	8 X	9 ✓	10 ✓
11 ✓	12 ✓	13 ✓	14 ✓	15 ✓	16 ✓	17 ✓	18 ✓	19 ✓	20 ✓
21 ✓	22 ✓	23 ✓	24 ✓	25 ✓					

Data: If species are detected and/or captured, enter data in table below.

Board Number	Species Code	Age	Sex	SVL (mm)	Weight (g)	Notes
10	SCOC	A	F	-	-	
11	SCOC	A	VNK	-	-	
21	SCOC	A	VNK	-	-	
16	SCOC	A	M	-	-	
7	SCOC	A	F	-	-	

APPENDIX D: Resume and Qualifications

KATY SEMPLE DELANEY

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EXPERIENCE

NATIONAL PARK SERVICE, SANTA MONICA MOUNTAINS NATIONAL RECREATION AREA (2010-PRESENT)
Wildlife Ecologist

- Project lead for terrestrial herpetofauna monitoring using pitfall trap arrays: Installation of traps, training interns, biweekly monitoring including capturing and marking reptiles, amphibians, and small mammals, data analysis and manuscript preparation.
- Project lead for aquatic herpetofauna monitoring: Conducting streams surveys for amphibians and invertebrates, data analysis and manuscript preparation.
- Project lead for re-establishment of Federally Threatened California red-legged frogs to the Santa Monica Mountains.
- Project lead for land bird monitoring using volunteer birders who conduct point counts with distance sampling, in partnership with the Western Foundation of Vertebrate Zoology.
- Supervisor to 2 full-time interns (6 month terms, year-round) and 1 biotechnician.

UCLA INSTITUTE OF THE ENVIRONMENT AND SUSTAINABILITY (2007-2009)
Environmental Research Scientist, Santa Monica Mountains Conservancy

- Created a novel and new Land Protection Plan for the Conservancy.
- The Conservancy could use the GIS-based Plan to prioritize parcels of land for acquisition based on ecological importance (e.g. increase the size of already protected parkland, improved landscape connectivity via a wildlife corridor).

UCLA DEPT. OF ECOLOGY AND EVOLUTIONARY BIOLOGY (2003-2006)
Post-doctoral Scientist, Dr. Seth Riley, National Park Service, advisor

- Effect of urbanization and habitat fragmentation on the population genetics of wide-ranging birds and lizards in the Santa Monica Mountains: Collected samples (mist-netted birds), identified genetic markers and genotyped hundreds of samples, coordinated and trained interns and student researchers, analyzed population genetic data, prepared manuscripts and annual reports for the National Park Service and United States Geological Society (funding source).
- Non-invasive monitoring of bobcats in the Santa Monica Mountains: Genotyped bobcat DNA extracted from scats to determine if routine scat collection and genetic screening was a reliable method for non-invasive population monitoring.

UCLA DEPARTMENT OF ECOLOGY AND EVOLUTIONARY BIOLOGY
Graduate student (1995-2003)
Dr. Robert Wayne & Dr. Gregory Grether, co-advisors

- Dissertation title: Evolution and behavior of Island Scrub-Jays (*Aphelocoma insularis*), Western Scrub-Jays (*Aphelocoma californica*) and sage grouse (*Centrocerus urophasianus*).
- Examination of genetic, behavioral and morphological differences between Island and Western Scrub-Jays to make inferences about the adaptations of Island Scrub-Jays to life on Santa Cruz Island. Fieldwork included population monitoring, nest finding, territory size and quality determination, nest site and territory vegetation mapping, trapping and banding birds.

Graduate student researcher (2001-2003)
Dr. Tom Smith, employer

- Microsatellite DNA library for the Black-bellied seedcracker (*Pyrenestes ostrinus*): Developed a genomic library to look for polymorphic microsatellite markers in this species which were used to asses population genetic structure and bill morphology.
- Genetic Identification of Management Units for Watershed-Dependent Species of Special Concern: Helped to identify new markers and used existing markers to genotype individuals sampled from the Central Valley of California of four bird species.

EDUCATION

- Ph.D., Ecology and Evolutionary Biology (2003), University of California, Los Angeles.
- B.Sc., Biology (1992), University of California, San Diego.

SELECTED PUBLICATIONS

Delaney, K.S., Busteed, G., Fisher, R.N., and S.P.D. Riley. (2021). Reptile and amphibian biodiversity and abundance in an urban landscape: The impacts of fragmentation and the value of small patches. Journal of Icthyology and Herpetology 109: 424-435.

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Semple, K., Wayne, R. K. and R. M. Gibson. (2001) Microsatellite analysis of female mating behaviour in lek-breeding sage grouse. Molecular Ecology 10 (8): 2043-2048.

ADDITIONAL EXPERIENCE & PARTNERSHIPS

- Participation in local conservation planning: Member of The Nature Conservancy's Scientific Advisory Group for ¡BAILA! (Biodiversity in Los Angeles) and SALSA (Stormwater and Landscape Spatial Analysis), member of the Expert Council for the City of Los Angeles' Biodiversity planning, consultant for the Los Angeles County Sustainability Plan.

- Interpretation and education: Regular engagement with visitors and staff at the Park communicating science. Community outreach through public speaking to Southwest Herpetological Society, Santa Susana Mountains Pass Association, Audubon Los Angeles, Audubon San Fernando Valley, Audubon Ventura, Audubon Conejo, and City of Calabasas. Presentations to scientific audiences at Pepperdine University, UC Los Angeles, US Fish & Wildlife Service Ventura, International Urban Wildlife Conference, The Wildlife Society Meeting, Amphibian Populations Task Force Meeting, and George Wright Society Conference.

- Grad student committee member: CSU Northridge (Sarah Wenner & Robert Hogg), University of Georgia (Micah Miles), UCLA (Joseph Curti). Postdoctoral researcher advisor: UC Los Angeles (Gary Bucciarelli).

- Partners and collaborators: California State Parks, Mountains Recreation and Conservation Authority, Santa Barbara Zoo, California State Coastal Conservancy, Santa Monica Bay Restoration Commission, Santa Monica Mountains Conservancy, U.S. Fish and Wildlife Service, U.S. Geological Survey, Natural History Museum of Los Angeles, The Nature Conservancy, Los Angeles County, City of Los Angeles, UC Los Angeles, Pepperdine University, CSU Northridge, Mountains Restoration Trust, Conejo Open Space Conservation Authority, Resource Conservation District of the Santa Monica Mountains, Heal the Bay, Western Foundation of Vertebrate Zoology.

Lindsay Nason

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Education

2021 PhD Candidate, Ecology, Evolution, & Behavior, University of Louisville.
Defense scheduled: April 15, 2021

2015 B.S. in Biology, University of Louisville, *summa cum laude*
Honors Thesis: . The effect of predator positioning and related angles on the flight-initiation distance and refuge choice of the eastern gray squirrel."

Primary Research Interests

- Best practices for wildlife conservation
- Effects of urbanization on species abundance, diversity and behavior
- Improving human-dominated landscapes to support increased biodiversity

Awards

Dean's Citation award (2021)

Dissertation Completion award (2021)

University Fellowship (2015-2020)

Earth Stewardship Initiative Fellow (2019)

Publications

Nason, L.D., Eason, P.K., Carreiro, M.M. *et al*. 2021. "Caterpillar survival in the city: attack rates on model lepidopteran larvae along an urban-rural gradient show no increase in predation with increasing urban intensity." Urban Ecosystems. https://doi-org.echo.louisville.edu/10.1007/s11252-020-01091-2

Eason, Perri K; Nason, Lindsay D.; Alexander, James E. Jr. 2019. "Squirrels Do the Math: Flight Trajectories in Eastern Gray Squirrels (*Sciurus carolinensis*)." Frontiers in Ecology and Evolution. 7:66

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Presentations

Munn, W, Nason, L, and Eason, P. (2020). The cityscape as a barrier to butterfly movement: butterflies avoid flying over buildings and tall fences when navigating urban areas. Abstract accepted for IU Animal Behavior Conference, Bloomington, Indiana. (Meeting canceled due to COVID)

Nalley, A, Costlow, M, Nason, L, and Eason, P. (2020). Flight behavior of the cabbage white butterfly (*Pieris rapae*) changes with habitat quality. Abstract accepted for IU Animal Behavior Conference, Bloomington, Indiana. (Meeting canceled due to COVID)

Nason, L and Eason, P. (2020). City slickers? The behavior of cabbage white butterflies (*Pieris rapae*) differs between urban and rural gardens. Abstract accepted for the International Society for Behavioral Ecology meeting, Melbourne, Australia. (Meeting canceled due to COVID)

Nason, L; Eason, P. (2019). The Importance of Gardens For Urban Butterfly Conservation. Poster. Entomological Society of America annual meeting, St. Louis, MO.

Nason, L; Eason, P. (2019). The Importance of Gardens For Urban Butterfly Conservation. Talk. Ecological Society of America annual meeting, Louisville, KY.

Nason, L; Eason, P; Cherry, A; Lawson, J; Carreiro, M. (November 2018). Caterpillar Survival in Urban Gardens: Assessing Predation Rates on Models of Lepidopteran Larvae Along an Urban-Rural Gradient. Poster. Entomological Society of America annual meeting, Vancouver, BC, Canada.

Eason, P; Nason, L; and Alexander, J. (April 2018). Squirrels Do the Math: Flight Trajectories in Eastern Grey Squirrels. Poster. IU Animal Behavior Conference, Bloomington, IN.

Nason, L. Urban Garden Butterfly Diversity (2017) Talk. Kentucky Society of Natural History, Louisville, KY.

Grants

(2018) U of L Graduate Student Council travel grant (intramural)

(2017) BGSA research grant

(2017) Woody Boebinger Memorial Scholarship (Kentucky Society of Natural History).

Research experience/skills

Dissertation research: How can urban gardens be improved to promote butterfly diversity and conservation? (2017-2020)

- Identified butterfly species using nonlethal techniques (binoculars, photography)
- Captured, marked, and released butterflies
- Estimated butterfly abundance
- Used scale maps to track butterfly flight patterns
- Recorded butterfly behavior observations
- Identified predators from marks left in artificial caterpillars
- Identified plant species
- Estimated plant biovolume density (a measure of plant cover that incorporates height and plant spacing)
- Estimated floral abundance
- Determined species diversity using Shannon's and Simpson's indices
- Performed statistical analyses using R
- Estimated impervious surface cover using ArcGIS® and ArcMap®
- Quantified visual data using ImageJ
- Directed undergraduate researchers
- Coordinated with multiple organizations/citizens for research site access and permissions
- Surveyed scientific literature
- Planned research methods and adapted published protocols to fit urban gardens

Assisted Megan DeWhatley, graduate student, Department of Biology, University of Louisville (2016)

- Collected freshwater snails

Assisted Gavin Bradley, graduate student, Department of Biology, University of Louisville (2015)

- Collected data on the cave salamander (*Eurycea lucifuga*)
- Traversed cave environments, including narrow squeeze-through/crawling areas

Senior undergraduate honors project: Squirrel refuge choice and escape behavior (2015)

- Recorded squirrel behavior observations

- Reconstructed squirrel escape trajectories
- Transformed compass data into angular data
- Performed statistical analyses using R
- Research assistant to William Persons, graduate student, Department of Biology, University of Louisville (2012-2014)
- Placed, monitored, and removed small animal traps
- Assisted in marking research grid
- Recorded field data
- Prepared materials for field use
- Recorded data on materials collected from the field

General Skills

- Independent fieldwork/data collection
- Collaborative fieldwork/data collection
- Species identification using binoculars (butterflies, birds)
- Statistics using R
- Microsoft Office

Professional Development

Earth Stewardship Initiative Fellow (August 2019)

- Worked with a team to make connections between city government, citizens, and other stakeholders to plan urban sustainability projects

Assisted with the UofL/Charles Covell annual butterfly count at the Horner Wildlife Sanctuary (2017-2019), a 30-year project to document change in butterfly diversity.

- Surveyed an extensive natural area to record butterfly species and abundance data

Attended "Managing Pollinators in Natural Areas: A Synthesis of New Research and BMPs Presented at the 2017 NAC AND Resource-based Competition Between Managed and Wild Bees"; Natural Areas Association Webinar (2018)

Attended Saving the Planet – Starting in your Backyard: Workshop for Landowners on Sustainable Landscape Management" (2017) Locust Grove, Kentucky.

Intern, Louisville Nature Center (2014-2015)

- Led educational hikes

- Teaching assistant for educational programs
- Removed invasive plants from the Beargrass Creek State Nature Preserve
- Extracted native flora from an area awaiting development for the purpose of transplanting them onto the preserve
- Hammered live stakes into erosion control area
- Performed office duties, ie. data management, copying, printing, and placing/answering calls
- Opened/closed the bird blind

Teaching Experience

Graduate Teaching Assistant, University of Louisville (2016-2020)

- Biol 240 honors recitation (Fall, 2020; 2 sections)
- Biol 244 2-credit majors lab (8 semesters; Spring, 2016–Fall, 2020; 11 total sections)
- Biol 102, 1-credit nonmajors lab (2 semester, Spring, 2019-Fall, 2019; 4 total sections)

Guest Lecturer, University of Louisville (2017-2020)

- Presentation on writing talks for specific audiences for Biol 203 (Scientific Literacy and Communication); 2020
- Lecture on transforming data/histograms/introduction to using R for Biol 350 (Biostatistics); 2018
- Lecture on rules of probability/binomial distribution for Biol 350; 2018
- Lecture on biodiversity for Biology 102 (non-majors biology); 2017

Mentor to Undergraduate Researchers, University of Louisville (2017-2020)

- Ashley Nalley and Madeline Costlow (Spring 2020). "Differences in flight and forgaing behavior in cabbage white butterflies."
- Whena Munn (Summer and Fall 2019). "How urban barriers affect butterfly flight behavior."
- Amy Cherry and Jessica Raley (Summer 2018). "Effects of Volatiles on Predation of Model Caterpillars."
- Amy Cherry, Jacob Lawson, Olivia Rumble, and Lauren Kappel (Summer 2017). "Predation of Model Caterpillars in Urban and Rural Gardens" and "Insect Pollinator Diversity in Gardens Across an Urban-Suburban Gradient."

STEM GTA mini-academy (Summer 2016)

- Learned and practiced techniques for more effective teaching

Tutor for the REACH program, University of Louisville (2014-2015)

- Conducted small-group tutoring sessions at the Learning Resource Center (Intro biology for majors, genetics, animal behavior, comparative vertebrate anatomy)

Service

- Biology Graduate Student Association Secretary (2019-2020)
- Biology Graduate Student Association Fundraising chair (2017-2018)
- Assisted maintenance of the Harriet A. Korfhage Native Plant Garden (2016-2020)
- Science Fair Judge for Louisville Regional Science and Engineering Fair (2017-2018)
- Mentored high school student Lucy Biberman for a science fair project on predation-response behavior of shell-dwelling cichlids. Project was presented at Louisville Regional Science & Engineering Fair. (2017)

Honors

- University of Louisville Fellow (2015-2020)
- University of Louisville Honors Program (2011-2015)
- Biology Department Award (2014)
- Dean's Scholar (Fall 2011, Spring 2012, Fall 2013)
- Dean's List (Fall 2012, Spring 2013)
- Athletic Director's Honor Roll (2011-2015)

References

1. **Dr. Perri Eason**

   Biology department chair, University of Louisville

   perri.eason@louisville.edu

   (502) 852-6771

2. **Dr. Margaret Carreiro**

   Professor emeritus, University of Louisville

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   Associate professor, University of Louisville

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APPENDIX
K

Least Bell's Vireo Report

Topanga Lagoon Restoration Project

Prepared for:
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Prepared by:
Courtney McCammon, CJ Biomonitoring

DRAFT Report Date:
August 11, 2021

INTRODUCTION **4**
SUMMARY 4
PROJECT DESCRIPTION 6
EXISTING CONSTRUCTION 8

METHODS 12

RESULTS AND DISCUSSION 14

CONCLUSION AND RECOMMENDATIONS 23

REFERENCES 49

APPENDICES 51
APPENDIX A: USFWS 2001 PROTOCOL 52
APPENDIX B: SITE PHOTOGRAPHS 52
APPENDIX C: SPECIES LISTS 59
APPENDIX D: CV FOR COURTNEY MCCAMMON 66

Introduction

Summary

CJ Biomonitoring conducted least Bell's vireo (LBVI) (*vireo bellii pusillus*) protocol level presence/absence surveys in suitable riparian habitat within the Topanga Lagoon Restoration Project area (**Figure 1**). CJ Biomonitoring qualified biologist, Courtney McCammon, conducted five (5) protocol level surveys between June 21 and July 31, 2021. No LBVI was detected within the survey area. All surveys were conducted in compliance with the United States (U.S.) Fish and Wildlife Service (USFWS) 2001 survey guidelines (USFWS 2001). The guidelines are provided in **Appendix A**.

Project Description

Location

The approximately 15-acre project area that would be disturbed includes a portion of Topanga State Park owned by CDPR on the north side of PCH (~7 acres), the Caltrans ROW along PCH including the bridge (~2 acres), and the public beach, parking lot, lifeguard headquarters/restroom and helipad managed by DBH on the south side of PCH (~6 acres). The potential work area includes the lagoon/ocean interface on the landward side of the bar-built sand berm and extends approximately 450 meters upstream into the creek with potential removal of fill on both the west and east sides. The disturbed potential work area is a subset of the overall project study area (59 acres) that extends upstream to include the former Rodeo Grounds floodplain area. The larger project study area is needed because one of the alternatives includes removal of the entire historic Topanga Ranch Motel. Feasibility for relocating overnight accommodations along Topanga Canyon Blvd. will be examined in the Overnight Accommodations and Visitor Services study (not funded by this request) and could require information about possible impacts to this section of the creek.

Project

The overall project goal is to develop an integrated final design that achieves lagoon restoration, increases recreational access, provides visitor services (CDPR has restaurant concessions and the defunct Topanga Ranch Motel) and improved emergency access by relocating the helipad, providing access under PCH, and moving the lifeguard headquarters which is currently undermined by coastal erosion.

The project team has identified the following five objectives that must be met to fulfill the purpose of the project.

1. Physical enhancement of the hydrologic function of the bar-built lagoon. This involves maintaining a natural pattern of lagoon mouth breaching, avoiding negative impacts to the surf break and littoral zone, restoration of more natural topography to benefit flood reduction, water quality and a more natural suite of habitat.
2. Biological restoration of natural gradient of native habitat that considers historic distribution, existing species needs, and future climate impacts. Protect and enhance existing habitat and fish passage for special-status species currently present site (tidewater goby, steelhead trout, grunion), nesting and roosting birds, and other special status species. Incorporate living shoreline and dune habitats that could potentially support snowy plover.
3. Preservation and interpretation of important cultural resources. This includes avoiding disturbance of any buried archaeological resources and siting bridge footings outside areas of concern. Feasibility for potential rehabilitation and use of the historic Topanga Ranch Motel for visitor services and/or overnight accommodation. Expand interpretive elements to share site history with the public.
4. Protection and expansion of recreational resources compatible with the Project purpose and landowner missions. This requires integration of coastal access, emergency response, and visitor services between CDPR, DBH, and Caltrans and would include relocation of facilities affected by SLR, infrastructure upgrades, and consideration of onsite overnight accommodations and other visitor services that are compatible with resource protection goals and landowner missions.
5. Planned management and funded maintenance to ensure long-term viability of the restoration efforts.

Existing Conditions

Like other coastal wetlands in the state, the Topanga Lagoon is a pale image of its former glory. Once almost 30 acres in size, the current Topanga Lagoon footprint is less than 1 acre. It is a naturally bar-built lagoon, meaning it is closed off (disconnected) from the ocean by a beach sand berm for long periods of time. The greater lagoon area is divided into a patchwork of ownerships and development, with many of the existing facilities showing signs of damage and is projected to further deteriorate into the future.

The northern portion of the lagoon area is owned by the California Department of Parks and Recreation (CDPR) as part of Topanga State Park. It includes remnants of the historic Topanga Ranch Motel and associated beach parking. Visitor services include a parking lot and restroom along with several concessions (Reel Inn, Cholada's, Feed Bin, Wylies, Rosenthal Winery) who lease space onsite. The Pacific Coast Highway (PCH) and aging bridge owned by the California Department of Transportation (Caltrans) bisect the lagoon and constrain the size of its mouth and channel. The lifeguard tower, beach, restrooms, and parking areas south of the PCH are managed

by Los Angeles County Department of Beaches and Harbors (DBH) and are currently experiencing significant impacts from coastal erosion and storm surges, which is projected to increase with sea level rise (SLR).

The open water areas of the lagoon are managed by CDPR and DBH and are significantly degraded due to impaired/limited habitat and water quality concerns; unmanaged human use-syringes, human feces, and trash are commonly encountered. The limited size of the open water area also exposes sensitive species to significant temperature changes with few retreat areas to use during drought, heat waves, and other extreme weather events. There is no coordinated coastal access and visitor services plan for the greater lagoon area, resulting in some facilities contributing to onsite degradation. Improved parking and overnight accommodations are in high demand locally along the coast.

Despite the existing use patterns and problems, Topanga Lagoon still hosts resources considered important at the regional, state, and national levels. A robust population of the federally endangered tidewater goby (*Eucyclogobius newberryi*) has been documented in the Topanga Lagoon since 2000. The only currently reproducing population of the federally endangered steelhead trout (*Onchorynchus mykiss*, Southern California DPS) within the Santa Monica Mountains is also present, although at very low levels. A wide range of other important species use the greater area such as protected nesting birds, state sensitive species like the arroyo chub (*Gila orcuttii*), western pond turtle (*Actinemys marmorata*), and two-striped garter snake (*Thamnophis hammondii*), among others. The beach supports a significant run of California grunion (*Leuresthes tenuis*).

Significant cultural sites are found in the uplands above and around the lagoon, underlining the importance of the greater area. These include sites associated with the Gabrielino/Tongva peoples and more recently, the historic Topanga Ranch motel. The beach adjacent to the lagoon hosts millions of visitors per year and is an important regional coastal access and recreation location. The resources within the Topanga Lagoon are varied and unique, and clearly worthy of protecting and enhancing.

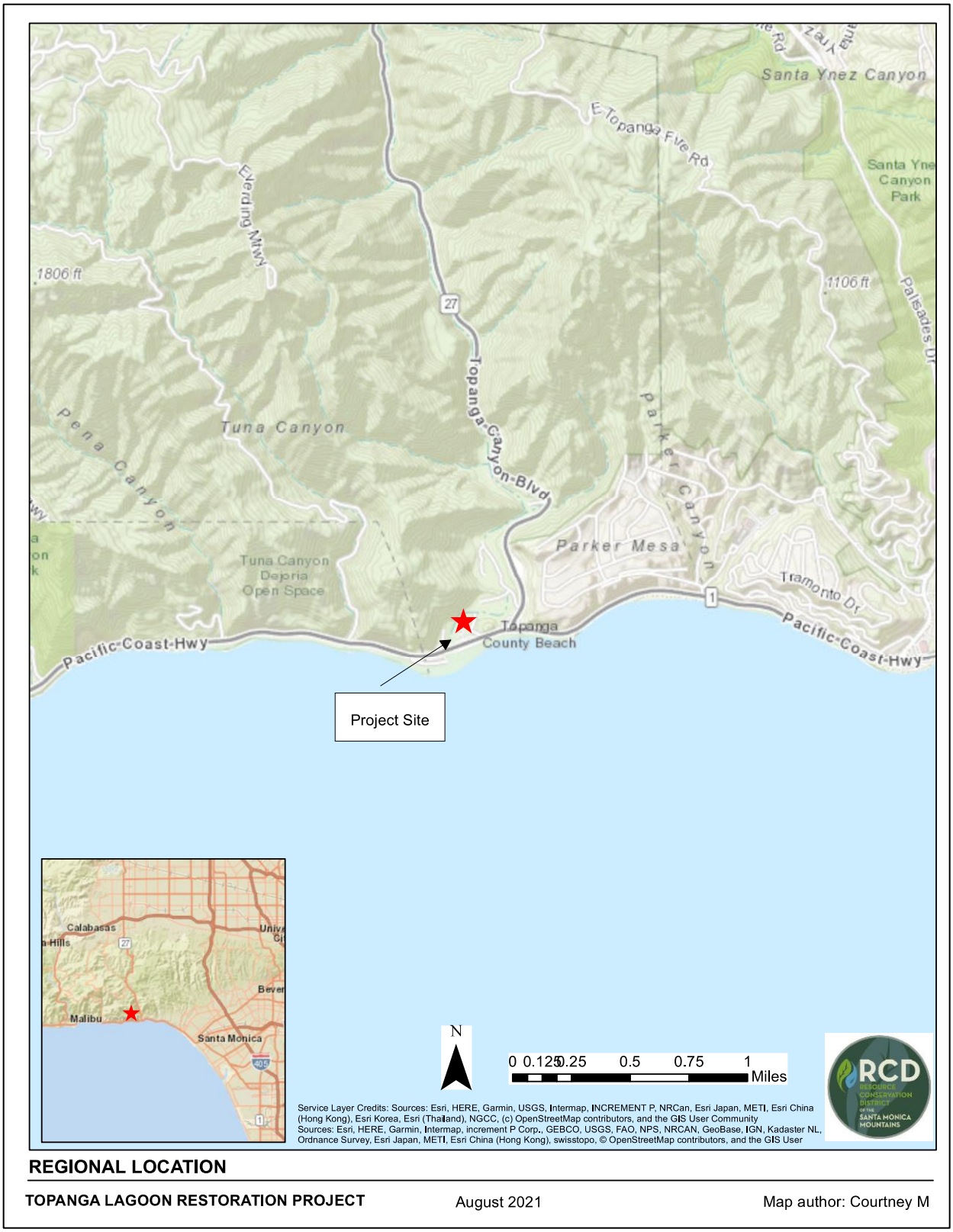

Figure 1. Map depicting project site at a local and regional scale.

Figure 2. Map depicting survey area.

Methods

The LBVI surveys followed the 2001 USFWS LBVI Survey Guidelines (**Appendix A**) (USFWS 2001). Prior to surveys, a thorough review of relevant literature and birding websites was conducted. The literature review provides a baseline from which to evaluate the potential presence of LBVI in the survey area. Suitable LBVI habitat was evaluated and mapped during initial biological surveys and vegetation mapping in _____. The following sources were among those reviewed in preparation for a field survey, or that were consulted during preparation of this report:

- Biogeographic Information and Observation System (BIOS)
- California Natural Diversity Database (CNDDB) Rarefind 5
- FWS Critical Habitat Mapper for Threatened and Endangered Species
- eBird (eBird 2016)

Five surveys at least ten days apart were conducted within the protocol survey period, June 21 through July 31. Surveys were conducted between dawn and 11:00 a.m. Surveys avoided periods of excessive or abnormal heat, rain, fog, or other inclement weather. Surveys were conducted by slowly walking survey routes through suitable habitat (USFWS 2001).

Results and Discussion

Habitat investigations were initiated in ____, to identify suitable LBVI riparian habitat in the survey area. Suitable LBVI habitat in the form of willow dominated riparian habitat was found in the area immediately surrounding Topanga Creek where it meets Pacific Coast Highway (PCH) and approximately 500-meters up stream. Suitable LBVI habitat within the study, including a buffer extending 500 feet outside of the study area were surveyed for presence/absence of the LBVI. **Figure 2** present the survey area.

Presence/absence surveys were conducted within suitable LBVI habitat by USFWS qualified biologist Courtney McCammon. Table 1 presents the survey dates and environmental conditions for the five surveys conducted from June 21 to July 31, 2021.

Table 1. Least Bell's Vireo 2021 Protocol Surveys.

Survey	Date	Start	Stop	Temperature	Cloud Cover	Wind	Valid
1	6/21/21	0558	0948	61-65	100-70	2-5	Yes

2	7/1/21	0537	0934	66-68	100-70	1-5	Yes
3	7/11/21	0530	0915	66-70	0	0-3	Yes
4	7/21/21	0624	1030	65-70	0	0-5	Yes
5	7/31/21	0538	0955	65-69	100-60	2-4	Yes

No LBVI was observed during the surveys. **Appendix A** provides a list of birds and other wildlife species observed in the survey area. Phainopepla (*Phainopepla nitens*), bushtit (*Psaltriparus minimus*), Western tanager (*Piranga ludoviciana*), Say's phoebe (*Sayornis saya*), Northern mockingbird (*Mimus polyglottos*), and hooded oriole (*Icterus cucullatus*) family groups were also observed during the LBVI survey area. American crow (*Corvus brachyrhynchos*) and western scrub jay (*Aphelocoma californica*), nest predators, were common in the survey area.

Conclusions and Recommendations

Surveys conducted from June 21 through July 31, 2021 were negative; therefore, there are currently no limitations within the study area for the LBVI. These results are valid for approximately one year. Since results are valid for one year, no further LBVI surveys should be required prior to July 2022. If construction occurs after July 2022, a LBVI presence/absence should be conducted.

References

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Appendices

Appendix A. USFWS 2001 LBVI Survey Protocol

RE: [EXTERNAL] LBV memo, Topanga

Inbox

Dellith, Chris 1:21 PM (2 hours ago)
to Dan, Jamie, Rosi

Hi Dan,

The five surveys conducted according to our protocol in June and July 2021, along with your research of least Bell's vireo occurrences in Topanga Canyon, we will consider the survey area not currently occupied and no further surveys are recommended. If you have any questions regarding this matter please contact me. Thank you.

Sincerely,
Chris

==========

Chris Dellith
Senior Fish and Wildlife Biologist
Ventura Field Office
U.S. Fish and Wildlife Service
2493 Portola Rd., Suite B
Ventura, CA 93003
Phone: (805) 677-3308
(he, his, him)

Appendix B. Site Photographs

Photographs depicting the down- (left) and up- (right) stream portions of the LBVI survey area for the Topanga Lagoon Restoration Project.

Appendix C. Species Lists

Bird list for Topanga Lagoon

Based on site visits to the property by Courtney McCammon on June 21 – July 31, 2021.

Accipitridae – Kites, eagles, and hawks

Cooper's Hawk (*Accipiter cooperii*)
Red-tailed hawk (*Buteo jamaicensis)*

Aegithalidae – Bushtit

Bushtit (*Psaltriparus minimus*)

Cardinalidae – Cardinals, Piranga Tanagers, and Allies

Black-headed Grosbeak (*Pheucticus melanocephalus*)
Western tanager (*Piranga ludoviciana*)

Columbidae – Pigeons and Doves

Eurasian collared-dove (*Streptopelia decaocto*)
Mourning Dove (*Zenaida macroura*)

Corvidae – Crows and Jays

California Scrub-Jay (*Aphelocoma californica*)
Common Raven (*Corvus corax*)

Fringillidae – Fringilline and Cardueline Finches

House finch (*Haemorhous mexicanus*)
Lesser goldfinch (*Spinus psaltria)*

Hirundinidae – Swallows

Northern rough-winged swallow (*Stelgidopteryx serripennis*)

Icteridae – Blackbirds

Bullock's oriole (*Icterus bullockii*)
Hooded Oriole (*Icterus cucullatus*)

Mimidae – Mockingbirds and Thrashers

California Thrasher (*Toxostoma redivivum*)
Northern mockingbird (*Mimus polyglottos*)

Paridae – Titmice and Chickadees

Oak Titmouse (*Baeolophus inornatus*)

Parulidae – Wood-warblers

Common yellowthroat (*Geothlypis trichas*)
Yellow-rumped Warbler (Audubon's) (*Setophaga coronata audubonì*)

Passerellidae – New World Sparrows and Towhees

California towhee (*Melozone crissalis*)
Song Sparrow (*Melospiza melodia*)
Dark-eyed junco (*Junco hyemalis*)
Golden-crowned sparrow (*Zonotrichia atricapilla*)
Spotted Towhee (*Pipilo maculatus*)

Picidae – Woodpeckers

Acorn woodpecker (*Melanerpes formicivorus*)

Psittacidae – African and New World Parrots

Lilac-crowned parrot (*Amazona finschi*)

Ptilogonatidae – Silky Flycatcher

Phainopepla (*Phainopepla nitens*)

Sylviidae – Sylviid Warblers

Wrentit (*Chamaea fasciata*)

Trochilidae – Hummingbirds

Allen’s hummingbird (*Selasphorus sasin*)
Anna’s hummingbird (*Calypte anna*)

Troglodytidae – Wrens

Bewick's Wren (*Thryomanes bewickii*)
House wren (*Troglodytes aedon*)

Turdidae – Thrushes

Western bluebird (*Sialia mexicana*)

Tyrannidae – Tyrant Flycatchers

Black phoebe (*Sayornis nigricans*)
Say’s phoebe (*Sayornis saya*)
Western kingbird (*Tyrannus verticalis*)

Vireonidae – Vireos

Hutton's Vireo (*Vireo huttoni*)

CLASS MAMMALIA – MAMMALS

Cervidae – Deer
Odocoileus hemionus californicus, California mule deer, tracks and scat

Leporidae – Hares and rabbits
Sylvilagus audubonii, desert cottontail

Sciuridae – Squirrels
Spermophilus beecheyi, California ground squirrel

CLASS REPTILIA – REPTILES

Phrynosomatidae – North American Spiny Lizards
Sceloperus occidentalis, Western fence lizard
Uta stansburiana, Side-blotched lizard

Colubridae – Colubrids
Diadophis punctatus modestus, San Bernardino ring-necked snake

Appendix D. CV for Courtney McCammon

EDUCATION

B.S., Biology,
Loyola Marymount University, 2012

M.S., Urban Ecology,
Loyola Marymount University, 2014

CERTIFICATIONS/ REGISTRATIONS

Scientific Collector's Permit #SC-13977 (exp. 1/22/22)

Certified Wildlife Tracker, CyberTracker, 2016 & 2017

CNDDB & BIOS training, CDFW, Aug, 2017

Introductory GIS class, Pace University, Fall 2017

Southwest Desert Bat Workshop, Oct. 2017

San Joaquin Kit Fox Workshop, Oct. 2017

Desert Tortoise Introductory Training, Nov. 2017

Southwestern Willow Flycatcher Workshop, May 2018

Jurisdictional Delineation Training, October 2019

EXPERIENCE

CJ Biomonitoring LLC (Nov 2017 – present)

City of Malibu (June 2019 – present)

Compliance Biology (Nov 2017 – present)

Woodstar Biological (Nov 2017 – present)

Courtney McCammon, B.S., M.S

WILDLIFE BIOLOGIST/OWNER – CJ BIOMONITORING, LLC

DETAILED PROJECT EXPERIENCE

City of San Clemente – Shorecliffs Golf Course Riparian Nesting Bird Survey and SAA compliance monitoring, San Clemente, CA (2017) Perform weekly riparian nesting bird surveys for common bird species. Perform construction monitoring to ensure accordance with SAA. Update the nest monitoring log and send to CDFW on a weekly basis.

Playa Vista Foundation – Ballona Freshwater Marsh and Ballona Corridor Nesting Bird and LBVI Survey – Los Angeles, CA (May – August 2017) Ms. McCammon performed weekly nesting bird surveys in riparian habitat focusing on LBVI presence and nesting.

FivePoint Mission Village - Newhall Ranch, CA (Nov 2017 - present) Brown-headed cowbird trapping program, camera trap study, small mammal trapping, pitfall traps, riparian nesting bird surveys, owl surveys, biological construction monitoring, capture and relocation of sensitive and non-sensitive wildlife. Additionally, Ms. McCammon assisted with least bell's vireo surveys along the Santa Clara River under the direction of a lead biologist.

French Valley Least Bell's Vireo Surveys, Murrieta- Riverside County – Jericho Systems 2018. Conducted presence/absence survey of the least Bell's vireo in the city of Murrieta, Riverside County. Documented 2 breeding pairs were observed. Ms. McCammon worked under the direction of permitted biologist Brian Karpman (10(a) 1(a) permit (TE-01768B-1)).

Las Virgenes Creek Restoration Project – Calabasas, CA (Dec 2018/Jan 2019) Approved by the FWS to monitor for California Red-legged Frog during a creek restoration project during the breeding season. Additionally, Ms. McCammon performed riparian nesting bird surveys prior to the beginning of work and during construction activities.

PROJECT EXPERIENCE

SUBCATEGORY FOR PROJECTS - GENERAL BIOLOGICAL ASSESSMENTS

- City of Malibu – Contract Assistant Biologist, Los Angeles, CA (2019-present) Ms. McCammon is the acting assistant to the Biologist for the City of Malibu conducting on-site inspections, reviewing permit applications, and attending ERB meetings She is completing approximately 20 reviews per month with oversight by the Biologist. Ms. McCammon also answers questions over email to applicants.
- Friends of Griffith Park – Raptor Survey, Los Angeles, CA (2017 – 2020) Ms. McCammon has co-managed the citizen science Griffith Park Nesting Raptor Survey for three years. Courtney made the volunteer training modules and performed the training. She co-managed all aspects of the survey including data management, volunteer management, and report writing. The results of the survey were reported and sent to the City of Los Angeles Recreation and Parks Department. Several presentations were given at the Los Angeles Zoo and the Los Angeles Public Library.

APPENDIX
L

Terrestrial Mammal Surveys for the Topanga Lagoon Restoration Project

Prepared by:
Seth P. D. Riley, PhD, Wildlife Ecologist and Branch Chief for Wildlife
National Park Service, Santa Monica Mountains National Recreation Area
401 W. Hillcrest Dr.
Thousand Oaks, CA, 91360
seth_riley@nps.gov
805-370-2358

August 30, 2021

INTRODUCTION

Terrestrial mammals represent an important part of any region's fauna, the vertebrates in particular. Mammal species cover a large range of sizes, from small rodents such as pocket mice and shrews, up to the largest terrestrial animals in most systems, ungulates and large carnivores. They also serve in many important ecological roles, from herbivores, including small (rodent), medium-sized (lagomorph), and large (ungulates) ones, to granivores (many rodents), to strict carnivores (felids), to omnivores (many members of Carnivora, such as canids and procyonids). They also can have significant impacts as ecosystem engineers, for example digging species such as ground squirrels and badgers, or aquatic species such as beavers, which create entirely new aquatic habitats through their activities. In some cases, they can be numerically dominant, both from an abundance and a biomass perspective. And there are some roles, such as the role of apex predator, that are almost always filled by mammals in terrestrial systems.

In southern California generally, and in the Santa Monica Mountains specifically, which include the Topanga Lagoon project area, terrestrial mammal diversity is quite high, in multiple different families. There are many different types of rodents, including voles, pocket mice, shrews, kangaroo rats, 5 different *Peromyscus* species, woodrats (2 spp.), ground squirrels, and gophers. There are two different lagomorphs, desert cottontails (*Sylvilagus audubonii*) and brush rabbits (*S. bachmani*), although no jackrabbits (*Lepus* spp.) currently. There is a large number and diversity of species in the order Carnivora from multiple families, including two canids, coyotes (*Canis latrans*) and gray foxes (*Urocyon cinereoargenteus*); two procyonids, raccoons (*Procyon lotor*) and ringtails (*Basariscus astutus*); two felids, bobcats (*Lynx rufus*) and mountain lions (*Puma concolor*); two mephitids, striped (*Mephitis mephitis*) and spotted (*Spilogale gracilis*) skunks; and two mustelids, American badgers (*Taxidea taxus*) and long-tailed weasels (*Mustela frenata*). There is also one marsupial, Virginia opossums (*Didelphis virginiana*), and one ungulate, mule deer (*Odocoileus hemionus*). Many of these animals have significant ecological roles, but a few of the most important are: mule deer, as the dominant large herbivore; the two rabbits, as ubiquitous and numerically important herbivores; ground squirrels (*Otospermophilus beecheyi*) and pocket gophers (*Thomomy*

bottae) as rodents that can have a major influence on soil properties and therefore on plant communities and for ground squirrels, their burrows create habitat for a wide range of other species from burrowing owls to gopher snakes to spiders; woodrats (*Neotoma* spp.) that also create habitat through the construction of their stick houses and act as seed dispersers; and finally mountain lions are the region's one apex predator, serving as the main predator on mule deer, but also preying on a range of other smaller species, including carnivores such as coyotes, raccoons, bobcats, and foxes.

In general, the existing conditions are such that mostly the site does not represent high quality habitat for terrestrial mammals, based on our experience with these taxa. This is because, although there are nearby areas on slopes adjacent to the project area that have intact native shrub vegetation, specifically coastal sage scrub, the project area itself is largely composed of degraded and non-native vegetation types, such as the extensive Arundo along the creek and the large flat area just north of the old Motel composed largely of non-native grasses, invasive Euphorbia, and mustard. That being said, many terrestrial mammal species, including the ones present in the Santa Monicas and mentioned above, can use a variety of different vegetation types as habitat and are often relatively general. This is particularly true for many of the carnivores, such as bobcats, coyotes, gray foxes, raccoons, skunks, and opossums (a marsupial, but ecologically similar to many of these species), but also true of some of the rodents, such as deer mice, both rabbits, and mule deer. It is also the case that the specific habitat requirements of many terrestrial mammal species, including relatively common ones, are often not that well understood, both generally and specifically in our local area. Finally, it is important to point out that for many of the medium-sized or large terrestrial mammals such as the carnivores and mule deer, the project area is quite small, such that it would represent only a portion, and for larger carnivores such as bobcats, coyotes, and in particular mountain lions, only a very small portion of the area in which they would live. So for these species, the activities that occur as part of the project, and for the different alternatives, will have less of an impact on populations or even individuals than they would on smaller species such as the rodents and lagomorphs. Finally, it is worth mentioning that if the vegetation in the project area were restored to intact native vegetation types such as riparian woodland with willows, oaks, and sycamores, or coastal sage scrub, this would benefit all terrestrial mammals.

Current concerns for terrestrial mammals in the Santa Monicas are similar to those for other taxa in the region. The habitat loss and fragmentation associated with a highly urban landscape such as that in the Los Angeles Metropolitan Area affects many different terrestrial mammals in significant ways. This is especially true for wide-ranging carnivores, and most significantly for the one large carnivore, mountain lions, given their huge area requirements and low population density. These urbanization effects include those from roads, especially larger freeways that serve as barriers, but there is also mortality on secondary or smaller roads. And there are urban effects that are harder to see, such as the use of toxicants like anticoagulant rodenticides by people, or the effects of people using the landscape, including both visitation in natural areas and more intensive use in areas of more intense human land use (e.g., golf courses, cemeteries,

landscaped parks). The other major current issue, again as for many other taxa as well, is the impact of wildfire, including in particular the impacts of the massive Woolsey Fire that burned almost ½ of the natural area within the Santa Monica Mountains in late 2018. Wildfires result in direct mortality and massively alter the habitat for years afterwards.

SURVEY METHODS

CNDDB/Literature Review. A CNDDB search was conducted June 10, 2021) for the Topanga quadrangle (USGS) and the 8 surrounding 7.5 minute quads.

Small mammal surveys: After a reconnaissance meeting on June 1, 2021 lead biologist Seth Riley decided that one week of trapping would be sufficient to assess the area for small mammals, based on the size and habitat quality of the project area. We set a total of 40 Sherman small mammal traps in 7 transects, with traps approximately 10 m apart. Transects A through F each had 6 traps and Transect G had 4 traps (Fig. 1).

Small mammal trapping was conducted for four nights in June, the nights of June 14, 15, 16, and 17, 2021. Trap sites were selected on June 14th, and traps were set each evening from June 14 through June 17, and checked at first light each morning from June 15 to June 18.

Seth Riley, Wildlife Ecologist for the National Park Service at Santa Monica Mountains National Recreation Area led the effort, with multiple observers participating in setting traps in the evening, checking traps in the morning, and processing captured animals: Tori Locke, Claire Sanders (Watershed Steward, RCDSMM), Thea Wang (PhD, post-doc in Mammalogy), Rosi Dagit (Sr. Conservation Biologist RCDSMM)and volunteer assistants Adrien Thein-Sandler, Ella Taghibagi, and Margot Barrett.

Medium-sized and large mammal surveys: Remote cameras were set at four sites in the project area and were active from June 29 through August 4, 2021. Seth Riley and Tori Locke selected camera sites in late June 2021, Tori set the cameras and collected and processed the photos from them.

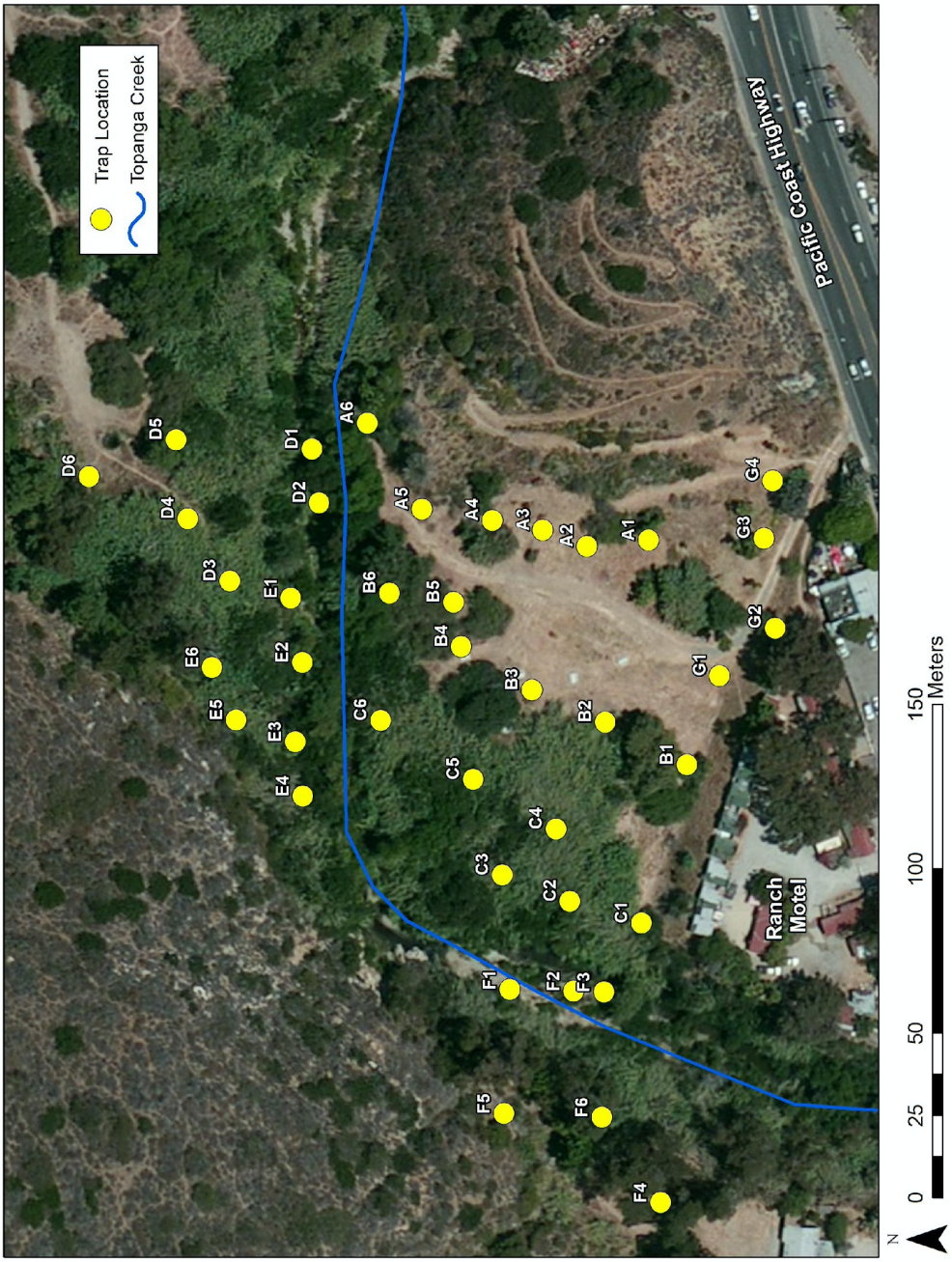

Figure 1. Small mammal trapping sites, Topanga Lagoon Restoration Site, June 2021. Transects are represented by sites with the same letter, e.g., Transect A is A1 through A6, Transect G is G1 through G4

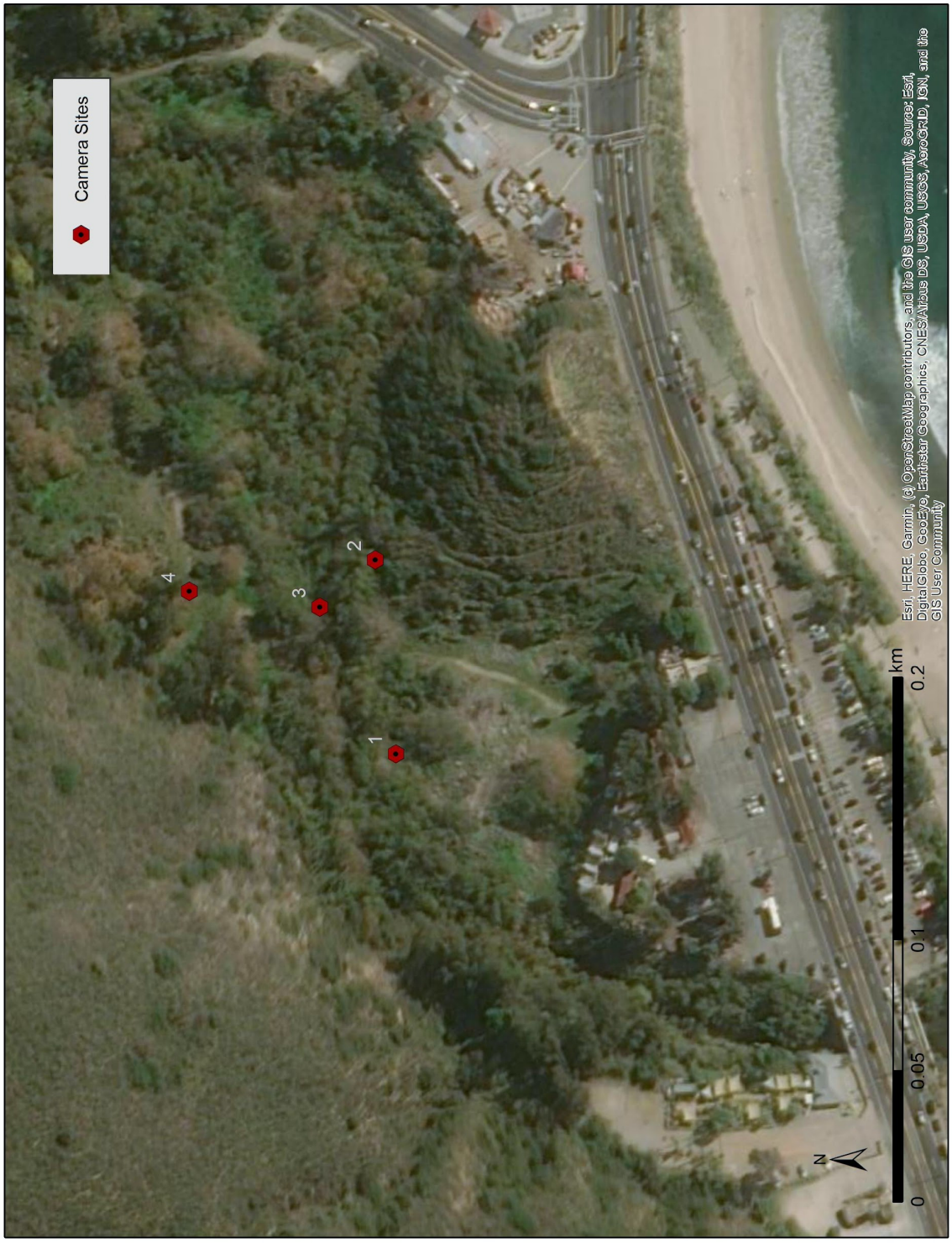

Figure 2. Remote camera sites for surveys of medium-sized to large mammals, Topanga Lagoon Restoration Site, July 2021.

Potential Special-Status Species

A CNDDB search (conducted June 10, 2021) revealed 4 special-status terrestrial mammal species recorded as occurring in the Topanga quadrangle (USGS) and the 8 surrounding 7.5 minute quads (Table 1). The habitat requirements and likelihood of occurrence for each species listed was assessed with respect to the vicinity of the Topanga Lagoon project area. We also included mountain lions, as they are currently considered to be threatened under the California Endangered Species Act, as they are being considered for listing.

Table 1. Potentially occurring special-status terrestrial mammal species.

Latin name	Common name	Fed. Status	State Status	Local habitat and range	Potential for occurrence
Neotoma lepida intermedia	San Diego desert woodrat	None	CDFW – species of special concern	Moderate to dense coastal scrub; SLO to SD Co.	Detected in surveys
Perognathus longimembris brevinasus	Los Angeles pocket mouse	None	CDFW – species of special concern	Coastal sage with fine sandy soils; LA Basin	Unlikely, lack of microhabitat.
Perognathus longimembris pacificus	Pacific pocket mouse	Endangered	CDFW – species of special concern	Coastal sage with fine alluvial sand; El Segundo to Mexican border.	No potential, not within geographic range.
Sorex ornatus salicornicus	Southern California saltmarsh shrew	None	CDFW – species of special concern	Coastal salt marsh; LA, Ven, Or Co.	Requires Salicornia. Current salt marsh habitat highly disturbed, so likelihood is low currently.
Puma concolor	Mountain lion	None	CDFW - threatened	Habitat with cover, shrub and woodlands; all of CA	Detected through other studies

The two special status species documented at the site, San Diego desert woodrats and mountain lions, are both highly unlikely to be adversely affected by the project at the population level.

For desert woodrats, although they are less common and widespread than big-eared woodrats, they are plentiful in good habitat in our experience, in the Santa Monicas and Simi Hills, and we caught five of them in just one transect at the project site. They are also specifically protected here because the fill removal is going to stop at the dirt trail on the east side of the flat area, and 5 of the 6 *N. lepida* that we caught were on Transect A, east of the trail.

For mountain lions, they range over such large areas that the project area represents a negligible amount of potential habitat and will have no effect even on one individual, let alone on the population.

Pacific pocket mice do not occur this far north, and for the Los Angeles pocket mouse, the microhabitat is not currently suitable.

Finally, for the salt marsh shrew, the remaining salt marsh habitat is south of PCH in the very heavily used area along the beach. The level of disturbance here is very unlikely to allow this species to survive there currently. However, the Lagoon Restoration Project could significantly increase the amount of salt marsh habitat available, for all of the alternatives 2-4, but especially for alternatives 2 and 4. This species, if it is still present at least in small numbers, could be one that would particularly benefit from the restoration project.

Ringtails (*Bassariscus astutus*) are a "fully protected species" in the state of California since 1968, largely because of a lack of knowledge about them at the time (or since, I would argue). In the Santa Monica Mountains, they are sometimes sighted in Malibu Creek State Park near Century Lake, and we have a few records of animals killed on Malibu Canyon Road between Piuma Rd. and Pepperdine University. Ringtails prefer rocky areas, including large boulders, with trees such as oaks nearby (D. Shier, personal communication), so there is very little chance of this species occurring at the site.

SURVEY RESULTS

Small mammal trapping: We observed five species of small mammals including two woodrat species, the big-eared woodrat (*Neotoma macrotis*, formerly the dusky-footed woodrat, *Neotoma fuscipes*; n=13 individuals) and the desert woodrat (*Neotoma lepida*; n=5), and three species of *Peromyscus*, the brush mouse (*Peromyscus boylii*; n=5), the cactus mouse (*Peromyscus eremicus*; n=5), and the deer mouse (*Peromyscus maniculatus*; n=1).

In term of location, there were differences between the transects, which make sense in relation to the nearby habitat. The B, F, and G transects each had just one species, big-eared woodrats and only five total individuals for the four nights and 60 trap nights. However, they were also all three in the worst habitat, a priori, for native wildlife, based on our experience and knowledge. The B transect was down the middle of the wide open area north of the Motel that was essentially 100% non-native forbs, specifically euphorbia (*Euphorbia lathyris*), and the one trap where we repeatedly caught the same female woodrat (black marker) was in an area of downed wood at the north edge of this open area. The F transect was along the creek at the west edge of the project area, where the habitat was dominated by non-native riparian vegetation, especially arundo (*Arundo donax*). The G transect was right along the road and along the slope at the southeast corner of the project area, again in areas without native vegetation or much vegetation structure at all. We did not expect to observe much in the way of native small mammals in any of these areas. We did think that we would potentially capture introduced species, especially black rats (*Rattus rattus*), but also potentially Norway rats (*Rattus norvegicus*), or house mice (*Mus musculus*), especially along the F transect. But in the end, we only caught native species. Non-native rats may also be particularly difficult to trap.

Along the C, D, and E transects, in each case we captured five animals of three species, and along the A transect we captured nine individuals of three species. The A transect, farthest to the east, also had some cactus scrub plants, was adjacent to better coastal sage scrub habitat up on the hill, and had more varied vegetation structure. We caught four desert woodrats here, *Neotoma lepida*, and no big-eared woodrats, while we only caught one other *N. lepida* anywhere else (site E6), which makes sense given the cactus scrub present along the A transect. Both *N. lepida* and *N. macrotis*, while broadly sympatric, are often locally separated, in our experience, based on habitat. They are also thought to be competitors, with *N. macrotis* being potentially behaviorally dominant (Cameron 1971, Cameron and Davies 1972, though see Meserve 1974).

Medium-sized and large mammal surveys: We detected nine medium-sized and large mammals with the four remote cameras from June 29 through August 4 (Table 2), seven native species plus opossums, which are naturalized in the area, and fox squirrels (*Sciurus niger*), which are considered invasive in southern California where they compete with the native gray squirrel (*Sciurus griseus*).

The observed species included five carnivores, coyotes, bobcats, gray foxes, striped skunks, and raccoons; two lagomorphs, brush rabbits and desert cottontails; one ungulate, mule deer, two larger rodents, ground squirrels and fox squirrels, and one marsupial, opossums.

Table 2. Number of detections for medium-sized to large mammal species at the 4 remote camera sites (Fig. 2) at the Topanga Lagoon restoration site, June 29 – August 4, 2021.

	Site 1	Site 2	Site 3	Site 4	# Sites
Bobcat	3	5	10	4	4
Mule deer	12	11	0	39	4
Gray fox	79	36	10	70	4
Opossum	1	3	29	1	4
Skunk	3	3	14	1	4
Rabbit[1]	100+	0	4	0	2
Fox squirrel	0	1	0	1	2
Grd squirrel	0	1	0	13	2
Coyote	0	0	0	2	1
Raccoon	0	0	1	0	1
# Native Species[2]	7	6	6	7	

[1] Rabbits includes 2 species, brush rabbits, *S. bachmani*, and cottontails, *S. auduboni*. Both species were present at Site 1, *S. bachmani* at Site 3.

[2] Species count includes both rabbits at Site 1, just *S. bachmani* at Site 3, and does not include fox squirrels.

The specific sites where these species were detected is less meaningful than it is for the small mammals, since these species move across large distances, especially the larger carnivores (coyotes, bobcats, gray foxes, raccoons) and to a somewhat lesser extent skunks and mule deer. So for all of the species, the whole project study area is a small portion of the area that they would use, and the same individual is easily able to pass by all sites. The number of detection events is also not as meaningful, since the same individual can be responsible for multiple events, both because of these are photo detections and therefore individuals are not generally identifiable, and because of the spatial considerations.

Nonetheless, we detected six or seven different larger mammal species at all four sites. And five species were detected at all four sites, bobcats, gray foxes, skunks, opossums, and mule deer. We have included a number of representative remote camera photos from the different species (Appendix A).

Regulatory status

None of the species that we observed through these surveys are listed on the federal or state endangered species lists, so there is no designated critical habitat. *Neotoma lepida* is a state species of special concern (see Table 1), although this may largely be an historical artifact – we catch them in abundance in appropriate habitat, as was evident even in this relatively small project.

The only anticipated, but not observed species would be non-native rats, specifically black rats (*Rattus rattus)*. There are other small mammals in the region, for example *P.*

truei, P. californicus, and *Chaetodipus californicus*, but they were not anticipated, based on the habitat quality. Had they been present in any numbers, we should have detected them with our small mammal trapping.

Mountain lion use of the project area: NPS has been tracking mountain lions using GPS collars throughout the Santa Monica Mountains for 19 years, since 2002. We checked the locations on a recent animal that we were tracking, female P75, who is known to use the southeast part of the Santa Monicas, specifically the Topanga Canyon Area, to see if she might have had locations in or near the project area. Looking at her points from 2019 and 2020, she was located at the northern edge of the project area on a couple of occasions, one on April 5, 2020, in the creek as it is bending to go E-W, and another in the creek farther west on November 1, 2019 (Fig. 3). This second point was during the time that she was likely feeding on a kill just to the north-west of the project area.

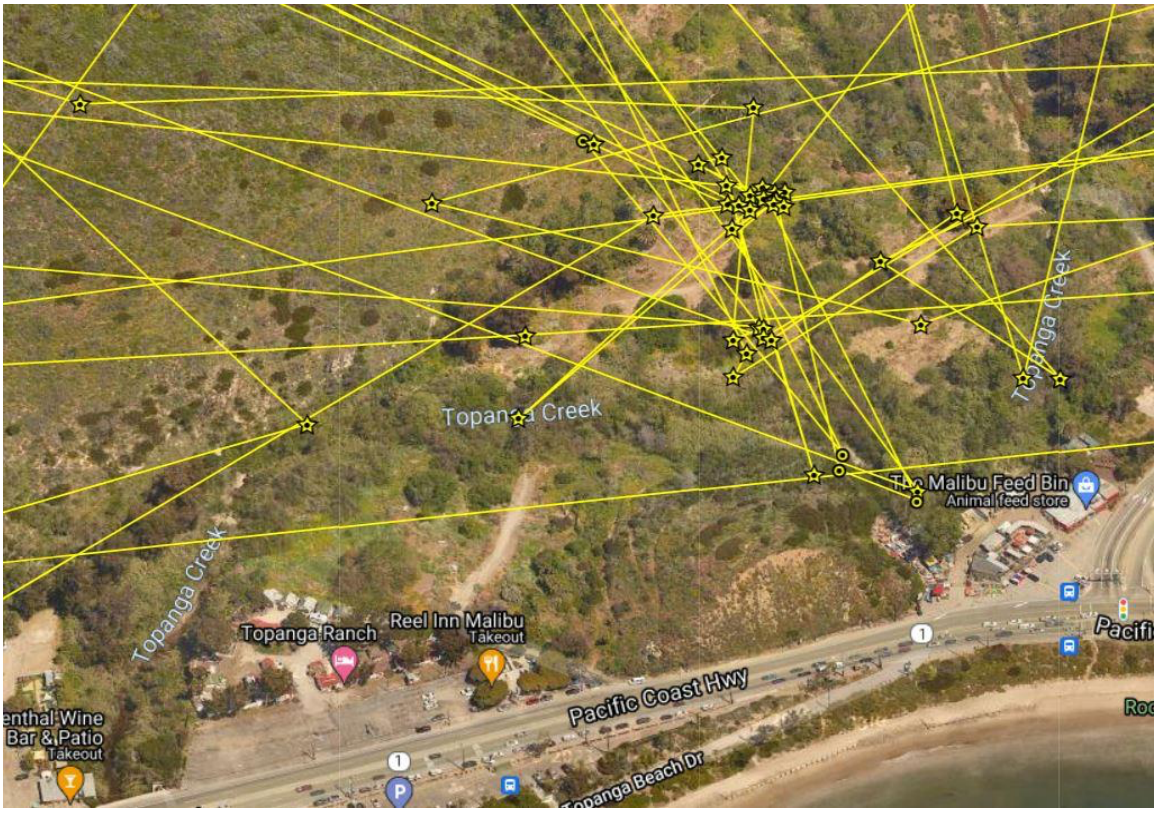

Figure 3. GPS locations from subadult female mountain lion P75 in the Topanga Lagoon Restoration area, 2019-2020. Circles indicate daytime points (0700-1600) and stars indicate night points (1700-

Potential Direct and Indirect Impacts of the proposed project

Alternative 1: This alternative, No Project/Managed Decline, will not negatively affect terrestrial mammals relative to the current site conditions, since no actions will be taken. However, it also will not benefit the mammal community in the way that the other alternatives would, through habitat restoration. Much of the habitat in the project area is currently relatively poor for native mammal species, especially along the N-S section of the creek to the west and in the flat open area just north of the Motel. As mentioned in the Results section, we caught very few small mammals in these areas, and only of one species. The flat area north of the Motel is poor habitat for all kinds of mammals, not just rodents. It is open, non-native grasses and forbs, and we have seen that for native carnivores such as bobcats and mountain lions, intact native vegetation types such as chaparral, coastal sage scrub, and riparian and oak woodlands are generally used, and even preferred, based on a recent analysis of the first 15 years of location data from our mountain lion study (Riley et al. 2021).

Alternative 2: This alternative would benefit terrestrial mammals the most in the end, since it would involve the greatest amount of increased restored habitat, as well as the most variety of habitat types along the new dendritic channel pattern. It would have the most direct impacts during construction, since the largest amount of fill would be removed, namely the whole hill where the Topanga Ranch Motel currently sits, as well as all of the flat area west of the north-south trail at the east end of the project. However, these direct impacts would also be relatively minimal, given that the Topanga Ranch Motel hill and the flat Euphorbia area are poor habitat currently, and there is not much evidence based on our surveys that many species, or individuals, of small mammals are present there. The removal of all of this fill should have very few if any effects on the medium-sized to larger mammals present, since they will easily be able to move away from any construction activities, and because the areas that they use, certainly for the carnivores and mule deer, are much larger than the footprint of this fill removal, even in Alternative 2.

The species that would be most likely to be affected would be the two rabbit species, likely desert cottontails in particular, and ground squirrels, since cottontails were observed using the motel grounds and even the parking lot, and ground squirrels prefer very open areas. However, the main place where we detected ground squirrels was farther north, north of the creek, at camera site 4 (Fig. 2). Even for these species, significant direct mortality during construction is likely to be low: they should be able to move out of the way of construction activities as they occur, since they are mobile except for very young animals (e.g., recent litters). There would potentially be subsequent indirect effects as individual animals are forced to move out of their established home ranges into unfamiliar areas, where they may be more vulnerable to predation or may overlap with conspecifics occupying the new areas.

If all of these areas were restored to the native habitats as mentioned above, it would provide the most value for the small mammals, though it would also be valuable for the

larger mammals. The proposed native communities would mean increased forage for herbivores such as the rabbits and mule deer, hunting cover for ambush predators such as bobcats and mountain lions, and riparian woodland communities that are regularly used by many different carnivore species, including raccoons, foxes, bobcats, coyotes, and mountain lions.

Alternative 3: Alternative 3 would provide significantly less restored habitat for terrestrial species, since the Topanga Ranch Motel would be essentially entirely preserved. This would mean less direct impacts on smaller mammal species living in the area at the time of construction, but the long-term benefits would be reduced. The Topanga Ranch Motel itself, even in a refurbished state, is not likely to provide a lot of habitat value for mammals, with the potential exception of desert cottontails, and potentially omnivores like opossums, raccoons, and coyotes, that can tolerate and even benefit from human presence. The lower elevation flat area north of the Topanga Ranch Motel would still be graded, and then restored, with the same kinds of initial risks and long-term habitat benefits as in Alternative 2, but in a smaller area of restoration.

Alternative 4: Alternative 4 would result in an intermediate amount of restored habitat on the Topanga Ranch Motel site, since about ½ of the Topanga Ranch Motel, the part west of the gate, would be removed, as opposed the whole thing being removed as in Alternative 2, or very little being removed as in Alternative 3. So there would be a concomitant intermediate amount of direct impact from grading of the Topanga Ranch Motel hill on the west side. This west side is up against the current creek channel, but again, the current habitat includes a lot of arundo, and we did not find evidence of a lot of native mammal diversity or abundance, so these direct effects would not likely be great. This far down the creek towards the ocean is also not likely an area that is getting much use by larger mammals as a movement corridor.

The other salient feature of Alternative 4 that makes it potentially desirable from an environmental point of view overall, is that PCH would be realigned to the north. This would have significant benefits for the beach and the lagoon habitats, but would not make much difference to the mammal community. Depending on the specifics of the realignment, one potential negative effect would be that the roadway would be moved closer to the native vegetation communities where mammals are supported, potentially increasing roadkill risk for some species. But this difference would likely be minimal, given that ½ of the Topanga Ranch Motel would still be present, and also because there is not much in the way of attractive natural habitat on the other (south) side of PCH, which should reduce the tendency of animals to try to cross. Even with beach restoration, this is not likely to change significantly for most of these species.

Recommendations for Protection during Construction

For medium-sized and larger mammals, including all of the carnivores and mule deer, there should not be much in the way of significant impacts from the construction itself, in terms of injury or death, since these species should be mobile enough to avoid the

construction activities as they occur. If possible, it would be best to avoid removing vegetation and ground disturbance in the spring season, as that is the peak reproductive season for carnivores as well as for mule deer, and younger and still dependent animals will be less able to move away from construction activities. Biological monitoring during these pre-construction disturbances should be sufficient to ensure that animals are not harmed.

The smaller species, such as rodents and potentially lagomorphs, will be more vulnerable to direct impacts from construction, such as the vegetation and removal of fill under the Topanga Ranch Motel and in the lower elevation flat area to the north of it. To the extent possible, preconstruction clearance for an area and shooing species in one direction out of a site fenced work zone with a Biologist present should be sufficient to permit these species to escape out of the work zone. Fencing that prevents them from returning into the cleared areas, and on-going Biological Monitoring should be sufficient to ensure that animals are not harmed.

Summary

Overall, despite the relatively poor quality of the habitat on the project site itself, we detected a number of different terrestrial mammal species, including five native small mammals through our small mammal trapping and seven native medium-sized to larger species with remote camera surveys. We also documented past use of the site by a female mountain lion. All of these species would benefit from the restoration of the site to more native vegetation types and the removal of non-native vegetation along the creek and in the lower elevation flat area north of the Topanga Ranch Motel. The greatest benefit for this fauna would come from Alternative 2, since the largest amount of currently disturbed and unsuitable habitat would be restored. Construction impacts on the terrestrial mammal fauna should be minimal, given the mobility of many species, and the relative lack of diversity and abundance of the less mobile species on the specific areas destined for removal.

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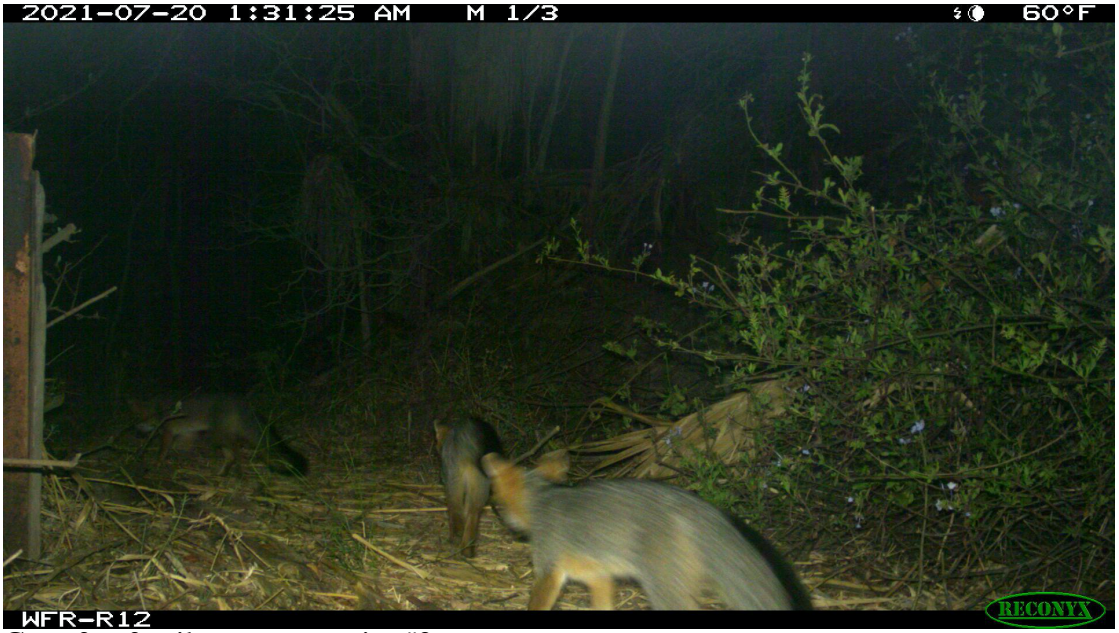
APPENDIX A: Photos from remote camera monitoring

Gray fox carrying prey (likely woodrat) at camera site #1.



Gray fox family at camera site #2.

Striped skunk at camera site #3.

Bobcat at camera site #4.

Mule deer at camera site #4.

APPENDIX B: Resumes and Qualifications

Seth Phibbs Dunmore Riley

Curriculum Vitae

Wildlife Ecologist; Branch Chief for Wildlife Office phone: (805) 370-2358
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Santa Monica Mountains National Recreation Area Email: seth_riley@nps.gov
401 W. Hillcrest Dr.
Thousand Oaks, CA. 91360
and
Associate Adjunct Professor, Dept. of Ecology and Evolutionary Biology
University of California, Los Angeles

EDUCATION:

University of California, Davis. Ph.D. March 1999, Ecology. GPA: 4.0.
Dissertation title: Spatial Organization, Food Habits, and Disease Ecology of Bobcats (*Lynx rufus*) and Gray Foxes (*Urocyon cinereoargenteus*) in National Park Areas in Urban and Rural Marin County, California.

Stanford University. B.A. June 1988, Human Biology with concentration in Animal Behavior and Ecology. Junior semester abroad, Paris.

RESEARCH INTERESTS

- Urban wildlife ecology
- Impacts of urban fragmentation on wildlife
- Conservation and community ecology of terrestrial vertebrates, especially mammalian carnivores, amphibians, and reptiles.
- Use of molecular genetic techniques to determine impacts of habitat fragmentation.
- National Park preservation and management, ecosystem management.

RESEARCH EXPERIENCE

2000 - Present. *Wildlife Ecologist for the National Park Service at Santa Monica Mountains National Recreation Area, Thousand Oaks, CA*. Managing the wildlife research and management program for the park. Conducting research on the ecology and conservation of bobcats and mountain lions in a fragmented landscape; on the abundance and distribution of terrestrial reptiles and amphibians relative to habitat fragmentation; on the distribution of aquatic amphibians and introduced exotic species in urban and natural streams; on the effects of freeways on wildlife movement and mortality; on the prevalence and effects of anticoagulant rodenticide exposure in wildlife. Also conducting long-term monitoring of reptiles and amphibians (both aquatic and terrestrial) in the park. Other projects include a long-term study of urban coyote behavior and ecology, studies of the genetics of carnivores, lizards, and birds in a fragmented landscape, recent studies of the effects of wildfire, especially the massive Woolsey Fire, on wildlife communities, and monitoring before, during, and after construction of the Liberty Canyon Wildlife Crossing. Representing the park and its wildlife program at conferences, to local agencies and residents, to park visitors, and to local and national media.

2003-Present. *Adjunct Professor (currently Associate level), Department of Ecology and Evolutionary Biology, University of California, Los Angeles, CA*. Advise graduate students and post-doctoral researchers, serve on advisory and exam committees for graduate students, teach seminar course in Applied Conservation Biology (Spring 2006, Spring 2010, Winter 2012, Winter 2014, Winter 2016, Winter 2018, Winter 2020).

1998 - 2000. *Post-doctoral researcher, Dept. of Evolution and Ecology, University of California, Davis*. Conducted research on the conservation of a native amphibian species and the potential for hybridization with exotic species. Used genetic techniques to identify native populations and the degree of hybridization with exotics.

1992 - 1995. *Wildlife Biologist for the National Park Service and National Biological Service at Golden Gate National Recreation Area, Marin County, CA*. Conducted dissertation field research on ecology, behavior, and conservation of bobcats and gray

foxes. Trapped, collared and radio-tracked bobcats and foxes. Collected and analyzed scats for food-habit studies. Analyzed data using Arcview GIS.

1987-1991. *Wildlife Biologist at the Center for Urban Ecology, National Park Service, in Washington, DC*. Conducted long-term mark-recapture population study of raccoons and radio-telemetry study of raccoon family relationships. Radio-tracked red foxes, opossums, white-tailed deer. Conducted vegetation study of white-tailed deer impacts. Responded to wildlife concerns of local national park personnel and park neighbors.

1986. *Research assistant at Center for Conservation Biology at Stanford University*. Conducted mark-recapture study of endangered butterfly species and initiated food-plant studies.

1985. *Research assistant in the Laboratory of Biochemistry, National Cancer Institute, NIH, Bethesda, MD*. Performed gel electrophoresis and gel column separations to isolate collagen molecules for study of connective tissue cancer.

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APPENDIX
M

Central Coast Bat Survey

28 June 2021

Rosi Dagit
Senior Conservation Biologist
RCD of the Santa Monica Mountains
540 S. Topanga Canyon Blvd.
Topanga, CA 90290

Re: Topanga Lagoon Bat Surveys, Topanga Canyon, Los Angeles County, CA

Dear Rosi:

On 1 June 2021, I, along with you and Claire Sanders, AmeriCorps Corpsmember serving at the Resource Conservation District (RCD) of the Santa Monica Mountains, visited your Topanga Lagoon Restoration project area located at the northwest corner of the intersection of Topanga Canyon Road and U.S. Highway 1, Los Angeles County, CA. My understanding of the project concerns as they relate to bats are primarily:

1. whether the immediate project vicinity supports bat roosts and bat foraging
2. whether planned restoration will adversely affect bat roosts or bat foraging activity

My understanding is also that the lagoon project has as its goals, restoration of the currently less than 2-acre lagoon to its historic 11 acres and:

1. improving ecological function of the lagoon
2. enhancing habitat for two protected fish: steelhead (*Oncorhynchus mykiss*) and Tidewater Goby (*Eucyclogobius newberryi*)
3. protecting shorebird nesting habitat
4. improving instream water quality
5. increasing wetland and transitional upland habitat.

I also visited RCD's long-term native vegetation restoration project aimed at enhancing the quality of the upstream of project riparian corridor of Topanga Creek with which the lagoon restoration project will integrate functionally. When making my assessment for this report I took all those factors into consideration.

Methods

At the time of our visit, I conducted a visual assessment of the site looking for potential roost sites and bat foraging habitats. As a result of that assessment, I deployed two Titley Scientific (Brendale,

Queensland, Australia) AnaBat Swift full-spectrum passive bat detectors/recorders, both fitted with Titley's US-O V3 omni-direction microphones to passively sample two areas with greatest probability in the project area to support bat activity. The detectors were set to automatically initiate and record call files in wav format from one half-hour prior to sunset until one half-hour following sunup (approx. 19:30 PM until 06:15 AM) on 1, 2, 3, and 4 June.

Detector #1 was located at 34.041255° N, 118.581980° W (WGS 84) at the edge of Topanga Creek to sample the open airspace of the western portion of the project area.

Detector #2 was located at 34.040751° N, 118.582821° W (WGS 84) in a small forest glade away from the creek and chosen to sample the eastern portion of the study area within a corridor that included *Salix* and *Baccharis*-dominated riparian scrub edge and a tall, riparian, Western Sycamore (*Platanus racemosa*) dominated woodland.

On 5 June 2021, I retrieved both detectors from the field. Subsequently, I used a suite of three analysis programs to determine the species cohort within the study area:

- Auto identification (ID) program SonoBat (author J. Joe Szewczak, Humboldt State University) to scrub (i.e., remove files that are determined to be non-bat in origin) and then analyze all but the scrubbed files.
- Auto ID program Kaleidoscope Pro (Wildlife Acoustics) to analyze all but the files scrubbed by SonoBat.
- Titley Scientific's Anabat Insight program to manually inspect and vet files assigned a high probability identification as well as those files rendered unidentified by either or both auto ID programs.

Results of Passive Monitoring

After scrubbing the call files to remove noise files, a total of 1,855 bat call files (avg. 464 files/night) were recorded over the four-night sampling period, 1104 by detector #1 (avg. 276 files/night) and 751 by detector #2 (avg. 188 files/night). From this file library, seven bat species were identified definitively. Call files of the Canyon Bat (*Parastrellus hesperus*) – approximately 70% of all identified call files - far outnumbered calls of each other species recorded and, moreover, outnumbered call files of all other species combined. The Mexican Free-tailed Bat (*Tadarida brasiliensis*) – constituting approximately 24% of all identified call files - was the second most recorded species. All other species contributed only few to several definitive call files over the four-night sampling period.

Noting first that number of bat call sequences recorded does not necessarily relate to the number of individuals present – often expressed that given 100 call files, these may represent 100 individuals each recorded once or one individual recorded 100 times (and, of course, the truth typically lies somewhere, anywhere in between) – roost-related descriptions of those species recorded during passive monitoring at the two Topanga Creek recording stations are the following:

- **Canyon Bat –** A species of arid canyons and dry shrub lands, the frequency of detection of this species during the survey can be correlated with the current arid climatology of

Topanga Canyon along with an abundance of nearby roost sites, especially within Topanga Canyon proper and the rocky formations that gird it. Canyon bats rarely roost in human-made structures, nor do they typically use mines or other cavernous formations and instead favors hill and cliffside crevices and rocky slabs, which occur in abundance immediately north of the study site. Status in project area: common (recorded on all 4 nights, >25 call files/night).

- **Mexican Free-tailed Bat** – A widespread species throughout North America – it is the most widely distributed mammalian species in the Western Hemisphere – Mexican Free-tailed Bats are also highly colonial. Maternity roosts range in size from as few as several score to the famous Bracken Cave population of more than 20 million, which also comprises the largest bat colony in the world. The most used natural roosts are caves and rock crevices on cliff faces and the species may also roost in abandoned mines and tunnels; in both large and small highway/roadway bridges; buildings; and even bat houses. Although the second most recorded species during the study period, the arid conditions that foster the local Canyon Bats meta-population and the lack of locally occurring cavernous mines and caves are factors contributing to a locally limited carrying capacity of this potentially numerous resident. The Mexican Free-tailed Bat has been documented as a bridge-roosting species in previous bats studies of Topanga Canyon (Pers. Com. R. Dagit, 1 June 2021) and my examination of several historic roost sites provided proof of current use but suggests the possibility of overall reduced numbers of this species over a two-decade period. Status in project area: common.
- **Big Brown Bat** (*Eptesicus fuscus*) – A forest-dwelling species that has also adapted to a cosmopolitan existence (including use of belfries, attics, and bridges), Big Brown Bats in non-anthropogenic situations favor daytime roosts behind loose bark of dead trees as well as tree cavities. They can be found in caves and crevices within rock formations. As is true for the Canyon Bat, naturally occurring Big Brown Bat roost habitats occur in abundance near the project. Furthermore, additional roost habitat may be provided by numerous local, especially wooden man-made structures. Status in project area: uncommon (recorded on 3 - 4 nights but fewer than 25 call files/night).
- **Western Red Bat** (*Lasiurus frantzii*) – A "solitary" species – often truly solitary, occasionally (especially male) individuals will congregate in small numbers (e.g., 3, 4 or 5 individuals) – the Western Red Bat roosts primarily in the foliage of trees or shrubs, and occasionally in rock crevices and, most often in relatively cold periods, leaf litter. The use of rock crevices is most prevalent when such habitat is near or adjacent the species' favored day roost habitats: riparian corridors with large cottonwood, sycamores, or alder trees. Favored foraging habitats are forest edge adjacent to streams or open fields and open riparian corridors. Consequently, where healthy riparian habitats have remained intact in the western U.S., the species is a common member of the bat cohort, albeit almost always in small numbers. Reduction in amount and health of riparian corridors, reduced stream flows, and lowered water tables – features often associated in the west to a combination of climate change and a suite of anthropogenic activities – has resulted in sufficiently reduced population numbers to have rendered this species a California Department of Fish &

Wildlife Species of Special Concern. Status in project area: rare (recorded on only 1 or 2 nights, < 5 call files/night).

- **Silver-haired Bat** (*Lasionycteris noctivagans*) – Another "solitary" lasiurine bat and generally considered a forest-dwelling species associated primarily with north temperate zone conifer and mixed conifer/hardwood forests, the Silver-haired Bat may be one of western North America's most ecologically misunderstood bats. Its occurrence in winter and during seasonal migrations in low elevation xeric habitats gives a hint to its probably overall more diverse habitat preferences, which helps also to explain its occurrence in currently arid Topanga Canyon. Females form maternity roosts almost exclusively in trees, typically inside natural hollows and (e.g., bird-excavated) cavities or behind exfoliating bark of large diameter snags. Hibernating individuals may be found in tree hollows including trees hollowed by disease or wildfire, behind exfoliating bark, in rock crevices, and occasionally under wood piles or in leaf litter. Apropos of its occurrence at the lagoon project area, Silver-haired Bats typically forage above the tree canopy, over open meadows, and along water courses within riparian habitats. Status in project area: uncommon (recorded on 3-4 nights but fewer than 25 call files/night).
- **California Myotis** (*Myotis californicus*) – During summer, M. californicus roost alone or in small groups in caves, mines, rocky hillsides, under tree bark, and in buildings. Recent studies in Canada have documented maternity colonies of up to 52 individuals roosting under sloughing bark, and in cracks and hollows of large diameter, intermediate stage snags (preferably ponderosa pine). In winter, solitary individuals and small groups have been found in caves, mines, and buildings. a common local bat that typically forages along stream-edge/forest edge habitats especially where they converge. Status in project area: rare (recorded on only 1 or 2 nights, < 5 call files/night).
- **Yuma Myotis** (*Myotis yumanensis*) – A species usually, almost intimately associated with permanent sources of water including rivers, streams, lakes, ponds, and reservoirs. but Yuma myotis also use tinajas in the arid West. It occurs in a variety of habitats including riparian, arid scrublands and deserts, and forests. The species roosts in bridges, buildings, cliff crevices, caves, mines, and trees. a roosting generalist (i.e., a species that may roost in tree cavities, caves, lava tubes, and anthropogenic structures) that forages over ponds and un-riffled and/or slow-moving streams. Status in project area: rare (recorded on only 1 or 2 nights, < 5 call files/night).

Discussion

General findings: Topanga Creek Corridor

The timing (6/1//2021 to 6/4/2021) and weather conditions for my passive survey (no rain, mild evening temperatures, and minimal wind) is within an optimal period and appropriate climatological conditions for a low elevation southern California bat survey. Migrant species that may have departed for winter will have returned to the area; free-tailed bats that departed for the spring swarm will have likewise reversed their short-distance migration; and species that might be less active if weather conditions are unfavorable (especially any combination of wind, rain, and cold temperatures) encountered no such conditions during the survey period.

Although I found no evidence of roosting, my roost survey was cursory and my assessment general in nature. Crevice habitats are limited to a very few rocky outcrops and both caves and mines absent from the project area. Larger, especially older, taller Western Sycamore trees are potential day, night, and maternity-roosting habitat as would be *all* trees of modest (and larger) height and girth. The project site is adjacent several structures (e.g., the Topanga Ranch Motel) constructed primarily of wood, most of which could harbor roosting bats barring protective features (e.g., wire mesh screens across attic vents).

Given those factors, the most commonly occurring species – Canyon Bat and Mexican Free-tailed Bat – most likely day roost in the canyon habitats north of and outside of the project area. Roosting habitats for the five less frequently encountered species occur throughout the project area. However, each of these species is rare to uncommon in the area.

Findings related to the Western Red Bat, a California Species of Special Concern

The Western Red Bat is an expected species given the habitat composition of the area. Habitat for foraging as well as day roosting is present and for the latter, especially in the upstream portion of the project area where taller, complex (especially sycamore) trees are a dominant feature of the landscape. As is common for this species in suitable habitats, call file records from the sampling period indicate species presence but suggest that few individuals of the species reside within the project area.

Long-term Impacts to Bats

The project as I understand it, especially in consort with RCD's habitat enhancement and restoration projects north of the specific project area, is likely to improve general foraging conditions for locally occurring bats by improving water quality (and thus promoting a more diverse insect fauna) and ultimately, albeit possibly minimally, provide for enhanced bat roosting opportunities.

Recommendations

Based on my visual inspection of the project area and results of four consecutive nights of passive acoustic sampling; specifically, that at least seven species of insectivorous bats occur, minimally for foraging and possibly for roosting within its confines, I recommend incorporation of standard best management practices that will minimize disturbance to the *in situ* bat cohort:

1. No nighttime lighting should be used except if some sort of lighting is required for public safety, such lighting should be limited and focused downward sufficient to illuminate hazards (e.g., open excavation pits) adequate to minimize danger to passers-by while not illuminating the greater air space above Topanga Creek.
2. A biologist familiar with the local bat cohort should be present if/when large trees are removed in support of the project. The biologist will be responsible for monitoring the tree-cutting process to document the presence or absence of bats that might be affected. The biologist should be familiar with the services of and have contact numbers for a local wildlife rescue and a bat rehabilitation facility in the event tree-felling results in injury to any bat.

3. Potential roost tree removal should be scheduled to avoid maternity roosting, putatively between 1 May and 1 September.
4. If structures will be removed in support of the project, a pre-demolition survey of each structure should be conducted such that a) the survey timing is adequate to arrange exclusion measures prior to demolition if warranted and b) avoids disturbance to any maternity colony.

Please do not hesitate to call or write with questions or comments pertinent to this report.

I certify that this report, to the best of my knowledge, is accurate and true.

William E Haas, Director
Central Coast Bat Survey

APPENDIX
N

TOGANGA STATE PARK
SEAFLOOR HABITAT CHARACTERIZATION AND MARINE
BIOLGICALSECOND YEAR STUDIES
JUNE-JULY 2023
SEDIMENT REUSE PROJECT FOR TOPANGA LAGOON

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Nearshore and Wetland Surveys

September 21st, 2023; Revised October 4th, 2023

TABLE OF CONTENTS

Section **Page**

1.0 INTRODUCTION 1
1.1 Results of the First Year Marine Biological Studies 1
1.2 2023 Survey Rationale 3
1.3 Project Survey Location 4

2.0 METHODOLOGY 7
2.1 Literature Review 7
2.2 2023 Field Surveys 8
2.3 Data Analysis 14
2.4 Habitat Classification 15
2.5 GIS Integration of the 2022 and 2023 Survey Information 15

3.0 RESULTS 16
3.1 Survey Conditions 16
3.2 Depth Contours 16
3.3 Intertidal and Subtidal Physical Habitat Types and Acreages 18
3.4 Review of Historical Biological Information 29
3.5 2023 Marine Biological Surveys 35
3.6 Marine Biological Habitat Classifications 63
3.7 Listed and Otherwise Sensitive Species 77
3.8 Invasive Species 82

4.0 PRELIMINARY BIOLOGICAL EFFECTS OF PROPOSED SEDIMENT NOURISHMENT ON INTERTIDAL AND NEARSHORE MARINE LIFE 85

5.0 LITERATURE CITED 92

LIST OF FIGURES

1 Project Location 5
2 Survey Limits 6
3 CRM's Research Vessel Showing Set Up for Sidescan Sonar Surveying 9
4 Towfish Positioning and Deployment on the Starboard Side of the Vessel 10
5 Hypack Navigation Software Used for Steering Vessel Along Tracklines 11
6 CRM Research Vessel Showing Setup for Sidescan Sonar Surveying 11
7 Splash Cam Video Unit 12

8 Transect Locations Intertidal and Subtidal Dive Surveys Between Topanga and Ratner Beaches. June/July 2023 13
9 Depth Contours in the Project Area....17
10 Marine Habitat Types 19
11 Cobble and Small Boulder Rocky Intertidal Habitat West of Topanga Lagoon....20
12 Cobble and Sand Intertidal to the East of the Topanga Lifeguard Station 20
13 East End of Topanga Beach- Illustrating the Nature of the Sand Beach with Some Exposed Cobble in the Lower Tide Zone....21
14a Riprap Protection at Mastro's Point, and Cobble and Rubble (Boulder) intertidal immediately east of Mastro's Point 22
14b Protective Riprap Along the Backshore, Cobble, Larger Rubble/Boulder Intertidal, and Sand Beach in the Background along Ratner Beach 22
15 Boulder and Bedrock Platform Intertidal near the Intersection of Coastline Drive and Coast Highway along Ratner Beach....23
16a Unconsolidated Bottom – Sand (with Sand Dollars) 24
16b Unconsolidated Bottom – Sand (Sidescan Sonar)....25
17a Unconsolidated – Cobble 25
17b Transitional, with Sand....26
17c Unconsolidated – Cobble/Gravel (Sidescan Sonar....26
18a Rock Bottom-Rubble 27
18b Consolidated Bottom-Rubble 27
19 Bait Ball with Shadow in Transition Area (Sidescan Sonar) 28
20 Topanga Surface Kelp Cover, 2003-2016....34
21 Rocky Intertidal Habitat West of Topanga Creek and Lagoon 36
22 Colonies of the Sandcastle Worm, *Phragmatopoma californica*....37
23 Lower Rocky Intertidal Zone at the Point East of Topanga Creek 38
24 Rocky Intertidal Habitat Surveyed East of Topanga Beach 39
25 Mid-Intertidal Habitat Along Ratner Beach....40
26 Lower Rocky Bedrock/Boulder Intertidal Habitat at Ratner Beach 40
27 Lower Intertidal Zone Dominated By Surfgrass, *Phyllospadix torreyi* at Ratner Beach 41
28 Low-Relief Habitat Composed of Cobbles and Boulders at Topanga Beach....43
29 Small Patches (1-2 m^2) of Surfgrass, *Phyllospadix torreyi* Along the 5' Isobath at Topanga Beach....43
30 Spiny Lobsters (*Panulirus interruptus*) and California Sea Hare (*Aplysia californica*) Along the 5' Isobath at Topanga Beach 44
31 Sand-Influenced Low Relief Reef Along the 10' MLLW Isobath at Topanga Beach 45

32 The Ornate Tube Worm (*Diopatra ornata*) on the Sand Bottom Along the 10' MLLW Isobath at Topanga Beach 45
33 Spiny Lobsters (*Panulirus interruptus*) Along the 10' MLLW Isobath At Topanga Beach. 46
34 Golden Gorgonian (*Muricea californica*) Along the 10' MLLW Isobath At Topanga Beach. 47
35 Sand Bass (*Paralabrax nebulifer*) Along the 10' MLLW Isobath at Topanga Beach 47
36 Low-Relief Boulders and Cobble Interspersed Between Sand Channels Were Common Along the 12' Isobath at Topanga Beach 48
37 Spiny Lobsters (*Panulirus interruptus*) Along the 10' MLLW Isobath At Topanga Beach 49
38 The Low-Relief Reef Was Dominated by Psammophytic and Sand-Resistant Algal Species at Topanga Beach 49
39 Several Horn Sharks (*Heterodontus francisci*) Were Observed Along the 12' MLLW Isobath at Topanga Beach 50
40 Spiny Lobsters (*Panulirus interruptus*) Along the 15' MLLW Isobath At Topanga Beach 51
41 The Spiny Sand Star (*Astropecten armatus*) and the Sea Pansy (*Renilla kollekerii*) Along the 15' MLLW Isobath at Topanga Beach 51
42 High-density Sand Dollar (*Dendraster excentricus*) Beds Were A Dominant Feature on the Middle Section of the 15' MLLW Isobath at Topanga Beach 52
43 The Occasional Sheep crab (*Loxorhynchus grandis)* Was Observed Along the 15' MLLW Isobath at Topanga Beach 52
44 High-Relief Reef (3' to 6') Comprised Approximately 10 to 15% of the Habitat Along the 5' MLLW Isobath at Ratner Beach 53
45a/b Large Areas of Surfgrass, *Phyllospadix torreyi*) and Sandcastle Worm (*Phragmatopoma californica*) Along the 5' MLLW Isobath at Ratner Beach. 54
46 Spiny Lobsters (*Panulirus interruptus*) and Gorgonians (*Muricea californica and M. fruticosa)* Were Common on the High-Relief Reefs on the 10' MLLW Isobath at Ratner Beach. 55
47 Rock Boring Clam (*Zirfaea pilsbryi*) Siphons Protruding Through a Cover of Sand over Rock and Cone Snails (*Conus californicus*) were Observed on the Soft Bottom of Ratner Beach 56
48 Several Garibaldi (*Hypsypops rubicundus*) Were Observed Around the Reefs at Ratner Beach. 57
49 Schools of Sargo (Anisotremus davidsonii) in Rocky Reef Habitat Along the 12' MLLW Isobath at Ratner Beach. 58

50 Garibaldi (Hypsypops rubicundus) Swimming Above Golden Gorgonian Colonies Along the 12' MLLW Isobath at Ratner Beach 59
51 Large and High-Density Sand Dollar (*Dendraster excentricus*) Beds Were Present East of Mastro's Point and Extended Several Hundred of Meters Along the 15' Isobath at Ratner Beach 60
52a/b Fluted Bryozoans (*Hippodiplosia insculpta*) and Gorgonians (*Muricea californica*) Were Common Inhabitants of the High-Relief Reefs Along the 15' MLLW Isobath at Ratner Beach 61
52c Example of Surfgrass Covering Low-lying Rock Habitat Influenced by Sand Along the 15' MLLW Isobath at Ratner Beach 62
53 Major Marine Biological Habitats 64
54 Cobble and Boulder Field Partially Buried in Sand With Algal Cover on the Surface of Rocks Not Sanded In. Some Algae is Growing Through Sand Cover 70
55 Low-Relief Boulder Reef Heavily Covered By Sand. Upright Red Algae (*Gracilariopsis*) and Articulated Coralline Algae Were Present on the Rocks.....70
56 Reef Top of 3' High Boulder with the Red Algae Gelidium, Encrusted With Bryozoans 71
57 Surfgrass (*Phyllospadix torreyi*), Along the 5' MLLW Isobath off of Ratner Beach.....72
58a/b *Muricea* spp. on Topanga Beach Low-Relief Reef (12' MLLW Isobath, Left) and on Ratner High-Relief (12' MLLW Isobath, Right).....73
59 Reef-Building Colony of the Sandcastle Tube Worm, (*Phragmatopoma californica*) 73
60a/b Lobsters Were Observed in Crevices and in Open Areas Near the Reefs 74
61 Dense Sand Dollar Bed Off of Topanga, 2022.....75
62 The Ornate Tube Worm, *Diopatra ornata*. A pipefish (*Sygnathus leptorhynchus*) is next to the Tube, Likely Feeding on Amphipods or Caprellids That Use *Diopatra* Tubes for Attachment.....76
63 Proposed Critical Habitat for the Green Sea Turtle 80
64 Initial Hydraulic Nearshore Nourishment Option. Source: Moffatt & Nichol, 2022 85
65 Sediment Dispersion Model. Source: Moffatt & Nichol, 2022.....86
66 Revised Hydraulic Nearshore Nourishment Option. Source: Moffatt & Nichol, 2023 87

LIST OF TABLES

1 Biological Habitat Types in the Project Area....18
2 Marine Deepwater Habitat Types 2022-2023....24
3 Intertidal Taxonomic Composition, June 2023....35
4 Subtidal Taxonomic Composition, July 2023....42
5 Description of Biological Habitat Types and Species of Interest....65

APPENDICES

1 Preliminary Sediment Disposal Options....97
2 Historical Surveys Conducted at Topanga Beach....99
3 Intertidal and Subtidal Species Lists for the 2022 and 2023 Intertidal/Subtidal Surveys....100
4 Special Status Species....117

1.0 INTRODUCTION

The California Department of Parks and Recreation proposes to restore Topanga Lagoon to protect endangered species and replace an aging Pacific Coast Highway (PCH) bridge and to allow for additional habitat and resiliency. The project also includes the relocation of visitor services such as parking, overnight accommodations or business leases within the affected area.

As part of the planning process, Coastal Resources Management, Inc. (CRM), Laguna Niguel, CA was retained by the Resource Conservation District of the Santa Monica Mountains (RCDSMM) to conduct a Habitat Characterization Study of Topanga Beach in 2022 (Coastal Resources Management, Inc. 2022) with the goal of identifying marine habitats and marine communities within the rocky intertidal and shallow subtidal areas in the vicinity of proposed Topanga Beach dredge material disposal in Topanga State Park. CRM conducted year-one studies between August and September, 2022.

This report presents the results of the second year of marine biological studies conducted for the project by CRM between June and July, 2023. The following provides a summary of the first-year marine biological studies, conducted in between August and October 2022.

1.1 RESULTS OF FIRST-YEAR MARINE BIOLOGICAL STUDIES

CRM surveyed and characterized seafloor characteristics using sidescan sonar and downlooking sonar techniques, surveyed and characterized the marine biological components of the Topanga Beach intertidal and subtidal habitats, and assessed the potential environmental effects of nearshore beach nourishment on the physical and biological environment in the vicinity of Topanga Beach. Specifically:

<u>Bathymetry and Seafloor Habitat Characteristics</u>

- CRM and Nearshore and Wetland Surveys (N&WS) surveyed depths within the project area that varied between -12 and -30 ft MLLW. The seafloor was not uniform in depth because of the combination of low relief rubble (boulder) fields and sand bottom habitat. Deeper than -17 ft, depth contours were uniform, and exhibited a gradual increase in depth out to the -30 ft isobath.

- The characteristics of the subtidal seafloor was surveyed using sidescan sonar techniques. The seafloor consisted of three predominate habitat types; Unconsolidated Bottom (Sand), Intermixed Unconsolidated Bottom (Sand/Rubble), and Rubble (Rock) Bottom. Unconsolidated Sand Bottom was the

dominant subtidal habitat covering 48 acres, followed by the Intermixed, Unconsolidated Bottom (12 acres), and Rubble/Cobble Rock Bottom (7 acres). The percent makeup of the seafloor was 72% sand, 18 percent mixed sand/rubble and 10% rock rubble.

- The seafloor deeper than the -20 ft contour consisted almost entirely of Unconsolidated Bottom-Sand. Between the -15 ft and -20 ft the intermixed seafloor consisted predominantly of Unconsolidated Bottom (Sand) and to a much less degree, barren individual rubble and cobble boulders (<2 ft high) that were mostly buried and affected by scour and burial. A large portion of the low-relief Rubble (Rock) reefs (<3 ft high) were partially, or fully covered by a seasonably-variable but relatively thin veneer of Unconsolidated Bottom (Sand). Between -10 and -15 ft Rubble (Rock Bottom-Rubble reefs (<3 ft in height) were dominant. Some areas however, exhibited higher relief, mostly in the eastern third of the survey area approaching and east of Mastro's Point. In all hard bottom habitat, the low-relief reefs were partially buried in sand with extensive sand channels running through the reefs.

- No other identifiable bottom features were present in the sidescan records or observed by the biologist-divers, including pipelines, other structure, or features of archeological significance.

- Topanga Beach intertidal habitat encompassed 15.9 acres and consisted of 7.7 acres of unconsolidated sand, and 8.2 acres of cobble/boulder mixed with sand and shell debris.

<u>Marine Biological Communities</u>

- Forty-seven taxa of plants and invertebrates were recorded during the October 2022 intertidal reconnaissance survey. Red algae contributed the highest number of species (11) followed by gastropods (10) and brown algae (7). These three groups accounted for 59.6% of the total number of species observed during the survey. Five species were consisted abundant; the green algae E*nteromorpha* sp., a brown algae ectocarpoid "fuzz", filamentous red algae, colonial diatoms, and the blue-clawed hermit crab *Pagurus samuelis*. These taxa were ubiquitous between the high tide zone and the low tide zone, but more frequently occurring within the mid intertidal zone.

- Subtidally, thirty-five (35) taxa of marine organisms were observed along four dive transects swam at depths between -9 and -30 ft MLLW, across depth

gradients. The number of taxa, included 7 algae and 1 seagrass (22.9%), 21 invertebrates (60%), and 6 species of fish (17.1%). Twenty taxa (57.1%) were found in low-relief reef habitat and while 15 (42.9%) were associated with sand bottom habitat.

1.2 2023 SURVEY RATIONALE

Based upon resource agency comments and project partner comments on the CRM 2022 report, second-year marine studies were recommended and then initiated by CRM to provide additional information to supplement the database of information and fill in data gaps in areas under sampled in 2023.

Sidescan Sonar. The scope of work for 2023 included:

- Fill in data gaps in seafloor habitat types off of Topanga Beach, particularly in the shallow water areas less than 20 ft deep
- Conduct a full scale sidescan sonar survey east of Mastro's Point where potential beach nourishment material put into the littoral current may migrate in an easterly (downcoast) manner
- Utilize the information in refining study area characteristics that will assist Moffatt & Nichol in development of their sediment transport computer model for the project

Intertidal Habitat and Biology. The scope of work for 2023 included:

- Fill in intertidal "gap" areas on Topanga Beach not surveyed in August 2022. This included the area of west Topanga Beach between the sheet-metal groin at the west of Topanga Beach to the mouth of Topanga Creek, and the portion of the beach located east of the Topanga Beach lifeguard tower beach to Mastro's Point; and
- Conduct an intertidal survey east of Mastro's Point encompassing Ratner's Beach extending to the beginning of Castle Rock Beach.

Subtidal Habitat and Biology. The scope of work for 2023 included:

- Fill in subtidal "gap" areas between the surf zone and depths of -15 ft that were under sampled during the 2023 surveys. Based on the results of the June 2023 sidescan survey, and using the results of the target species identification results from that survey, CRM conducted focused surveys off of Topanga Beach and east of Mastro's Point along Ratner Beach to confirm and/or identify sediment types, marine community components, Essential Fish Habitat (EFH) and the presence of sensitive or species of interest (i.e., surfgrass, spiny lobster, sea pansies, and sand

dollars) in the region down current of proposed sediment discharge off of Topanga Beach.

1.3 PROJECT LOCATION

The project site is located at Topanga Beach, in the County of Los Angeles (Figure 1). As part of the Lagoon's restoration, material removal is required to increase the footprint of the lagoon. One option is to place the materials in the nearshore waters off of Topanga State Beach, Los Angeles County, California at depths ranging from -16 to -30 feet Mean Lower Low Water (MLLW) that may directly or indirectly affect resources in these areas.

In order to obtain additional baseline information of the nearshore habitat where material placement is proposed and areas that may be influenced by material placement activities, CRM and N&WS conducted seafloor habitat mapping surveys, and CRM conducted intertidal and subtidal marine biological surveys between the western extent of Topanga Beach and the region east of Topanga Beach between Mastro's Point to and including Ratner Beach in 2023 (Figure 2). The purpose, as identified in Section 1, was to provide additional data to augment the 2022 survey and report with the ultimate goal to assess the effects of beach material placement on marine resources within the Topanga Beach subtidal habitat proposed for material placement (receiver area), and subtidal/intertidal areas east of Mastro's Point, down current (east) of the Topanga Beach receiver site.

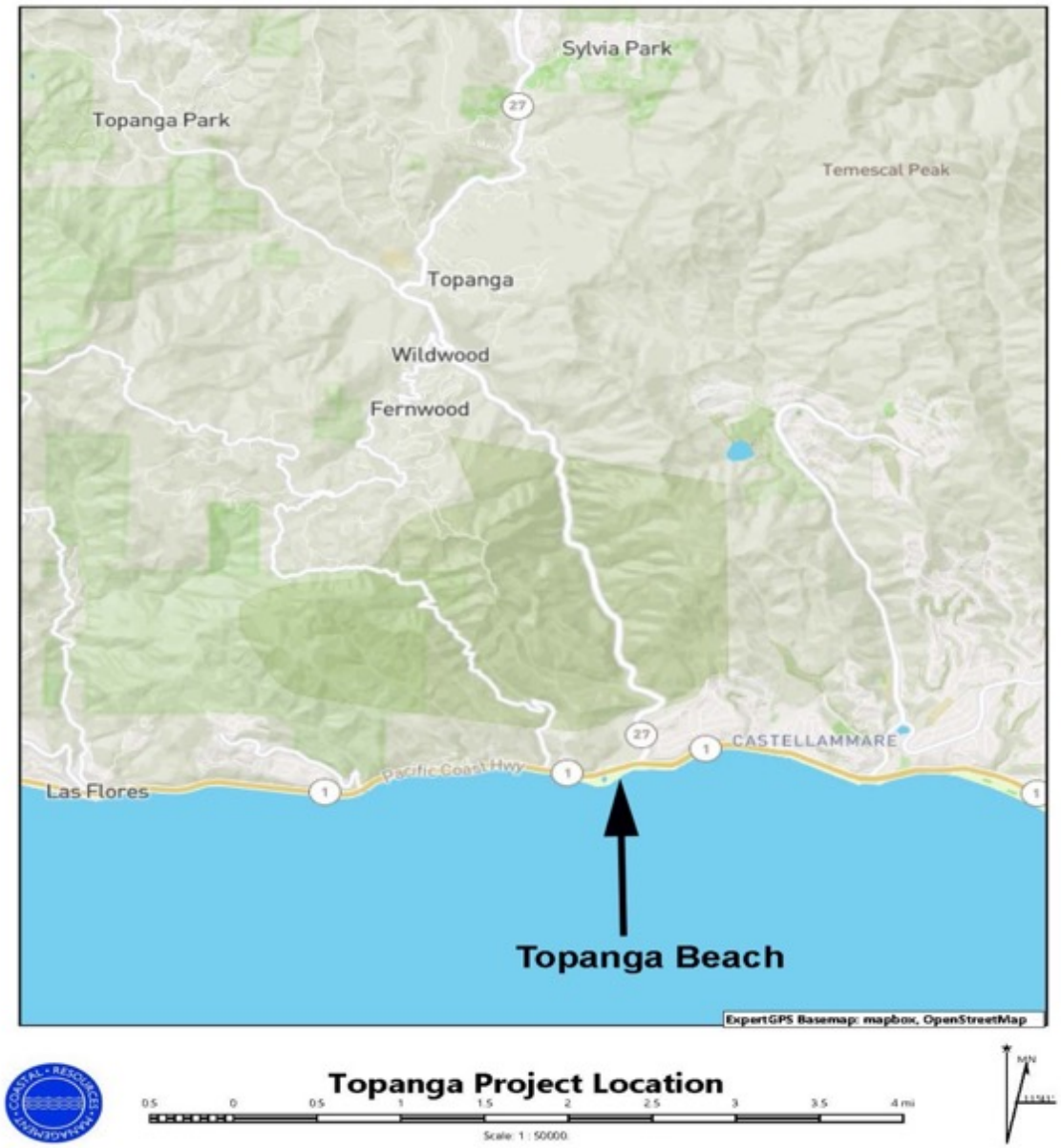

Figure 1. Project Location

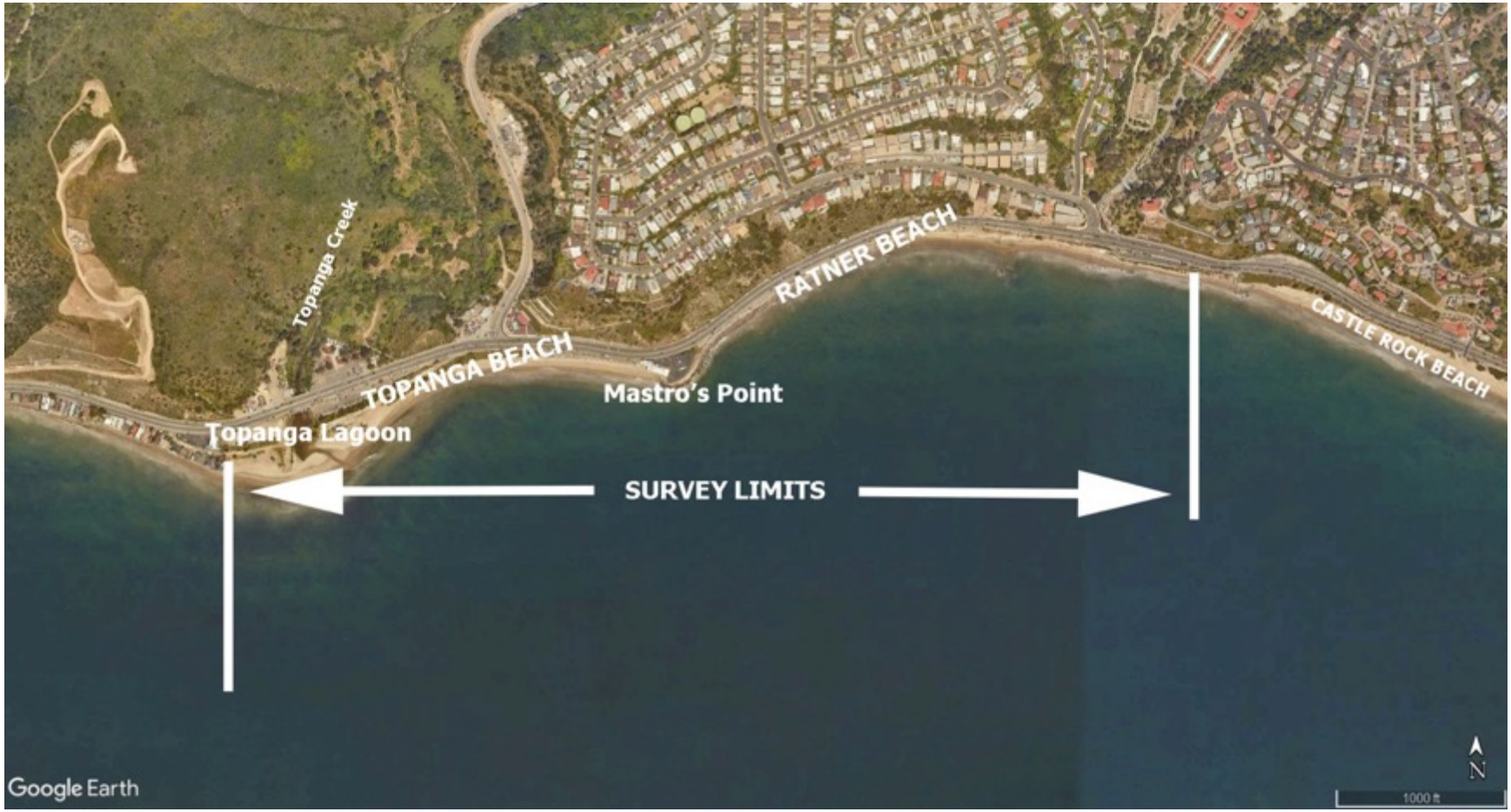

Figure 2. Project Limits

2.0 METHODOLOGY

2.1 LITERATURE REVIEWS

CRM conducted a literature review of existing data bases and reports per requirements of the 2022 project Task Order. This information is relevant to the 2023 report, and is included in this report.

(1) Biological Database Classification Systems

- Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al., 1979). This document provided the basis for the classification of bottom types and vegetation types recorded during the survey via sidescan sonar, downlooking sonar, and remote video camera surveys.
- California Department of Fish and Wildlife (CDFW) Marine Region 7 GIS Data Downloads (kelp, surfgrass, eelgrass, and artificial reefs). These databases were the most useful, providing clear and informative GIS maps that summarized historical conditions in the project area.
- Kelpwatch.org Online database of kelp bed distribution for the Topanga Beach area. This database provided sequential year database graphic in a general manner, relying on CDFW kelp maps. Helpful to a certain extent, but not as much as the CDFW Region 7 GIS Data downloads.

(2) Google Earth© Aerial Photos of the Project Area

Historical aerial photos (1995 to date) were reviewed to identify hard bottom areas in the project area, centered on Topanga Beach. These aerial maps were helpful in identifying potential hard bottom habitat, historical kelp beds, inter-annual variation in kelp surface canopy, as well as the cycle of erosion and accretion of sand (and exposure of rocky habitat) on Topanga Beach. In addition, recent aerial drone photography and videography shot by Mr. Bernard Yin on June 6th, 2023 and provided to RMD and CRM was reviewed in reference to Topanga and Ratner Beach shoreline characteristics at the time the drone was deployed.

(2) Marine Biological Surveys That Included Detailed Data and Species Lists

- 1974 Los Angeles County Underwater Resources Inventory, by Glen H., Egstrom
- 1994 Cal Trans District 7 Malibu Marine Biological Inventory and Impact Assessment Dive and Intertidal Survey Report prepared by Coastal Resources Management, Inc. in October 1994 for LSA Associates, Inc.
- 1997 County of Los Angeles Department of Public Works Marine Biological Resources Inventory and Environmental Assessment-Evaluation of Proposed

Malibu Placement Sites Study, Los Angeles County, CA. Prepared by Coastal Resources Management, Inc. October, 1997.

- 2022 Coastal Resources Management, Inc. Nearshore Habitat Characterization Study for the Topanga Lagoon Restoration Project. Prepared for the Resources District of the Santa Monica Mountains. December 2022.

2.2 2023 FIELD SURVEYS

The survey employed sidescan sonar and downlooking sonar technology to identify marine habitat types, identify bottom types (e.g., rock, sand), identify aquatic vegetation (e.g., kelp, eelgrass, surf grass, algae), identify any large objects (wrecks, debris, etc.), and anticipated resources that are known from or potentially present within the identified survey area. CRM conducted marine biological surveys of the nearshore benthic habitats and the rocky intertidal zone along the Topanga State Beach shoreline.

The surveys were conducted between June and July 2023. Seafloor mapping surveys were conducted on June 28th-29th; rocky intertidal surveys were conducted on June 8th-9th, 2023; and dive surveys were conducted between July 11th and July 13th, 2023.

2.2.1 Field Personnel. Habitat mapping survey personnel included Mr. Rick Ware (Principal Investigator/Senior Marine Biologist, CRM), Mr. Rick Hollar (Senior Coastal Engineer, N&WS), and Mr. Steve Graham (N&WS, Skipper); nearshore dive personnel included Mr. Rick Ware (Principal Investigator/Senior Marine Biologist), Dr. Stephen Whitaker, (Marine Biologist, University of California, Santa Barbara; and Mr. Mike Anghera (Marine Biologist),. Rocky intertidal personnel included Mr. Rick Ware (Senior Marine Biologist), Dr. Stephen Whitaker), and Ms. Elaine Valentine Ware (Field Assistant). Mr. Bernard Yinn provided aerial drone video and still photography.

2.2.2 Sidescan and Downlooking Sonar Survey Methodology

Sidescan and downlooking sonar mapping tasks focused on seafloor mapping, ground-truthing seafloor types, and identifying marine habitats and marine organisms using a remotely deployed underwater video system. The marine biological dive survey focused on confirming seafloor habitat types determined remotely, and characterizing the marine biological community plants and animals associated with the seafloor, including the presence of sensitive marine habitats and species. These tasks were performed from CRM's 22 ft Carolina Skiff (Figure 3) outfitted with full navigation, downlooking sonar, sidescan sonar, and davit for deployment of gear. CRM launched from Marina del Rey (MDR Harbor) each morning at 0700 and return to MDR Harbor each day by 1600 hrs.

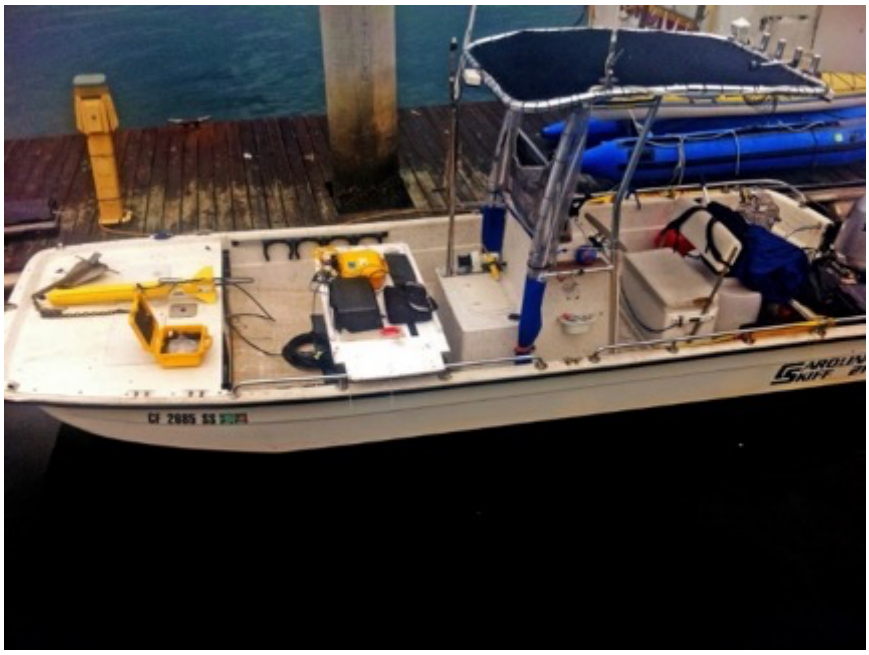

Figure 3. CRM's Research Vessel Showing Set Up for Sidescan Sonar Surveying

The following equipment was used to conduct the study:

- Hemisphere VS330 Differential Global Positioning System (DGPS) Receiver,
- Edgetech 4125D Sidescan Sonar System with 400/900 kHZ Towfish and Edgetech Discover Software,
- Odom Hydrographic Hydrotrac II Depth Sounder,
- SBG Equinox Motion Sensor,
- Valeport Velocity Probe, and
- Hypack Max Hydrographic Data Acquisition and Processing Software.

Positioning: Horizontal positioning for the survey was achieved using a real time DGPS positioning system. WAAS Differential Corrections were used to correct the raw GPS data. The horizontal datum was North American Datum of 1983 (NAD83), epoch 2011.0, the projection was California State Plane Coordinate System Zone V, and the units were US Survey feet. The vertical datum was Mean Lower Low Water (MLLW), epoch 83-01 based on recorded water level data from the National Oceanic and Atmospheric Administration (NOAA) tide gauge located on the Santa Monica Pier (Station 9410840). The bathymetric and DGPD data were recorded using the Hypack Max logging and acquisition software. Bathymetric data, collected simultaneously with the sidescan sonar data, was corrected to Mean Lower Low Water datum. Depth recording error was +/- 0.17 ft (2 inches).

Sidescan Sonar Data Collection: The sidescan towfish was flown from the starboard bow of the survey vessel to minimize signal contamination from the propeller wash (Figure 4).

Two Hypack line files was created with transects oriented roughly shore-parallel and spaced 50 ft apart. The first line file consisted of 11 lines (total length 20,400 ft) located west of Mastro's Point and offshore of Topanga Beach and inshore of the 2022 survey area. The second line file consisted of 30 lines (total length 86,900 ft) located east of Mastro's Point and offshore of Ratner Beach. Using the navigation display of the Hypack online software, the vessel was steered along pre-planned tracklines (Figures 5 and 6).

The Edgetech 4215D Sidescan Sonar System with the 400/900 kHz towfish was operated at the 20-meter (65 ft) range (each channel) providing greater than 100% data overlap. Sidescan sonar and DGPS data were recorded using the Edgetech Discover software and processed using Chesapeake SonarWiz Software to produce a compilation of rectilinear corrected composite image mosaics. The position of the towfish was determined by applying an offset to the vessel's position based on a layback as resolved from the vessel's heading and the amount of sonar tow cable laid out. Towfish altitude above the seabed was recorded continuously and used for data slant range correction. Sounding data were recorded using Hypack software at the same time as the sidescan sonar data. A sound velocity profile was recorded prior to the onset of data collection and after completion of data collection.

Figure 4. Towfish Positioning and Deployment on the Starboard Side of the Vessel

Figure 5. Hypack Navigation Software Used for Steering Vessel Along Tracklines. Steering Position Was Relayed Via Monitor to Skipper

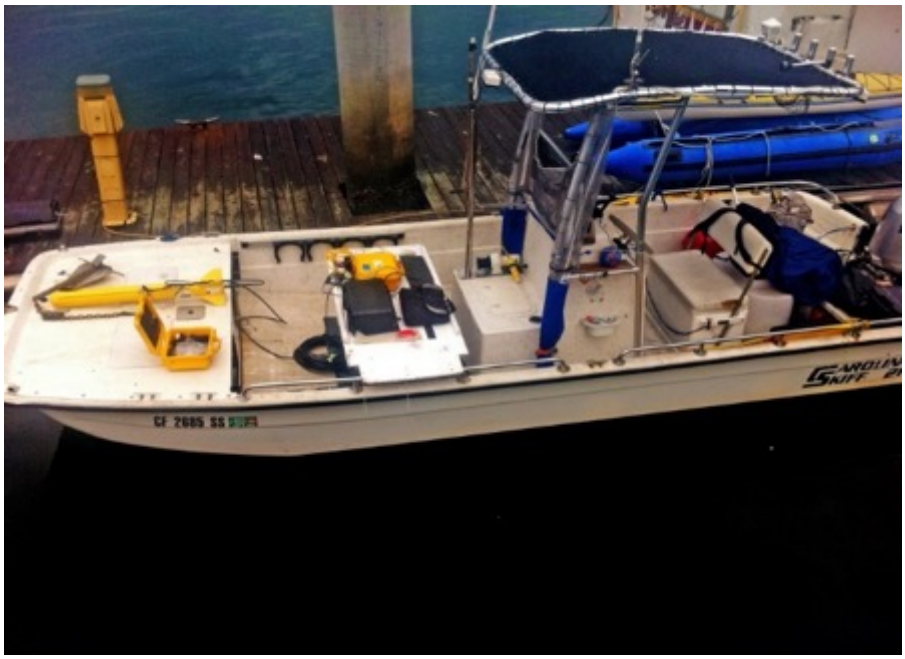

Figure 6. CRM's Research Vessel Showing Set Up for Sidescan Sonar Surveying

Occasional schools of bait fish were observed through the study area but were sparser than noted during the 2022 survey. The presence of the bait balls resulted in spurious images in the sidescan record.

Sidescan Target Verification Survey. While the sidescan sonar survey lines were being run, GPS waypoints were marked at locations that depicted the various bottom types and the presence of submerged aquatic vegetation (SAV). These waypoints were then used to conduct follow-up video target surveys on June 29th, 2023 to verify seafloor habitat types recorded by sidescan sonar.

An Ocean Systems Deep Blue "Splash Cam" (Figure 7) equipped with a GoPro 5 video camera was used to view and record seafloor habitat types and dominant marine community characteristics at 24 selected locations.

The unit was deployed from the vessel's davit. Run times varied from 30 seconds to 5 minutes. The Deep Blue Splash Cam video was viewed real-time onboard during the survey.

Figure 7. Splash Cam Video Unit

2.2.3. Biological Surveys

Intertidal Surveys. CRM biologists conducted an intertidal survey on June 8th and June 9th, 2023 from the western extent of Topanga Beach to the eastern extent of Ratner Beach, located east of Mastro's Point (Figure 8).

The survey focused on characterizing the presence and abundance of common macro algae and invertebrates, as well the presence of sensitive and indicator species such as surfgrass (*Phyllospadix torreyi)*. Rare, highly cryptic species were recorded when observed but no concerted effort was made to search for them. Species were recorded

during visual surveys of the intertidal zone along with their relative abundance in the community. Photographs were taken to document habitat types and dominant species.

The rocky intertidal habitat at Topanga Beach was surveyed on foot from approximately 230 meters (754.4 feet) west of the mouth of Topanga Creek downcoast to the sand beach east of the rocky point in front of the lifeguard building. In addition, the west side of the riprap below Mastro's Ocean Club was surveyed along with the entire Ratner Beach rocky shoreline. (Figure 8). Biologists walked the shoreline during low tide recording all organisms observed to the lowest taxonomic level possible and photographing representative habitats and taxa.

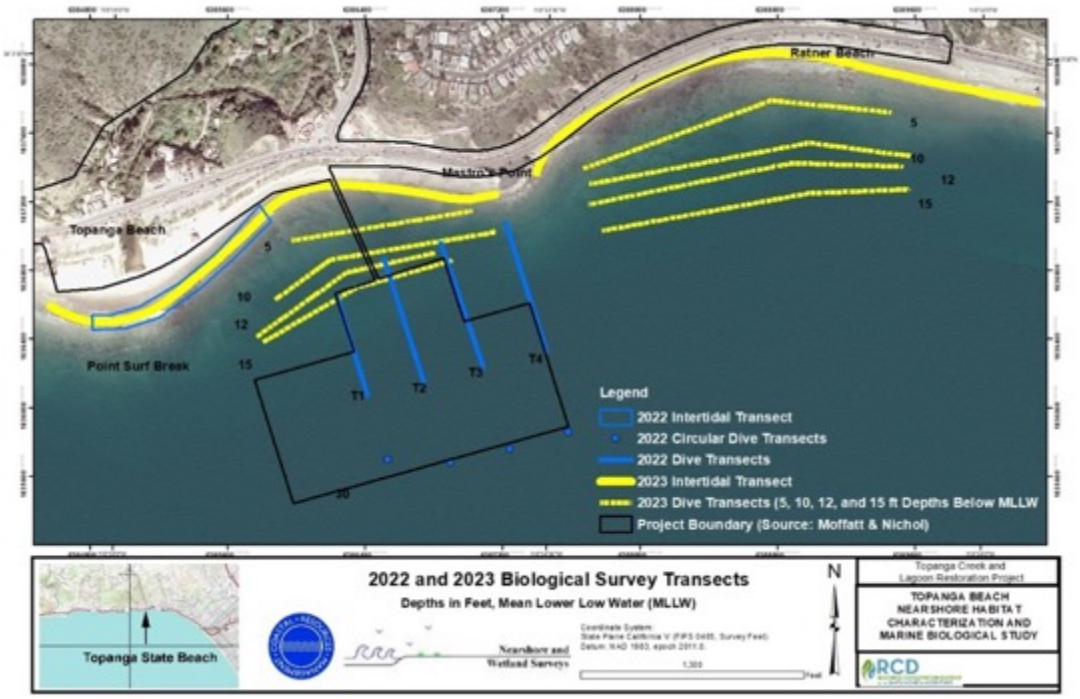

Figure 8. Transect Locations. Intertidal and Subtidal Dive Surveys Between Topanga and Ratner Beaches. June/July 2023

2023 Dive Survey. CRM conduct a qualitative survey of the shallow subtidal habitat at Topanga Beach and the area downcoast along Pacific Coast Highway (Ratner Beach) between July 11th and July 13th, 2023. Dive transect locations are shown in Figure 8. Transects ranged from 320 to 402 meters (m) long (1,056-1,320 ft) offshore of Topanga Beach and 547 to 563 m long (1,795-1,848 ft) off of Ratner Beach (Figure 8).

Emphasis was placed on identifying areas of Essential Fish Habitat and Habitat Areas of Particular Concern, such as surfgrass (*Phyllospadix* spp.) beds, kelp, and rocky reef, along with dominant, unique, sensitive or commercially important species such as sand dollars, (*Dendraster excentricus*), the sea pansy (*Renilla kollekerii*), spiny lobsters (*Panulirus interruptus*), and gorgonians (*Muricea* spp). Rare, highly cryptic species were recorded when observed, but no concerted effort was made to search for them.

Longshore transects were surveyed along isobaths at depths of -5, -10, -12, and -15 ft relative to Mean Lower Low Water (MLLW). The width of transects varied from one to six meters, depending on underwater visibility. These shallow depth zones and hard bottom habitats at Topanga represented areas that were under sampled in 2022. In addition, Ratner Beach was added to the 2023 survey plan in order to understand what biological resources could be potentially affected by the flow of sediments placed in the nearshore habitat offshore of Topanga Beach, associated with the Topanga Lagoon Restoration Project.

The types of data collected during the diver surveys included (1) the presence and abundance of plants and animals (rare, present, common, and abundant); bottom habitat types (rock, sand, and rock type), depth, water temperature, and underwater visibility.
Species and habitat notes were recorded during the dives while using SCUBA. Photographs were taken to document habitat types and dominant species. In addition, verification of bottom habitat types and marine life were made at several locations at depths between -15 and -25 ft MLLW offshore of both Topanga and Ratner beach.

2.3 DATA ANALYSIS

2.3.1 Sidescan Sonar

The sidescan sonar and DGPS data were monitored and recorded using Edgetech Discover Software. The data were processed using Chesapeake SonarWiz Software. The sidescan sonar data were corrected for amplitude, across-track slant range, and along-track speed variation. The adjusted data were merged with the vessel position and heading data and the layback offset applied. The processed data from both the low and high frequency channels were used to produce a single geo-referenced, rectilinearly correct photo mosaics of the nearshore habitats. The photo mosaic was inserted into an AutoCAD drawing file, converted into an ESRI .shp file, and integrated into ArcGIS 10.1. Polygons were created that outline the various habitat areas from which habitat acreages were calculated.

2.3.2 Bathymetry

The raw data were processed using the single module of the Hypack Office software. Corrections for variation in speed of sound and tide level (NOAA Santa Monica gauge) were applied. Resulting depth contours were inserted into an AutoCAD drawing file, converted into an ESRI .shp file, and integrated into ArcGIS 10.1 to illustrate and produce a two-foot and five-foot contour map of the project area seafloor.

2.3.3 Intertidal and Dive Surveys. Intertidal and subtidal dive notes and photographs were reviewed and synthesized. Species lists were produced from the information collected during the intertidal survey, and information from the dive surveys were also added to the existing species list for the 2022 survey.

2.4 HABITAT CLASSIFICATION: INTEGRATION OF VIDEO TARGET INFORMATION WITH SIDESCAN SONAR DATA

Bottom and vegetation habitat types used for this project followed the definitions provided in the *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin, et. al, 1979).

Underwater videos taken at selected locations were used to verify seafloor bottom conditions and the types of marine life present in the study area. Videos were reviewed in real-time on board the vessel when important information was observed on the screen. Diver photographs of bottom types were also used to verify bottom habitats in the project area.

With this combined information, habitat type polygons were generated as DXF files and then imported as ESRI shape (.shp) files into ESRI ArcMap10.1 and projected to provide seafloor habitat maps.

Similarly, the seafloor and marine organisms were captured on GoPro video collected by the biologist-divers along each of the eight underwater band transects. These were reviewed to assist in taxonomic identifications and provide additional information about the types of habitats and marine life present in the project area.

2.5 GIS INTEGRATION OF THE 2022 AND 2023 SURVEYS

The 2022 and 2023 survey areas where adjacent to each other with some degree of overlap between the two. There was good general agreement between the results of the two surveys. To maximize the utility of the projects it was decided to revisit the results of the 2022 survey and to incorporate them into the results of the 2023 survey. The 2023 survey was benefited from better sidescan sonar records as a result of better weather and

sea conditions during the survey. Also the 2023 had an expanded diver documentation that provided better ground truthing of the sidescan sonar data and a better understanding of the bottom habitats. Armed with this more complete data the 2022 sidescan sonar records were revisited and revised to provide better agreement with the 2023 records.

The most apparent difference between the two data sets was the presence of more sand during the 2023 survey within the -15 to -20 ft depth contours. This could be the result of higher-than-normal rainfall events in 2023 that lead to increased sedimentation in Topanga Lagoon. These sediments could have been transported to the nearshore waters. However, it also could be, or in combination with, natural nearshore sand movement events. The additional sand accumulation appears to less than 0.5 ft thick but was enough to largely cover cobbles seen intermixed with sand in the 2022. In generating the habitat polygons, preference was given to Rubble and Cobble over sand. If either Rubble or Cobble was seen during either survey the area was mapped at Rubble or Cobble instead of Sand. Existing data collected through the project literature review and the project field studies (sidescan sonar, downlooking sonar, and GPS mapping of kelp beds) were integrated as ArcGIS layers. These layers provided the biological and physical habitat information that was used to establish baseline seafloor and marine biological attributes in the survey area. Calculation of habitat type areal cover, vegetation cover, and historical marine biological data were then determined from the GIS analyses.

3.0 RESULTS

3.1 SURVEY CONDITIONS

The sidescan sonar survey was conducted under light fog to clear sky conditions on June 28-29th, 2023. Swells were small, ranging from 1 to 2 ft. Winds varied between 5 and 15 knots. Conditions during the dive survey were excellent between July 11th and July 13th, 2023 with clear skies, light winds, and 1 to 2 ft swells. The intertidal survey was conducted under slightly overcast-to-clear conditions on June 8th and June 9th, 2023. Low tides during the intertidal survey were -0.91 ft MLLW on July 8th, and -0.51 ft MLLW on July 9th. Water temperature varied between 66 and 67 degrees Fahrenheit (^{0}F) during the sidescan survey and between 66 ^{0}F and 68 ^{0}F degrees during the dive survey. Surveyed depths varied between -6 and -28 ft MLLW for the sidescan and dive surveys.

3.2 DEPTH CONTOURS

Depths within the project area are summarized in Figure 9 that show the contours between -6 and -30 ft MLLW**.** These contours are based upon both the 2022 and 2023 bathymetric surveys. The seafloor between -6 ft and -17 ft was not uniform in depth because of the combination of low-high cobble and rubble (boulder) fields and sand

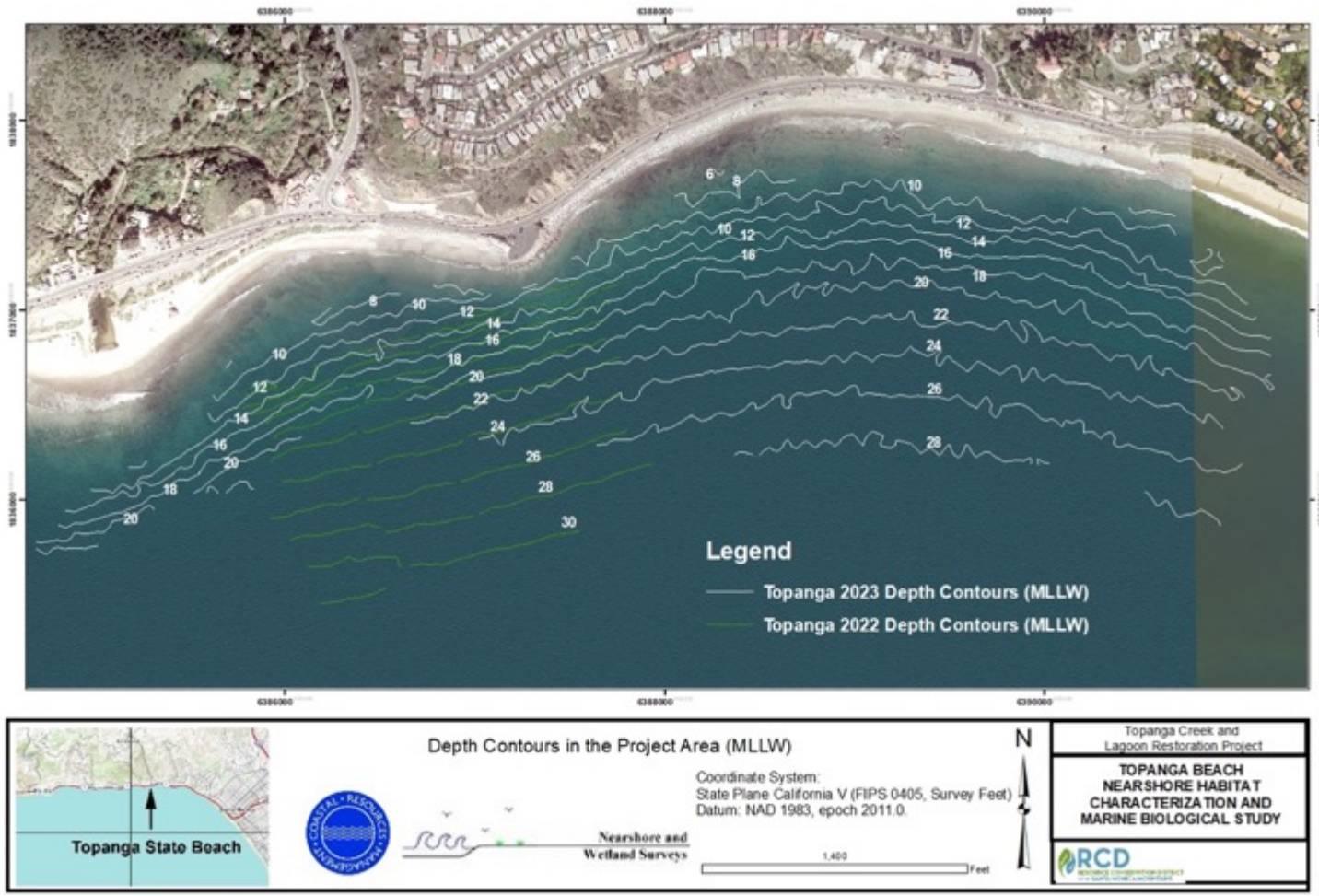

Figure 9. Depth Contours in the Project Area

bottom habitat. Deeper than -17 ft, depth contours were uniform, and exhibited a gradual increase in depth out to the -30 ft isobath.

3.3 MARINE INTERTIDAL AND SUBTIDAL HABITAT TYPES AND ACREAGES

Intertidal and Deep Marine Habitat Types are illustrated in Figure 10.

3.3.1 Intertidal Habitat Types

Thirty four (34) acres of intertidal habitat was mapped for both Topanga Beach and Ratner Beach. The types and acreages of intertidal habitats observed at Topanga Beach and Ratner Beach are shown in Table 1.

Table 1. Intertidal Habitat Acreages and Percentages at Topanga and Ratner Beach. June 2023

	Topanga Beach		Ratner Beach		Study Area	
Habitat Types	Acres	% Total	Acres	% Total	Acres	% Total
Riprap	0.4	2.8	3.1	15.7	3.5	10.3
Sand	5.8	40.6	5.9	29.8	11.7	34.3
Sand/Cobble*	0.0	0.0	2.5	12.6	2.5	7.4
Cobble	2.3	16.4	1.8	9.1	4.1	12.1
Rubble/Cobble**	5.7	40.1	6	30.3	11.7	34.4
Rubble/Platform	0.0	0.0	0.5	2.5	0.5	1.5
Total	**14.2**	**100.0**	**19.8**	**100.0**	**34.0**	**100.0**

* mixed sediments; sand dominant **mixed sediments, rubble dominant

At Topanga, the backshore and the upper intertidal zones are composed of Unconsolidated-Sand (sand). The rocky intertidal habitat is primarily composed of relatively unstable Unconsolidated-Cobble (cobble) beds (Figure 11). Small to medium-sized cobbles and boulders dominate the mid-intertidal zone. The lower intertidal zone has a greater amount of larger Consolidated-Rubble Rock (boulders and bedrock). Additionally, the intertidal area west of the Topanga Lagoon has a greater amount of larger boulders in the low intertidal zone than the area located east of the Topanga Lagoon mouth. The mid-tide zone in front of the Lagoon mouth however, was sanded in during the 2023 survey, while it was not sanded in during the 2022 survey. Sand was present to various degrees within the cobble and rubble fields, resulting in partial burial of low-lying cobble and rubble. East of the point surf break, the beach transitions from sand and cobble to mostly sand along the shore leading to Mastro's Point (Figures 12 and 13). Protective riprap also lines the backshore portion of this beach.

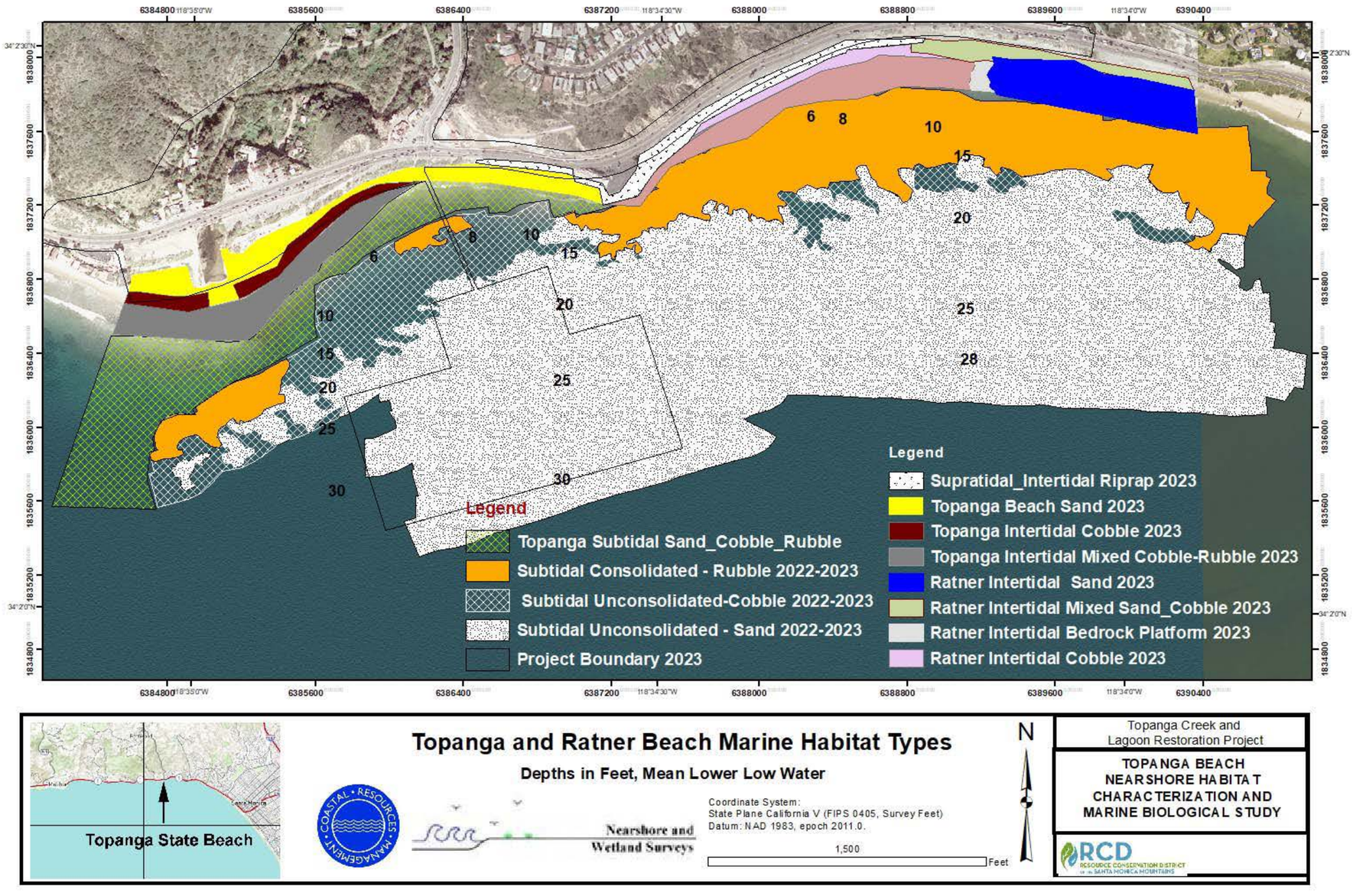

Figure 10. Marine Habitat Types

Figure 11. Cobble and Small Boulder Rocky Intertidal Habitat West of Topanga Lagoon.

Figure 12. Cobble and Sand Intertidal to the East of the Topanga Lifeguard Station

Figure 13. East End of Topanga Beach- Illustrating the Nature of the Sand Beach with Some Exposed Cobble in the Lower Tide Zone

At Ratner Beach, the backshore is armored with large riprap along the major of the shoreline (Figure 14a). This protective riprap extends subtidally around Mastro's Point, and transitions to only backshore riprap east of Mastro's Point (Figure 14b). Below the riprap, the substrate is composed varying mixtures of cobble, and rubble (boulders) and bedrock reef. Ratner Beach exhibited a distinct, area of accessible, bedrock intertidal that was present near the intersection of Coastline Drive and Pacific Coast Highway (Figure 15).

Ratner Beach habitat differs from Topanga Beach. First, there is a substantially greater amount of riprap for shoreline protection; secondly, the shoreline in the lee of Mastro's Point lacks a substantial sandy intertidal and lastly, and although there is similar cobble habitat at both areas, there is a greater amount of larger sized, angular, stable boulders along Ratner Beach than at Topanga Beach.

Figure 14a. Riprap Protection at Mastro's Point, and Cobble and Rubble (boulder) Intertidal Immediately East of Mastro's Point

Figure 14b. Protective Riprap Along the Backshore; Cobble, Larger Rubble/Boulder Intertidal; and Sand Beach in the Background Along Ratner Beach

Figure 15. Boulder and Bedrock Platform Intertidal near the Intersection of Coastline Drive and Coast Highway Along Ratner Beach

Percentages and areal cover of sand, cobble, and rubble will shift based upon a variety of factors including wave height, wave direction, storm activity, and seasonal accretion and loss patterns.

3.3.2 Marine Deepwater Habitat Types and Acreages

Seafloor habitats in the project area are illustrated in Figure 10. A total of 190.6 acres of subtidal seafloor was mapped in the project area with sidescan sonar during the 2022 and 2023 surveys (Table 2). Three habitat types were represented based upon the US Department of the Interior, Fish and Wildlife Service publication, "Classification of Wetlands and Deepwater Habitats of the United States."

These were Unconsolidated – Sand (137.3 acres), Unconsolidated – Cobble (16.7 acres), and Consolidated – Rubble (36.6).

It should be noted that most of the habitats were gradational with extensive intermix between typed. Extensive sand inundation was present throughout all Unconsolidated – Cobble/Gravel and Consolidated – Rubble areas.

Table 2. Marine Deepwater Habitat Types 2022-2023

Habitat	Acres	Total	% Total
Subtidal Unconsolidated Sand	137.3		72
Subtidal Unconsolidated Cobble	16.7		9
			19
Subtidal Consolidated Rubble	36.6	(190.6 acres)	100.0
Subtidal Cobble/Rubble*	20		
Total			

Notes: To some degree, sand was present in each of the listed cobble and rubble areas.
* Acreages determined by Google Aerial Photos (2012-2016);
CDFW Kelp Bed Maximum Extent (2016), CRM dive surveys (2022/2023)

An additional 20 acres of mixed cobble/rubble habitat was characterized by using Google Aerial Photos, surficial kelp distribution, and the results of CRM dives conducted in 2022 and 2023. This is not included in the calculations of Wetland and Deepwater Habitat acreages because the data were collected using different methods and not directly comparable to the definitions of Wetland and Deepwater Habitat. The information however, is still valid when discussing marine habitat types and the distribution of the marine biological community.

Unconsolidated Bottom-Sand

Unconsolidated Bottom-Sand (Figures 16a and 16b) was the primary habitat offshore of the -20 ft contour. There is little variation seen in the sidescan record with the exception of occasion minor sand waves.

Figure 16a. Unconsolidated Bottom – Sand (with Sand Dollars)

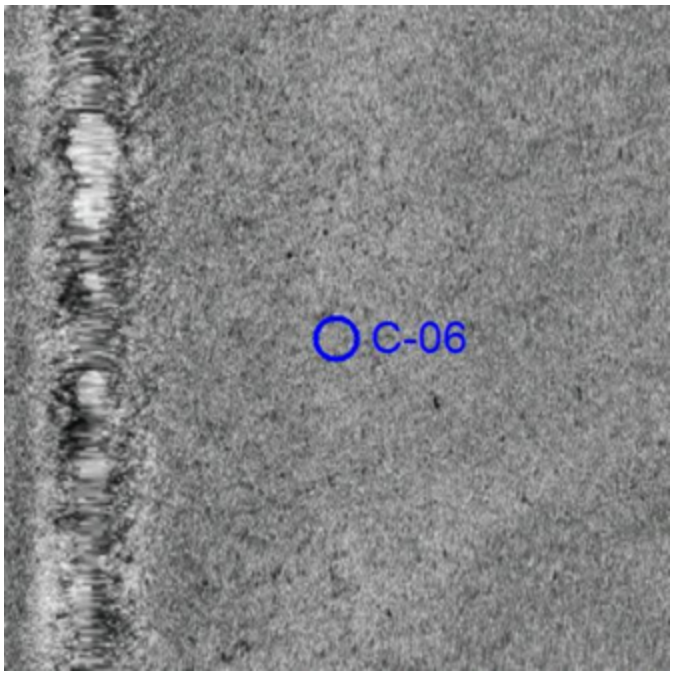

Figure 16b. Unconsolidated Bottom – Sand (Sidescan Sonar)

Unconsolidated – Cobble

Unconsolidated Cobble habitat (Figures 17a-17c) appeared either in transition between Consolidated – Rubble and Unconsolidated – Sand or as isolated patched surrounded by Unconsolidated – Sand.

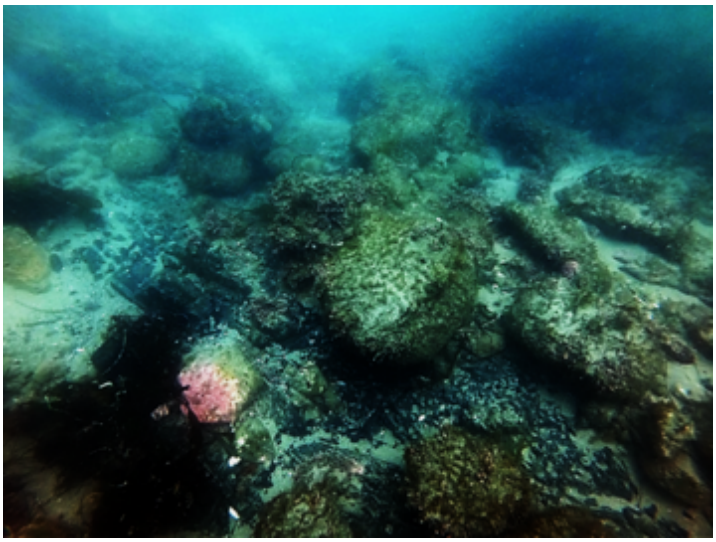

Figure 17a. Unconsolidated –Cobble

Figure 17b. Transitional, with Sand

Figure 17c. Unconsolidated – Cobble (Sidescan Sonar)

Rock Bottom - Rubble

Rock Bottom-Rubble (Figures 18a and 18 b) was observed primarily inshore of the -15 ft contour.

Figure 18a. Rock Bottom – Rubble

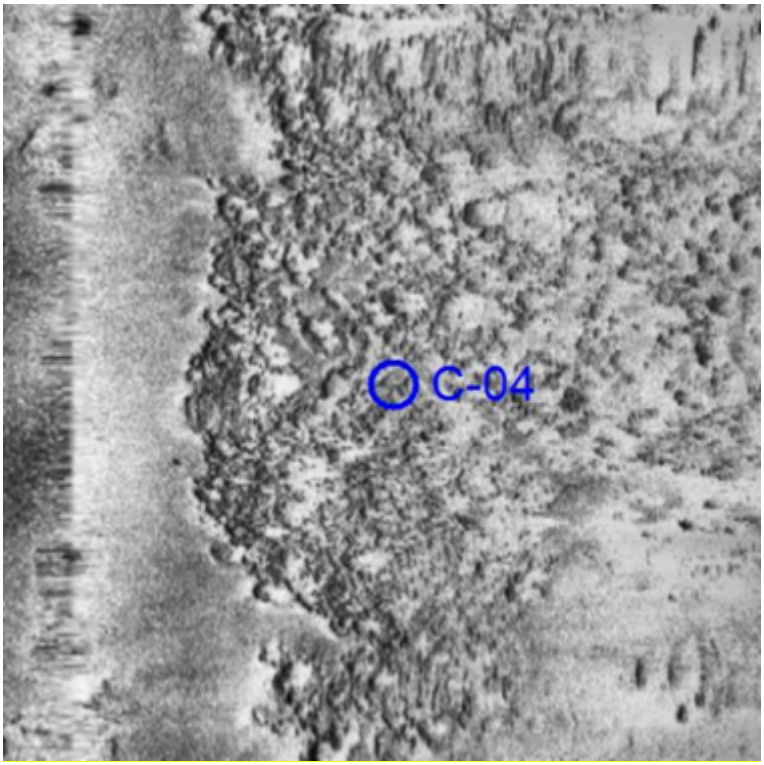

Figure 18b. Consolidated Bottom – Rubble (Sidescan Sonar)

3.3.4 Other Features

Per requirements of the project's Work Order, other identifiable features were also to be reported. No feature of archeological significance was observed.

Water Column Returns. Several bait balls were observed during the sidescan sonar survey, which left distinctive images on the sonar record (Figure 19). The balls were sufficiently dense to result in a shadow. If the bait ball was near the towfish, the image of the bait ball disappeared from the sidescan sonar image when the water column data were removed, leaving only a shadow as evidence.

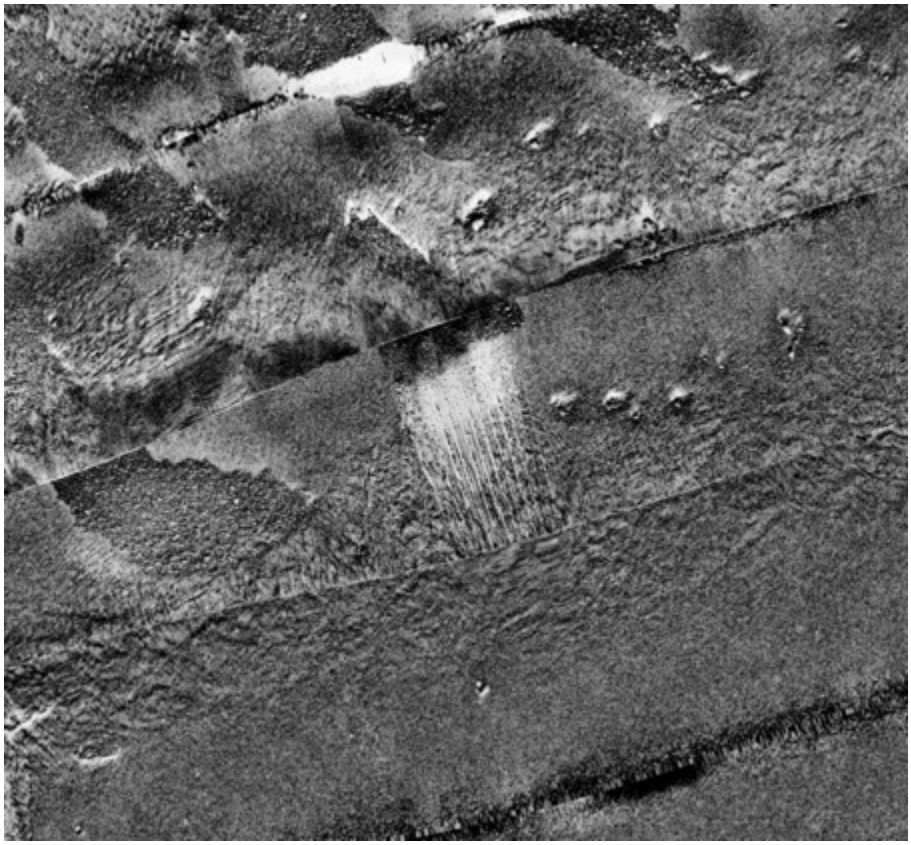

Figure 19. Bait Ball With Shadow in Transition Area Between Unconsolidated Cobble and Unconsolidated – Sand (Sidescan Sonar)

3.4 REVIEW OF HISTORICAL BIOLOGICAL INFORMATION

The biological characteristics of the Topanga project area were determined from a (1) review of available historical information for the project area (2) direct field data collection using downlooking sonar, remote video camera target verification (3) dive surveys, and (4) the analysis of still photographs taken from the dive survey videos.

3.4.1 Review of Available Literature and Data Sources

There is a general paucity of recent biological data in the literature for the specific project area, based upon a review of several data sources, dating back to the late 1950s and as recent as 2020. With the advent of online databases particularly with the California Department of Fish and Wildlife, a greater amount of biological information is available. However, the most recent information for the Topanga project area was collected by Coastal Resources Management, Inc. in 2022 that is summarized in Section 1 of this report and in full in Coastal Resources Management, Inc. (2022).

Earliest intertidal surveys in the project area were conducted by Dawson (1965) and Widdowson in 1973-1974 (Thom and Widdowson, 1978). A general comparison of intertidal algal species richness between the two surveys indicated species richness over the 8-9 year span was similar; 35 in 1965 and 38 in 1973. Subtidally, species richness was lower in 1985 (Montgomery Engineers, 1985) compared to surveys conducted by CRM in 1994 (52).

Egstrom (1974) conducted a Los Angeles County-wide generalized underwater resource inventory from Cabrillo Beach to Leo Carrillo Beach from 1972 to 1974 between September 1992 and May 1974. The surveys covered 43 sites and 76.5 miles of Los Angeles County coastline, the purpose being to document the state of underwater topographic and ecological resources relative to increasing land development and increasing industrial activity. Topanga Beach (Site 21) was included in his survey area. A total of 10 underwater transects were swam from the shoreline out to depths of between 35 ft to 45 ft (Appendix 2) Five transects (A-E) were between Topanga Lagoon and the Charthouse Restaurant headland (now Mastro's) Point. The other five transects (F-J) were east of the headland and extended to the Los Angeles/Malibu City Line. The Topanga surveys were conducted between September 1973 and May 1974.

In front of Topanga Beach, the seafloor varied between scattered rocks to sand in the shallows, to a combination of sand and low relief reef to depths of approximately 17 ft, and then sand out to approximately 45 ft. The subtidal habitat in front of the Lagoon had a greater amount of rock and reef than areas east, extending to the Charthouse. Just east

of the Charthouse, the seafloor was mostly rocky bottom in the shallows (mixed with sand patches) that extended to a depth of 30 ft. East of those transects, the seafloor was sandier but individuals rocks occurred to depths of 30 ft.

Kelp, other algae, and "eelgrass" (most probably surfgrass and not eelgrass, because it was reported on rocks), were commonly found at depths to 22 ft offshore of the rocky intertidal in front of Topanga Lagoon. Surfgrass was common at depths between 5 and 13 ft in front of Topanga Canyon Boulevard. Kelp and surfgrass were not found on the remaining two transects where the bottom was sandier. A "grass" was also found o sandy sediments but it was not described. (Note: this may have been eelgrass *(Zostera*) but there is no other description). On the east side of the Charthouse, kelp, algae, and surfgrass were found on rocks to depths of approximately 12 to 25 ft. Kelp was not as abundant as that in front of Topanga Beach.

Common marine life observed mussels, barnacles, and tube worms in the tide zone and shallow waters, and numerous varieties of sea stars (particularly fringed). Whelks, moon and auger snails, anemones, lobster, kelp bass, señorita, sargo, and various surf perches were common. Additional species observed include spider and cancer crabs, nudibranchs, urchins, electric rays, rockfish, and halibut.

Coastal Resources Management, Inc. (1994) conducted extensive subtidal and intertidal surveys along the Santa Monica and Malibu coastlines in March and April 1994, as part of the Cal Trans District 7 Pacific Coast Highway study of sediment deposition along the Malibu coast. Five locations were surveyed; Temescal Canyon, Will Rogers State Beach, Topanga Beach, Las Tunas, Dan Blocker Beach, and Latigo Shores.

The surveys at Topanga were conducted just west and east of the Charthouse Restaurant (where Mastro's is now located). Transect locations are shown in Appendix 2. Dive surveys were conducted a depths of -9 to -18 ft; intertidal surveys were conducted in the area's boulder fields. Subtidally, the seafloor consisted of sand and accounted for 84% of the seafloor, and rock bottom accounted for the other 16%. The rocky habitat consisted primarily of low-relief <3 ft boulders and bedrock with some spines of higher relief.

The results of the survey indicated that subtidal species richness increased along an east-to-west gradient between Temescal Canyon and Latigo Point. A total of 47 plants and invertebrates were recorded at Topanga, along with 3 species of fish. In comparison, the number of species at the other sites varied between 37 (Temescal Canyon) and 81 (Latigo Point).

Common groups of marine life at Topanga included red algae, brown algae, mollusks, annelid worms, and ectoprocts. The dominant algal species present (based on occurrences along 100 meter transects) included coralline algae, the red algae G*astroclonium coul*te*ri, Gracilaria* spp., *Rhodymenia californica*, and *Lithothamnion*, sp. Giant kelp was rare; the most common larger algae was the brown algae *Cystoseira osmundacea.* Surfgrass (*Phyllospadix torreyi*) was also rare. The most common invertebrates included ornate tube worms (*Diopatra ornata*), brittle stars (*Amphiodia occidentalis*), and sand stars *(Astropecten armatu*s) on the sand bottom; and sea stars, (P*isaster giganteus*), bryozoans (*Bugula neritina*), and tunicates (*Euherdmania claviformis*) in the low-relief boulder areas.

Intertidally, a total of 57 species of plants and invertebrates were identified from Topanga in low relief boulder habitat. At other sites, species richness varied between 37 species at Temescal to 73 species at Latigo Point. Like the subtidal community, species richness increased along a gradient from the east end of the project area (Temescal Canyon) to the west end at Latigo Point.

The Topanga splash zone was lacking most marine life due to the high elevation and level of desiccation. Richness (number of species) was greater with increasing distance to the low intertidal zone. The most common species of plants included green algae (*Ulva* spp.), red algae (*Corallina* sp., G*astroclonium coulteri*, *Laurencia* sp., and *Lithophylum* sp.) and the brown kelp *Egregia laevigata*. The most frequently observed invertebrates included anemones (*Anthopleura elegantis*sima), sand castle tube worms (*Phragmatopoma californica*), gooseneck barnacles (*Pollicipes polymerus*), barnacles (*Chthamalus fissus/dalli* and *Balanus glandul*a), chitons (*Nuttalina fluxa*), unicorn snails (*Acanthin*a sp.), limpets (*Lottia scabra, L. digitalis, Notoacmea* sp.), and California mussels (*Mytilus californianus*).

CRM (1997) conducted marine biological surveys for the County of Los Angeles Public Works Department in March 1977 similar to the 1994 study for 1994 CRM Cal Trans work. Dive surveys were conducted offshore of Topanga Beach just west of the current study's Station T1, and approximately 1,600 ft east of the Charthouse (Appendix 2). Silt and low-relief boulder fields characterized the seafloor off Topanga. Seventeen species were recorded at this site. A total of 27 species were recorded east of the Charthouse. The total number of species observed at both sites was 37, and the types of species observed reflected the various habitat types. Higher numbers of red algae, cnidarians, polychaete worms, and ectoprocts, and fish were observed east of the Charthouse. Both areas lacked large, brown algae, kelp, and surfgrass. Dominant species on the sandy bottom at Topanga included the ornate tube worm *Diopatra ornata*, a maldanid polychaete tube

building worm, and the sand star *Astropecten armatu*s. In rocky habitat, the red algae *Gelidium coulteri*, *Corallina* sp., and the ectoproct *Hipplodoplosia insculpta* were the most common species. East of the Charthouse, the sand bottom community was similar to Topanga Beach with polychaete worms and sand stars being the dominant forms. However, the red algae *Rhodymenia californic*a was more abundant and a greater diversity of ectoprocts, tube snails (Se*rpulorbis squamigerus*), tunicates, sponges, and barnacles was recorded along the eastern transect compared to Topanga Beach.

At Topanga, low reef boulder areas were inundated with silt and sand. Compared to earlier 1994 surveys, hard bottom areas observed had been buried by shifting seafloor sediments in the years between the two surveys. Poor underwater visibility limited the identification of bottom fish. Where low relief boulders were present, algae constituted between 5 and 50% of the cover; invertebrates constituted between 0 and 10.5% and between 10 and 95% of the hard substrate was barren.

Kelp and Surfgrass Data Bases. The California Department of Fish and Wildlife (CDFW) maintains an extensive online GIS database of marine resource biological and physical data sets. In particular, the following GIS data sets have extensive and Topanga project-area specific biological data including: (1) Historical kelp bed data sets between 1989 to 2016; (2) known intertidal locations of surfgrass (*Phyllospadix torreyi*); and (4) artificial reefs.

This data is available at (https://www.wildlife.ca.gov/Conservation/Marine/GIS).

Giant kelp beds (*Macrocystis pyrifera*) historically have been present on the reefs at the west end of Topanga Beach and immediately east of Mastro's Point (Charthouse Point). These beds are located in CDFW Kelp Administrative Area #15. The cumulative distribution of kelp is shown in Figure 20. Kelp canopy has undergone major changes since 1989. Data analyzed from 2003 to 2016 indicates periods of extremely low surface canopy (2003-2009) followed by kelp maxima years (2010-2014), and a return to a period of low kelp surface canopy (2015-2016). No data are provided between 2017 and 2023. CRM did not observe any surface canopy of giant kelp (*Macrocystis pyrifera*) during either the sidescan or dive surveys in August 2022 or during the July 2023 surveys.

Surfgrass has been a constant in the low intertidal field surveys within the CDFW data base for Topanga, and was present intertidally in 1994 and 1997. Subtidally it was present in 1974 (Egstrom 1974), present in 1994 (CRM 1994), and absent in 1997 (CRM

1997). It was present in the lower intertidal at Topanga Beach in 2022, and subtidally offshore of Topanga Beach in 2022, but it occurred infrequently.

Eelgrass (*Zostera pacifica*) beds were mapped as part of the National Marine Fisheries Service's Southern California Bight Regional Eelgrass Surveys (Merkel and Associates, 2015). It does not occur within the Topanga Beach area; the nearest beds are located 7 miles to the west of Topanga off Malibu at depths between approximately 26 to 33 feet MLLW. It was not present during the CRM 2022 survey.

Artificial Reefs. Two artificial reef are located near Topanga Beach off of Temescal Canyon. Topanga Artificial Reef (TAR) and the Santa Monica Bay Artificial Reef (SMBAR) were constructed in 1987 as part of California Department of Fish and Game's Reef California Artificial Reef Program (CARP) designed to encourage reestablishment of a productive kelp bed which existed there since the 1930s. TAR consists of 10,000 tons of quarry rock that was placed in three separate modules on sandy bottom at a depth of -28 ft. SMBAR consists of 20, 000 tons of quarry rock in 13 separate modules and encompasses 3.6 acres of seafloor at depths between 57 ft and 72 ft MLLW. Reefs are located about 2.5 miles southeast of Topanga Beach.

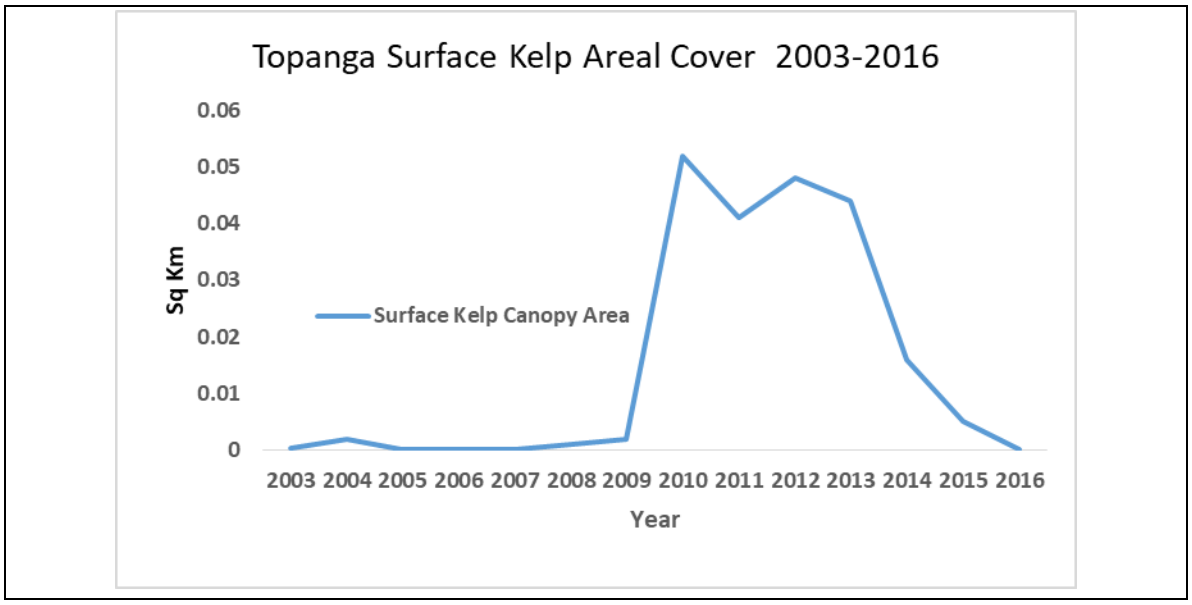

Figure 20. Topanga Surface Kelp Areal Cover, 2003-2016. Source: California Department of Fish and Wildlife

3.5 2023 MARINE BIOLOGICAL SURVEYS RESULTS

3.5.1 Intertidal Surveys

3.5.1.1 Community Composition

A total of 74 taxa of marine plants and invertebrates were observed during the 2023 intertidal survey. Of these, 59 were present at Topanga Beach and 65 were observed at Ratner Beach. In comparison, 47 species were recorded during the July 2022 survey at Topanga Beach. During both the 2022 and 2023 surveys, the combined total number of taxa observed in the intertidal environment was 82. Note however, that only the Topanga intertidal was surveyed in 2022.

The taxonomic makeup of the community in 2023 is shown in Table 3, comparing the major groups of plants and invertebrates at each site.

Table 3. Intertidal Taxonomic Composition. June 2023

TOPANGA 2023	# of Taxa	% Total		RATNER 2023	# of Taxa	% Total	
GASTROPODA	15	25.4		RHODOPHYTA	20	30.8	
RHODOPHYTA	13	22.0		GASTROPODA	10	15.4	
PHAEOPHYTA	8	13.6		PHAEOPHYTA	8	12.3	
ARTHROPODA	5	8.5		ARTHROPODA	8	12.3	
BIVALVIA	4	6.8		CHORDATA	3	4.6	
CHLOROPHYTA	2	3.4		CHLOROPHYTA	2	3.1	
CNIDARIA	2	3.4		CNIDARIA	2	3.1	
POLYCHAETA	2	3.4		POLYCHAETA	2	3.1	
POLYPLACOPHORA	2	3.4		POLYPLACOPHORA	2	3.1	
DIATOMS	1	1.7		BIVALVIA	2	3.1	
SPERMATOPHYTA	1	1.7		ECHINODERMATA	2	3.1	
PORIFERA	1	1.7		DIATOMS	1	1.5	
OPISTOBRANCHIA	1	1.7		SPERMATOPHYTA	1	1.5	
BRYOZOA	1	1.7		PORIFERA	1	1.5	
ECHINODERMATA	1	1.7		OPISTOBRANCHIA	1	1.5	
CEPHALAPODA	0	0.0		BRYOZOA	0	0.0	
CHORDATA	0	0.0		CEPHALAPODA	0	0.0	
Richness	**59**	**100.0**			**65**	**100.0**	

In each survey, gastropods (snails), rhodophytes (red algae), and phaeophytes (brown) algae were the major groups that had the greatest number of species although the order of dominance of these two groups were reversed between Topanga and Ratner. Ratner Beach has seven more taxa of red algae than at Topanga in 2023 but five fewer gastropods. In 2023, crustacean arthropods at Ratner Beach (barnacles, gooseneck

barnacles, and crabs) also accounted for more species than at Topanga than during 2022 or 2023. Habitat types, the distribution of the dominant species, and their relative abundances along the Topanga and Ratner Beach transects are discussed below.

3.5.1.2 Biological Characteristics. Topanga Beach. The rocky intertidal habitat at Topanga Beach is primarily composed of relatively unstable cobble beds. The upper intertidal zone is composed mostly of sand, although periodic seasonal erosion will uncover areas of cobble. Small to medium-sized cobbles dominate the mid-intertidal zone and most of the lower intertidal. The lower intertidal zone has a patchy distribution of large, stable boulders and bedrock (Figure 21).

Figure 21. Rocky Intertidal Habitat West of Topanga Creek and Lagoon

The macrophyte communities at Topanga Beach are characteristic of habitats composed of relatively unstable substrata that are frequently disturbed by wave action, sand scour, and sand deposition. The movement of unstable rocks during periods of high wave action, along with frequent scouring and burial from sand, influences intertidal community composition (Sousa, 1979; Littler and Littler, 1984; Murray and Littler, 1984). The mid-shore rocky intertidal community at Topanga Beach is largely composed of short-lived, ephemeral, and opportunistic macroalgae including *Ulva* spp., *Gelidium couteri*/*pusillum*, *Polysiphonia*/*Ceramium*/*Centroceras* spp., *Scytosiphon lomentaria*,

Colpomenia peregrina, and *Endarachne binghamiae*. Psammophytic macroalgae such as *Taonia lennebackeriae* and *Zonaria farlowii*, along with the sand-resistant species, *Ralfsia* spp., *Lithothamnion* spp., *Lithothrix aspergillum*, and *Corallina vancouveriensis*/*pinnatifolia* are also common.

In addition to many of the species observed on the mid-shore, the lower intertidal is characterized by longer-lived taxa including surfgrass (*Phyllospadix torreyi*), feather boa kelp (*Egregia menziesii),* and mussels, (*Mytilus californianus*) along with red algae such as *Laurencia pacifica*, and *Pterocladiella capillacea*. The sandcastle worm, *Phragmatopoma californica* forms extensive colonies primarily on the large boulders along with smaller colonies of the snail, *Thylacodes squamigerus* (Figure 22).

Figure 22. Colonies of the Sandcastle Worm, *Phragmatopoma californica* in the Lower Intertidal at Topanga Beach.

The relative abundance of ephemeral algae (*Gelidium couteri*/*pusillum*, *Polysiphonia*/*Ceramium*/*Centroceras* spp., *Scytosiphon lomentaria*, *Colpomenia peregrina*, *Endarachne binghamiae* and especially *Ulva* spp.) increases markedly from the mouth of Topanga Creek east to the sand beach downcoast of the rocky intertidal point (Figure 23). High cover of opportunistic algae is characteristic of intertidal habitats influenced by freshwater (Littler and Littler, 1987) and high nutrient effluent (Littler and

Murray, 1975; Murray and Littler, 1978). Most patches of surfgrass in the zone dominated by ephemeral algae appear brown and damaged along Topanga Beach (Figure 23). Surfgrass condition was generally better on the west side of Topanga Creek/Topanga Lagoon than on the east side.

Figure 23. Lower Rocky Intertidal Zone East of Topanga Creek. Habitat is dominated by ephemeral green algae, *Ulva* spp. Patches of the surfgrass denoted by the yellow arrow appear mostly brown and unhealthy.

There were approximately 100 Western gulls on the beach mostly in the vicinity of the mouth of Topanga Creek. One snowy egret was also seen on the beach.

3.1.5.3 Biological Characteristics-Ratner Beach. The shoreline was surveyed from the east side of the point at Mastro's downcoast to the rocky reefs along Ratner Beach to near the intersection of PCH and Coastline Drive (Figure 24).

Figure 24**.** Rocky Intertidal Habitat Surveyed East of Topanga Beach. Located between Mastro's Point and the intersection of PCH and Coastline Drive. Upper intertidal is armored with riprap.

The backshore along most of the area surveyed is armored with large riprap (Figure 24). Below the riprap, the substrate is composed of a mixture of cobbles, boulders, and bedrock reefs. The upper intertidal is dominated by green algae (*Ulva* spp.), isopods (*Ligia* sp.), barnacles (*Chthamalus* spp. and *Balanus glandula*), shore crabs (*Pachygrapsus crassipes*), hermit crabs (*Pagurus samuelis*), and several species of limpets (*Lottia scutum*, *L. limatula*, and *L. scabra*).

The mid-intertidal is primarily composed of cobbles, sand, and low-relief boulders (Figure 25). Due to frequent disturbance from the movement of unstable rocks and sand, the community is dominated by psammophytic macroalgae such as *Taonia lennebackeriae* and *Zonaria farlowii*, along with the sand-resistant species, *Ralfsia* spp., *Lithothamnion* spp., *Lithothrix aspergillum*, and *Corallina vancouveriensis*/*pinnatifolia*. Colonial anemones (*Anthopleura elegantissima*) and turban snails (*Chlorostoma funebralis*) are highly abundant on the larger rocks.

Figure 25. Mid-Intertidal Habitat Along Ratner Beach. Habitat is primarily composed of cobbles, sand, and low-relief boulders.

The large boulders and bedrock in the lower intertidal support a high cover of mussels, anemones (*Anthopleura* spp.), red algae (*Chondracanthus canaliculatus* and *Gastroclonium subarticulatum*), and the sandcastle worm (Figure 26). Expansive beds of surfgrass occur on the lower relief boulders (Figure 27).

Figure 26. Lower Rocky Bedrock/Boulder Intertidal Habitat at Ratner Beach. Located near the intersection of PCH and Coastline Drive.

Figure 27. Lower intertidal zone is dominated by the surfgrass, *Phyllospadix torreyi* along Ratner Beach, east of Topanga Beach between Mastro Point and Coastline Drive.

Six Western gulls were seen on the riprap and rocky intertidal during the survey along with six bottlenose dolphins and one harbor seal in the water close to shore.

3.5.2 Subtidal Surveys

Community Composition. The purpose the 2023 subtidal surveys was to identify key components of the shallow water habitats at depths between -5 and -15 ft MLLW at Topanga Beach and Ratner Beach. A total of 54 taxa of marine plants and invertebrates were identified along eight dive transects in 2023 (See Figure 8). Table 4 compares the community composition at the two locations (Topanga and Ratner) in 2023. Forty-two taxa were present at Topanga Beach and 51 were observed at Ratner Beach (Table 4). The combined list for both areas taxa included 21 species of algae, 1 seagrass, 22 species of invertebrates, and 10 species of fish. Forty-three were associated with rock, 9 were sand bottom organisms, and 2 were associated with both habitat types. At Topanga Beach in 2022, 35 taxa were observed along four dive transects set perpendicular to shore at depths between -9 and -30 ft MLLW. The number of taxa, by group included 7 algae, 1 seagrass, 21 invertebrates, and 6 species of fish. Twenty taxa were found in low-relief reef habitat and while 15 were associated with sand bottom.

Table 4. Subtidal Taxonomic Composition, July 2023

TOPANGA SUBTIDAL TAONOMIC COMPOSITION	N	% Total
BACCILARIOPHYCAE	1	2.4
CHLOROPHYTA	1	2.4
PHAEOPHYTA	7	16.7
RHODOPHYTA	10	23.8
SPERMATOPHYTA	1	2.4
PORIFERA	0	0.0
CNIDARIA	3	7.1
POLYCHAETA	2	4.8
ARTHROPODA	3	7.1
MOLLUSCA-GASTROPODA	2	4.8
MOLLUSCA-CEPHALOPODA	1	2.4
MOLLUSCA-OPISTOBRANCHIA	1	2.4
MOLLUSCA-NUDIBRANCHIA	0	0.0
MOLLUSCA-BIVALVIA	0	0.0
BRYOZOA	2	4.8
ECHINODERMATA	2	4.8
UROCHORDATA	0	0.0
CHORDATA	6	14.3
RICHNESS	42	100.0

RATNER SUBTIDAL TAXONOMIC COMPOSITION	N	% Total
BACCILARIOPHYCAE	1	2.0
CHLOROPHYTA	1	2.0
PHAEOPHYTA	6	11.8
RHODOPHYTA	13	25.5
SPERMATOPHYTA	1	2.0
PORIFERA	0	0.0
CNIDARIA	3	5.9
POLYCHAETA	2	3.9
ARTHROPODA	3	5.9
MOLLUSCA-GASTROPODA	3	5.9
MOLLUSCA-CEPHALOPODA	0	0.0
MOLLUSCA-OPISTOBRANCHIA	1	2.0
MOLLUSCA-NUDIBRANCHIA	1	2.0
MOLLUSCA-BIVALVIA	2	3.9
BRYOZOA	3	5.9
ECHINODERMATA	1	2.0
UROHORDATA	1	2.0
CHORDATA	9	17.6
RICHNESS	51	100.0

Rhodophytes (red algae), chordates (fish), phaeophytes (brown algae), and mollusks (snails, bivalves, octopus, sea hares, and nudibranchs) were the most abundant groups. Ratner Beach subtidal habitat exhibited greater numbers of red algae and fish, while other taxonomic groups were generally similar in the numbers contributed at each site. Habitat types, species distributions, and their relative abundances at the Topanga and Ratner Beach transects are discussed below.

3.5.2.1 Topanga Beach Transects

Topanga -5' Isobath. The -5' isobath is an extension of the lower intertidal with similar habitat composition and species complex. The habitat is primarily a mix of hard-bottom (low-relief rubble boulder/cobble) and sand approximately 30/70%, respectively. Most of the rock was located on the western end of the transect near the primary surf break (Point Surf Break). The bottom was dominated by sand, and secondarily sand mixed with cobble beginning half way to Mastro's Point, that terminated about 100 m from Mastro's Point. Scattered, isolated areas of low and high-relief reefs (~3-6' high reefs) were common near the Point.

The low-relief habitat is highly sand influenced as evidenced by the high sand cover and the dominance of psammophytic and sand-resistant algal species (Figure 28). Several small patches (1-2 m^2) of surfgrass were observed (Figure 29).

Common to abundant algae included: *Taonia lennebackeriae*, *Ulva* spp., *Cystoseira osmundacea*, *Chondracanthus canaliculatus*, *Egregia menziesii*, *Zonaria farlowii*,

Figure 28. Low-Relief Habitat Composed of Cobbles and Boulders at Topanga Beach. Habitat comprised approximately 30% of the area along the -5' MLLW isobath. The area was highly sand influenced and dominated by psammophytic and sand-resistant algal species.

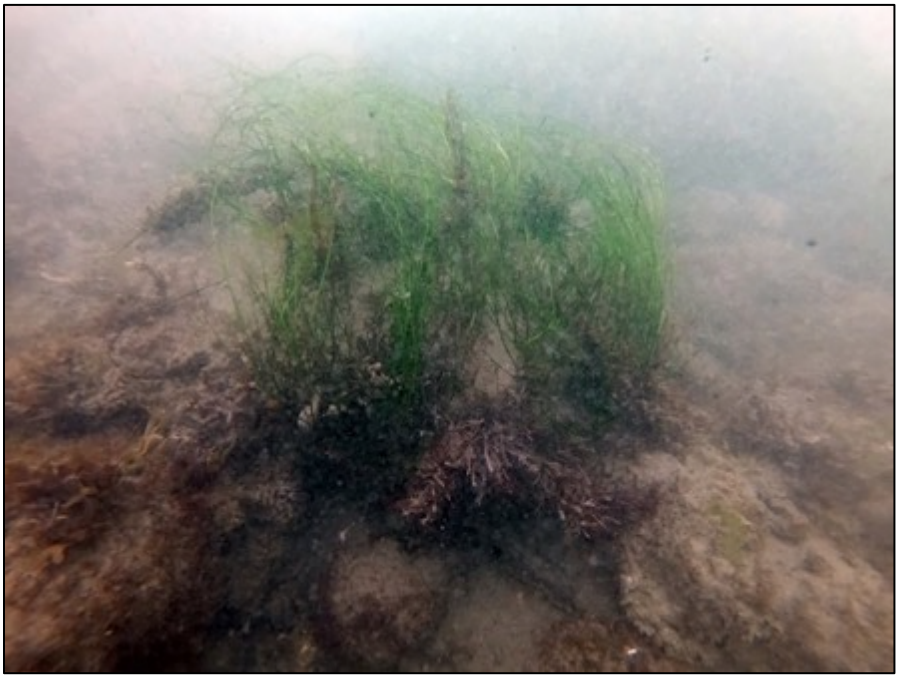

Figure 29. Small Patches (1-2 m^2) of Surfgrass, Along the -5' MLLW isobath at Topanga Beach.

Desmarestia ligulata, *Colpomenia sinuosa, Corallina vancouveriensis, C. chilensis, Gelidium* spp., *Lithothrix aspergillum*, *Lithophyllum* spp., diatoms, *Ahnfeltia plicata*, *Gymnogongrus leptophyllus*, and *Rhodymenia* spp.

Common invertebrates included Spiny lobsters (*Panulirus interruptus*), sea hares *(Aplysia californica),* sandcastle tube worms, wavy turban snails (*Megastraea undosa)*, and encrusting bryozoans (Figure 30). Less common invertebrates included the purple olive snail (*Callianax biplicata*) and the sheep crab (*Loxorhynchus grandis)*.

Common fishes included: barred sand bass (*Paralabrax nebulifer),* kelp bass (*P. clathratus),* spotted sand bass *(P. maculatofasciatus),* kelp perch *(Brachyistius frenatus)*, and round string ray (*Urolobatis halleri)*.

Figure 30. Spiny Lobsters and California sea hares Along the -5' MLLW Isobath at Topanga Beach.

Topanga -10' Isobath. The habitat on the -10' isobath was similar to the -5' isobath with approximately the same percentage of low-relief boulder/cobble and sand composition (30%/70% respectively). Rocky reef habitat was prevalent at the east and west ends around the rocky points with sand dominating the middle-third section where the sand beach was located along the shore. The low-relief habitat is highly sand influenced as evidenced by the high sand cover and high cover of psammophytic and sand-resistant algal species (Figure 31).

Five small patches 1-2 sq m of surfgrass were seen. Ornate tube worms (*Diopatra ornata*) were common in the areas dominated by sand (Figure 32).

Common to abundant algae included: *Taonia lennebackeriae, Ulva* spp., *Cystoseira osmundacea, Chondracanthus canaliculatus, Egregia menziesii, Zonaria farlowii,*

Figure 31. Sand-Influenced Low-Relief Reef Along the -10' MLLW Isobath at Topanga Beach.

Figure 32. The Ornate Tube Worm (*Diopatra ornata*) on the Sand Bottom Along the -10' MLLW Isobath at Topanga Beach.

Desmarestia ligulata, Colpomenia sinuosa, Corallina vancouveriensis, C. chilensis, Lithothrix aspergillum, Gelidium spp., *Lithophyllum* spp., Diatoms, *Ahnfeltia plicata, Gymnogongrus leptophyllus, Gracilaria* sp*., and Rhodymenia* spp. Several *Sargassum muticum* thalli were observed.

Common invertebrates included: the purple olive snail*, the California* sea hare*,* sandcastle tube worms*,* wavy turban snails, fluted bryozoans, and unidentified encrusting bryozoans. Lobsters were relatively abundant (Figure 33). Less common invertebrates included octopus (*Octopus bimaculatus),* the golden gorgonian (*Muricea californica,* Figure 34), the crab *Cancer antennarius,* and the sand dollar *Dendraster excentricu*s.

Common fishes included: sand bass, kelp bass, spotted sand bass, kelp perch, and round sting rays (Figure 35).

Figure 33. Spiny Lobsters (*Panulirus interruptus*). Common Along the -10' MLLW Isobath at Topanga Beach.

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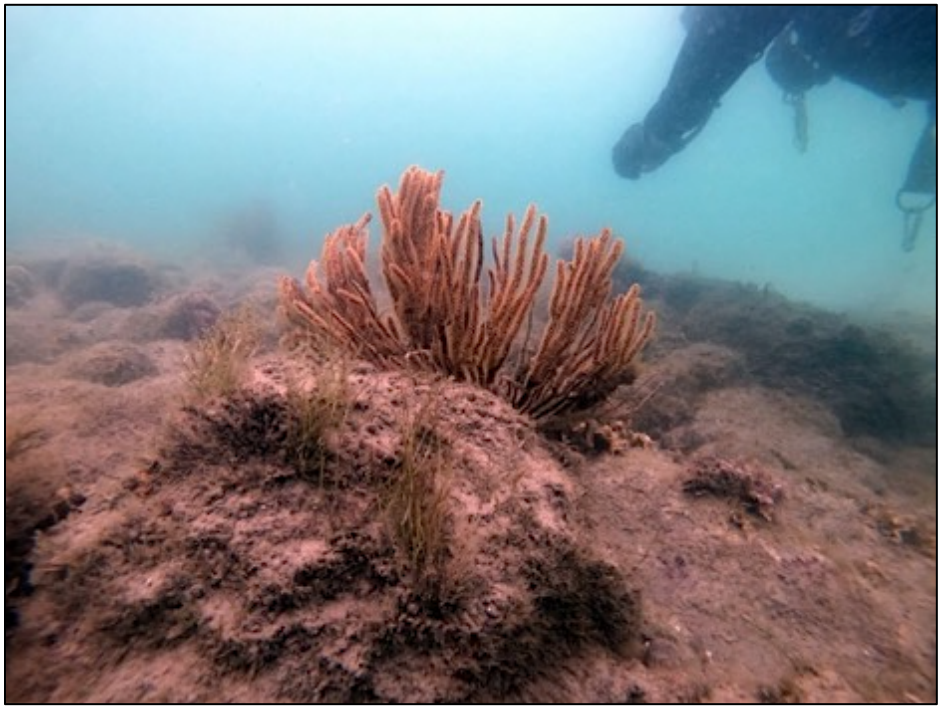

Figure 34. Golden Gorgonian (*Muricea californica*) Along the -10' MLLW Isobath at Topanga Beach

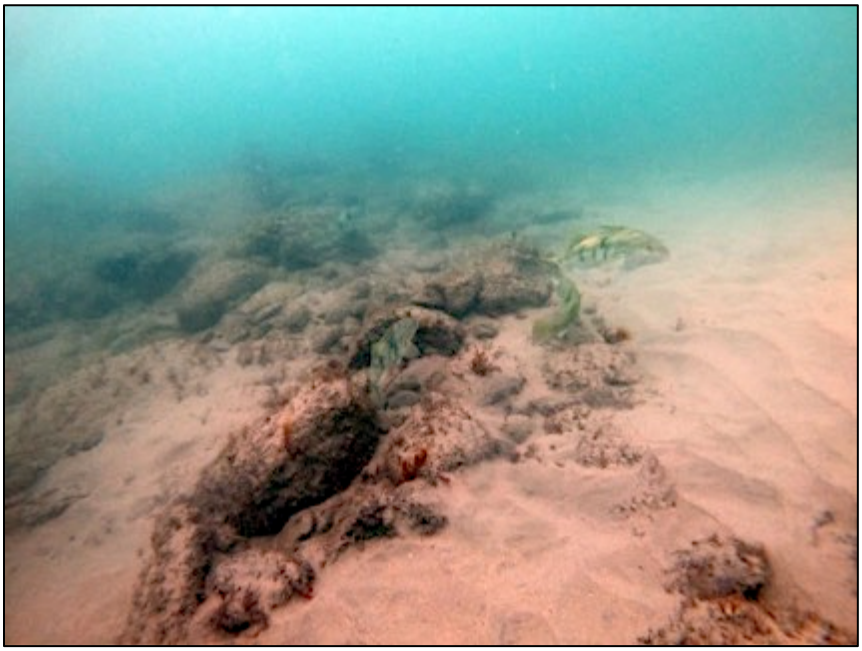

Figure 35. Sand bass (*Paralabrax nebulifer*), shown just to the right of the rock outcrop were common along the --10' MLLW isobath at Topanga Beach.

Topanga 12' Isobath. At the west end of the -12' isobath near the surfing point, the habitat was comprised of low-relief boulders/cobbles interspersed between a series of sand channels (Figure 36). The seafloor in the middle-third of the transect was dominated by sand. Near the point at Mastro's, boulders and cobbles were more common with some relatively large boulders measuring 1-2 m in diameter providing refuge for spiny lobsters (Figure 37). Low-relief reef comprised approximately 25% of the habitat along the transect. High-relief boulders and bedrock made up a small percentage (~5%) of the habitat with the rest being sand.

Common to abundant algae included: *Taonia lennebackeriae, Ulva* spp., *Zonaria farlowii, Desmarestia ligulata, Colpomenia sinuosa, Corallina vancouveriensis, C. chilensis, Lithothrix aspergillum, Gelidium* spp., *Lithophyllum* spp., *Gracilaria* sp., Diatoms, *Ahnfeltia plicata, Gymnogongrus leptophyllus,* and *Rhodymenia* spp (Figure 38). *Cystoseira osmundacea* was present in low abundance.

Common invertebrates included purple olive snails, California sea hare, wavy turban snail, spiny lobsters, fluted bryozoans, the hydroid Ag*laophenia struthionides,* sand dollars, encrusting bryozoans. Less common invertebrates included golden gorgonians, and cancer crabs.

Common fishes included sand bass, kelp bass, spotted sand bass, and round sting ray. Several horn sharks (*Heterodontus francisci*) were observed (Figure 39).

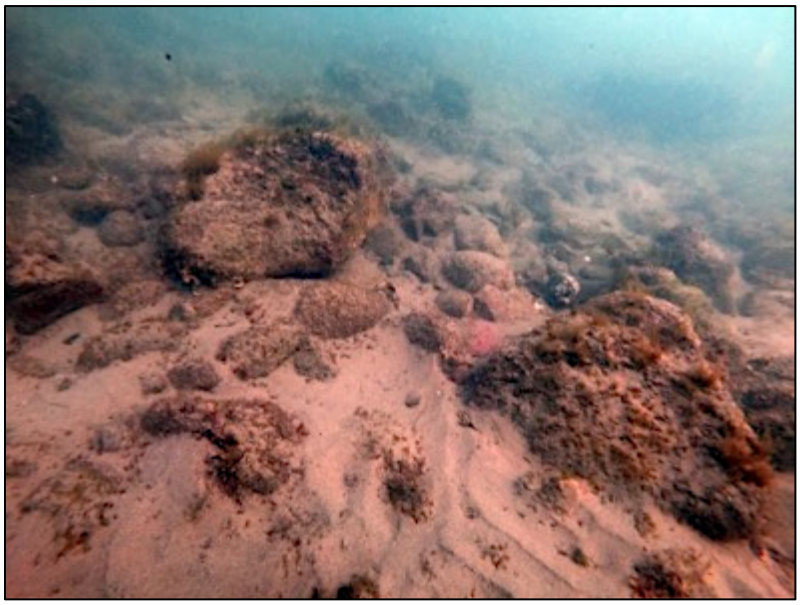

Figure 36. Low-Relief Boulders and Cobble Interspersed Between Sand Channels Were Common Along the -12' MLLW Isobath at Topanga Beach

Figure 37. Spiny lobsters (*Panulirus interruptus*) Along the -12' MLLW Isobath at Topanga Beach

Figure 38. The Low-Relief Reef Was Dominated By Psammophytic and Sand-Resistant Algal Species at Topanga Beach

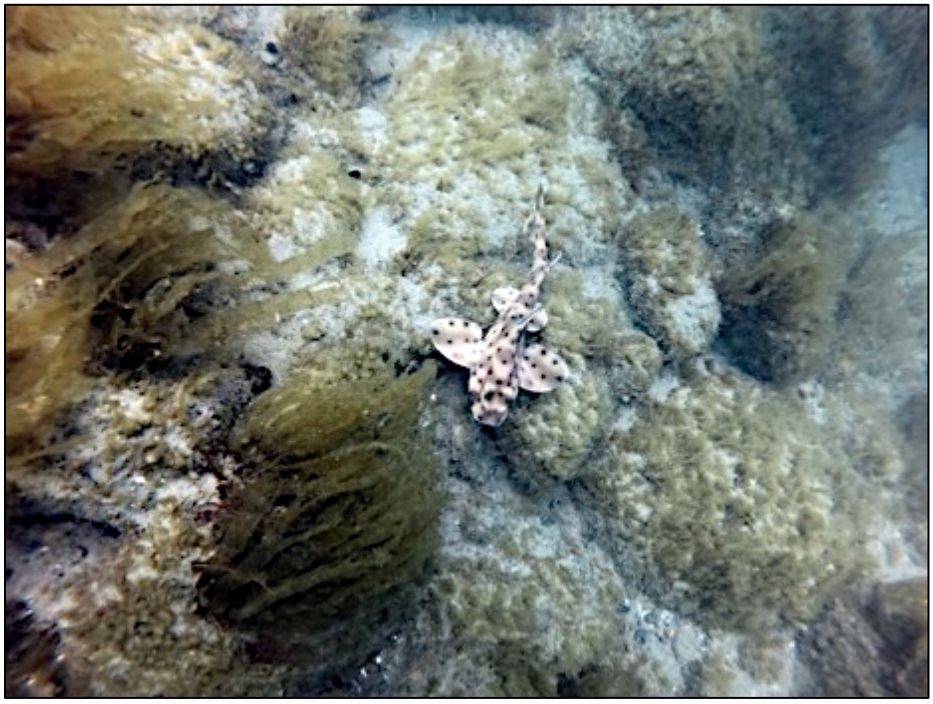

Figure 39. Several Horn Sharks (*Heterodontus francisci*) Were Observed Along the -12' MLLW Isobath at Topanga Beach.

Topanga -15' Isobath Sand was the dominant feature along the -15' isobath comprising approximately 90% of the seafloor with the remainder being comprised of low-relief cobbles and medium-sized boulders (Figure 40). The rocky habitat was located near the Point Surf Break just south of Topanga Lagoon and Creek.

Common to abundant algae in the cobble and boulder fields included: *Taonia lennebackeriae, Ulva* spp., *Corallina vancouveriensis, C. chilensis, Lithothrix aspergillum, Gelidium* spp., *Lithophyllum* spp., diatoms, and *Gracilaria* sp. *Cystoseira osmundacea* and *Sargassum muticum* were present in low abundance.

The larger boulders supported lobsters (Figure 40), golden gorgonians, the brown algae *Cystoseira osmundacea*, and several articulated coralline algae species (*Corallina vancouveriensis, C. chilensis,* and *Lithothrix aspergillum*) The sand habitat supported a relatively diverse assemblage of invertebrates such as the spiny sand star (*Astropecten armatus*), sea pansy (*Renilla kollekerii*), and ornate tube worms (Figure 41). High-density sand dollar beds dozens of meters wide and in densities up to several hundred per square meter occurred midway between the surfing point and Mastro's (Figure 42). Other common invertebrates included: purple olive snails, spiny lobsters, and encrusting bryozoans. Less common invertebrates included golden gorgonians and sheep crabs (Figure 43).

Figure 40. Spiny Lobsters (*Panulirus interruptus*) and Gorgonians (*Muricea*) Along the -15' MLLW Isobath at Topanga Beach.

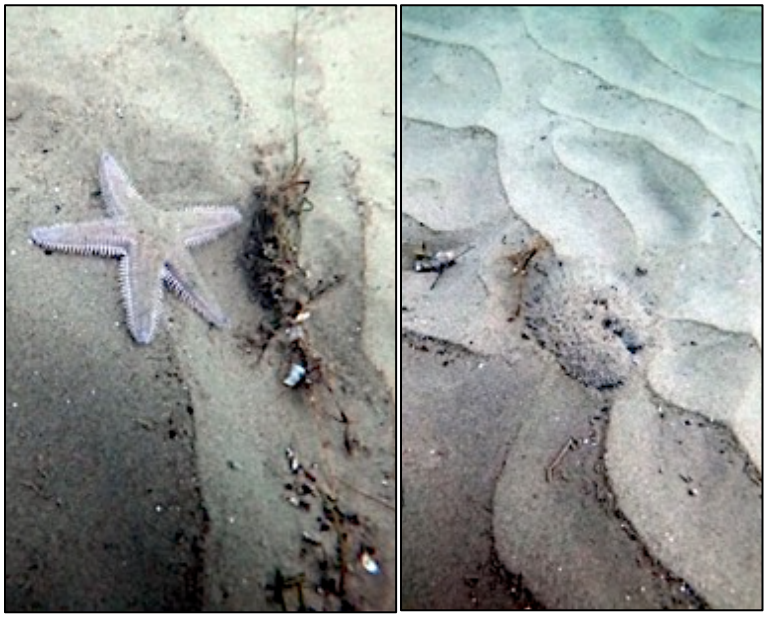

Figure 41. The Spiny Sand star (*Astropecten armatus*) and the Sea Pansy (*Renilla kollekerii*) Along the -15' MLLW Isobath at Topanga Beach

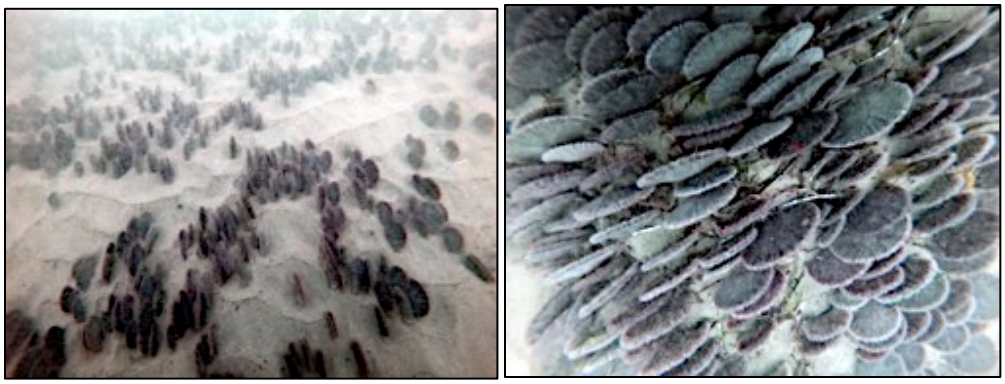

Figure 42. High-Density Sand Dollar (*Dendraster excentricus*) Beds. These were the dominant feature on the middle section of the -15' MLLW isobath at Topanga Beach.

Figure 43. The Occasional Sheep Crab (*Loxorhynchus grandis*) Was Observed Along the -15' MLLW Isobath at Topanga Beach.

Along the -15' dive transect, the most common fishes observed included sand bass, kelp bass, spotted sand bass, and round stingray.

5.5.2.2 Ratner Beach Dive Transects

The shallow subtidal physical environment along Ratner Beach varied markedly from the upcoast area surveyed along Topanga Beach. There was considerably more hard-bottom habitat, both low and high relief, with areas of relatively large (several m^2) bedrock reef. Sand habitat at both Ratner and Topanga was overall much more common than hard bottom, comprising about 70% of the seafloor along each of the dive transects.

Ratner -5' Isobath. Like Topanga Beach, the -5' isobath at Ratner Beach was similar in habitat composition to the lower intertidal zone due to the proximity of the two areas, and many of the same species were found in both the lower intertidal and shallow subtidal zones. High-relief Consolidated Rubble, i.e., (rocky reef with 3' to 6' of elevation) comprised approximately 10-15% of the shoreline along with approximately 30% of low-relief reef, and the remainder was sand bottom (Figure 44). Large (several m^2) beds of surfgrass and expansive colonies of sandcastle tube worms were common along the -5 ft Isobath (Figure 45a and 45b).

Figure 44. High-relief Reef (3-6') Habitat and Sand Bottom Along the -5 ft MLLW Isobath at Ratner Beach

Figure 45a and 45b. Surfgrass (P*hyllospadix torreyi,* Figures 45a and 45b) and Sandcastle tube worm (*Phragmatopoma californica*) Colonies (Figure 45b) were common along the -5' MLLW isobath at Ratner Beach

The low-relief habitat was highly sand-influenced as evidenced by the high sand cover and high cover of psammophytic and sand-resistant algal species. However, the high-relief reefs were less sand-influenced and colonized by a greater cover of leafy and foliose red and brown algae rather than more opportunistic algal species.

Common to abundant algae included: *Taonia lennebackeriae*, *Ulva* spp., *Cystoseira osmundacea*, *Chondracanthus canaliculatus*, *Egregia menziesii*, *Zonaria farlowii*, *Desmarestia ligulata*, *Colpomenia sinuosa, Corallina vancouveriensis, C. chilensis, Gelidium* spp*., Lithothrix aspergillum*, *Lithophyllum* spp., Diatoms, *Ahnfeltia plicata*, *Gymnogongrus leptophyllus*, and *Rhodymenia* spp. *Gracilaria* sp. was common in the sand channels.

Common-to-abundant invertebrates included *s*piny lobsters, California sea hares*,* reef-building polychaete worms, wavy turban snails, purple olive snails, and encrusting bryozoans. Sheep crab were less commonly observed.

Common fishes included: barred sand bass*,* kelp bass*,* spotted sand bass*,* and kelp perch. One horn shark was observed.

Ratner -10' Isobath. The -10' isobath was characterized by approximately 30% low-relief reef comprised of cobbles, boulders, and bedrock. The small amount of high-relief reef (~5%) is prime habitat for the California gorgonian and the brown gorgonian (*M. fruticosa*) as well as spiny lobsters (Figure 46). Rock boring clams (*Zirfaea pilsbryi*) and

the California cone snail (*Conus californicus*) were common in the sand channels (Figure 47). Relatively large and numerous small patches of surfgrass occurred along the isobath.

Common to abundant algae included: *Taonia lennebackeriae*, *Ulva* spp., *Cystoseira osmundacea*, *Chondracanthus canaliculatus*, *Chondracanthus* spp., *Egregia menziesii*, *Zonaria farlowii*, *Laurencia pacifica*, *Desmarestia ligulata*, *Colpomenia sinuosa, Corallina vancouveriensis, C. chilensis, Gelidium* spp., *Lithothrix aspergillum*, *Lithophyllum* spp., Diatoms, *Ahnfeltia plicata*, *Gymnogongrus leptophyllus*, and *Rhodymenia* spp. *Gracilaria* sp. was common in the sand channels.

Common to abundant invertebrates included spiny lobsters, cone snails, sandcastle tube worms, wavy turban snails, purple olive snails, fluted bryozoans, hydroids, and encrusting bryozoans. Less common invertebrates included sheep crabs, California sea hares, the nudibranch *Flabellina iodinea,* the stalked sea squirt *Styela montereyensis,* and brown gorgonians.

Common fishes included: sand bass, kelp bass, barred sand bass, sargo *(Anisotremus davidsonii),* black surfperch *(Embiotoca jacksoni)* and kelp perch. Several garibaldi *(Hypsypops rubicundus)* were observed (Figure 49).

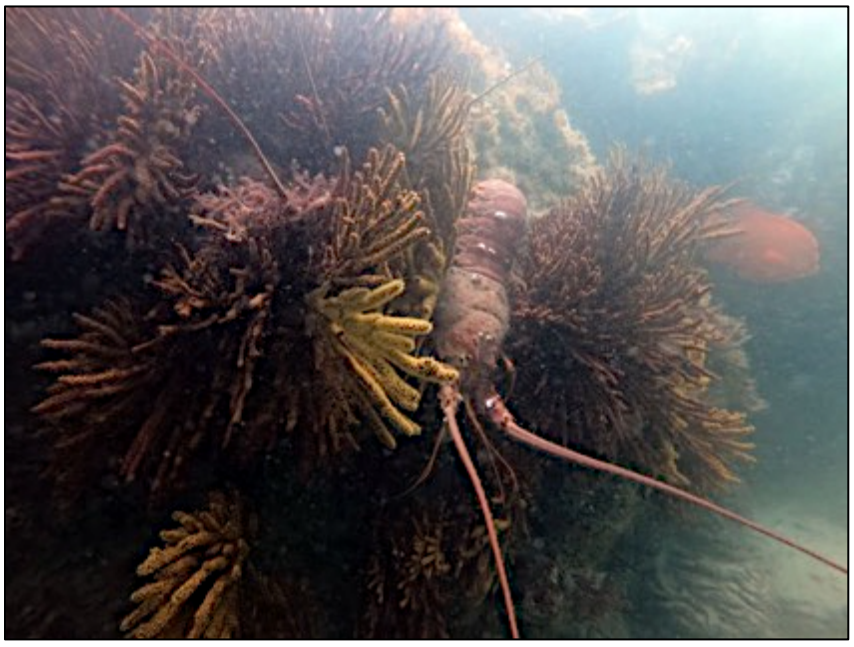

Figure 46. Spiny Lobsters (*Panulirus interruptus*) and gorgonians (*Muricea californica* and *M. fruticosa*) on the High-Relief Reefs Along the -10’ MLLW Isobath at Ratner Beach

Figure 47. Top: Rock boring clam (*Zirfaea pil*sbryi) siphons (protruding through a cover of sand over rock) clam siphons. Bottom: California cone snails (*Conus californicus*) were observed on the soft bottom of Ratner Beach.

Figure 48. Several garibaldi (*Hypsypops rubicundus*) were observed around the reefs at Ratner Beach.

Ratner -12' Isobath. High-relief rocky reefs accounted for approximately 5% of the habitat along the -12' isobath with some exceptional reefs rising more than 3 m off the bottom harboring a diverse assemblage of flora and fauna. The high-relief reefs supported large colonies of golden gorgonians and numerous spiny lobsters (Figure 49). Surfgrass beds occurred along approximately 5% of the area surveyed along the -12' isobath.

Common to abundant algae included: *Taonia lennebackeriae, Ulva* spp., *Corallina vancouveriensis, C. chilensis, Lithothrix aspergillum, Gelidium* spp., *Lithophyllum* spp., diatoms, filamentous red algae, and *Rhodymenia* sp. *Gracilaria* sp. was common in the sand channels.

Common to abundant invertebrates included: sand dollars, purple olive snails, spiny lobsters, the bivalve *Pseudochama exogyra,* ornate tube worms, rock-boring clams, stalked sea squirts, the bryozoan *Diaporecia californica*, fluted bryozoans, and other encrusting bryozoans. Less abundant invertebrates included cancer crabs, California sea hares, and nudibranchs.

Common fishes included: sand bass, kelp bass, spotted sand bass, sargo, garibaldi, and round string ray (Figure 50).

School of Sargo (*Anisotremus davidsonii*) in rocky reef habitat on the 12’ isobath off of Ratner Beach.

Figure 49. Large colonies of gorgonians (*Muricea californica*) occur on the high-relief reefs on the -12’ isobath.

Figure 50. Garibaldi (*Hypsypops rubicundus*) swimming above golden gorgonians on the -12' isobath at Ratner Beach.

Ratner -15' Isobath. The habitat along the -15' isobath is largely composed of sand on the western half and a mixture of low and high-relief reefs (cobbles, boulders, and bedrock) on the eastern section. Overall, there was approximately 70% sand, 25% low-relief reef, and 5% high-relief surveyed along the 15' isobath. High-density sand dollar (*Dendraster excentricus*) beds dozens of meters wide dominate the sand bottom near the west end of the transect (Figure 51). The hard bottom is highly sand influenced and dominated by psammophytic and sand-resistant algal species. The high-relief reefs support large colonies of fluted bryozoans and gorgonians (Figure 52).

Common to abundant algae included: *Taonia lennebackeriae, Ulva* spp., *Corallina vancouveriensis, C. chilensis, Lithothrix aspergillum, Gelidium* spp., *Lithophyllum* spp., diatoms, filamentous red algae, and *Rhodymenia* sp.

Common to abundant invertebrates included: sand dollars, purple olive snails, spiny lobsters, golden gorgonians, the bivalve *Pseudochama exogyra,* the staghorn bryozoan *Diaporecia californica*, fluted bryozoans, and other encrusting bryozoans.

Figure 51. Large and high-density sand dollar (*Dendraster excentricus*) beds were observed between Mastro's Point and Ratner Beach. The beds extended several hundred meters along the 15' MLLW isobath.

Common fishes included: sand bass, kelp bass, spotted sand bass, and round sting ray.

Figure 52a and 52b. Fluted bryozoans, *Hippodiplosia insculpta* (Top, 52a) and gorgonians, Muricea *californica* (Bottom, 52b) were common inhabitants of the high-relief reefs on the -15' MLLW isobath at Ratner Beach.

Figure 52c. Example of surfgrass covering low-lying rock habitat influenced by sand at -15 ft MLLW offshore of Ratner Beach.

The results of subtidal surveys at depths between -5 and -15 ft MLLW off of Topanga Beach and Ratner Beach indicated the seafloor consisted on the average about 30% rock and 70% sand, although the 15 ft isobath at both sites was primarily sand. At Topanga, most low relief hard bottom (cobble and/or rubble reef) was located near the surfing point just east of Topanga Lagoon or to the east approaching Mastro's Point, with a majority of sand bottom located in between the two distinct cobble and rubble areas. Ratner Beach however, exhibited more a greater complexity of intermixed low-and-high relief habitat throughout the area between depths of -5 to -12 ft MLLW. Sandy bottom dominated the 15 ft isobath.

The biological community was generally similar in community taxonomic composition although the number of species present (species richness) was greater in the Ratner subtidal than in the Topanga subtidal. In particular, there were greater numbers of red alga and fish species at Ratner Beach compared to Topanga Beach. This outcome was likely the result of a greater degree of larger and stable reef habitat at Ratner than Topanga. The low-relief habitat at the sand/rock interface -at both sites was highly sand influenced as evidenced by the high sand cover and high cover of psammophytic (sand-loving) and sand-resistant algal species. The high-relief habitat at Ratner Beach appeared less disturbed with higher cover of foliose algae and fewer opportunistic species.

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Giant kelp (*Macrocystis*) was not observed during the surveys. Other brown algal species were present at both sites, but brown algae exhibited a greater depth range than at Topanga. Surfgrass was present in small patches at Topanga, but it was found in healthier, larger patches and beds between -5 and -12 ft MLLW depths offshore of Ratner Beach.

Hard bottom at both Topanga and Ratner was colonized by gorgonians (*Muricea* spp.) but were they were found more extensively at Ratner than at Topanga. Colonial tube-building polychaete worms (*Phragmatopoma*) were common to abundant on low reef areas at both sites but more extensive at Ratner due to greater hard bottom relief. . Both areas exhibited healthy numbers of lobsters out in the open and in crevices. The present of greater sized reefs and under-hangs at Ratner appeared to support a greater number of lobsters than at Topanga where the habitat was less conducive. On the sand bottom, sand dollars *(Dendraster*) were present in very high densities at both Topanga and Ratner between -10 and -15 ft, but the beds were larger and extended farther offshore at Ratner than at Topanga. Sea pansies (*Renilla*) were located at depths of -12 ft, only at Topanga, and in the same general area where they were located during the 2022 surveys.

3.6 MARINE BIOLOGICAL HABITAT CLASSICATIONS

The classifications of marine habitats represented in the project area were based on the US Department of the Interior, Fish and Wildlife Service publication, "Classification of Wetlands and Deepwater Habitats of the United States". The determinations were result of sidescan investigations and remote videos of the seafloor made during the sidescan sonar target verification survey; direct observations and photographic records made by marine biologists during three field days of intertidal surveys and five days of dive surveys at depths between in 2022 and 2023. Where applicable, Essential Fish Habitat (EFH) and EFH Habitat Areas of Particular Concern (HAPC) were identified for each classification. Figure 53 illustrates the distribution of marine habitat types in the project area. Table 5 describes the biological habitats and particular species of interest, and presents estimated acreages and depth ranges of habitats and species where applicable. Descriptions of the Unconsolidated-Sand, Unconsolidated- Cobble, and Consolidated-Rock (Rubble) are described in more detail in Section 3.3.2, but are also summarized in this section as they relate to biological communities and particular species that occur within each marine habitat.

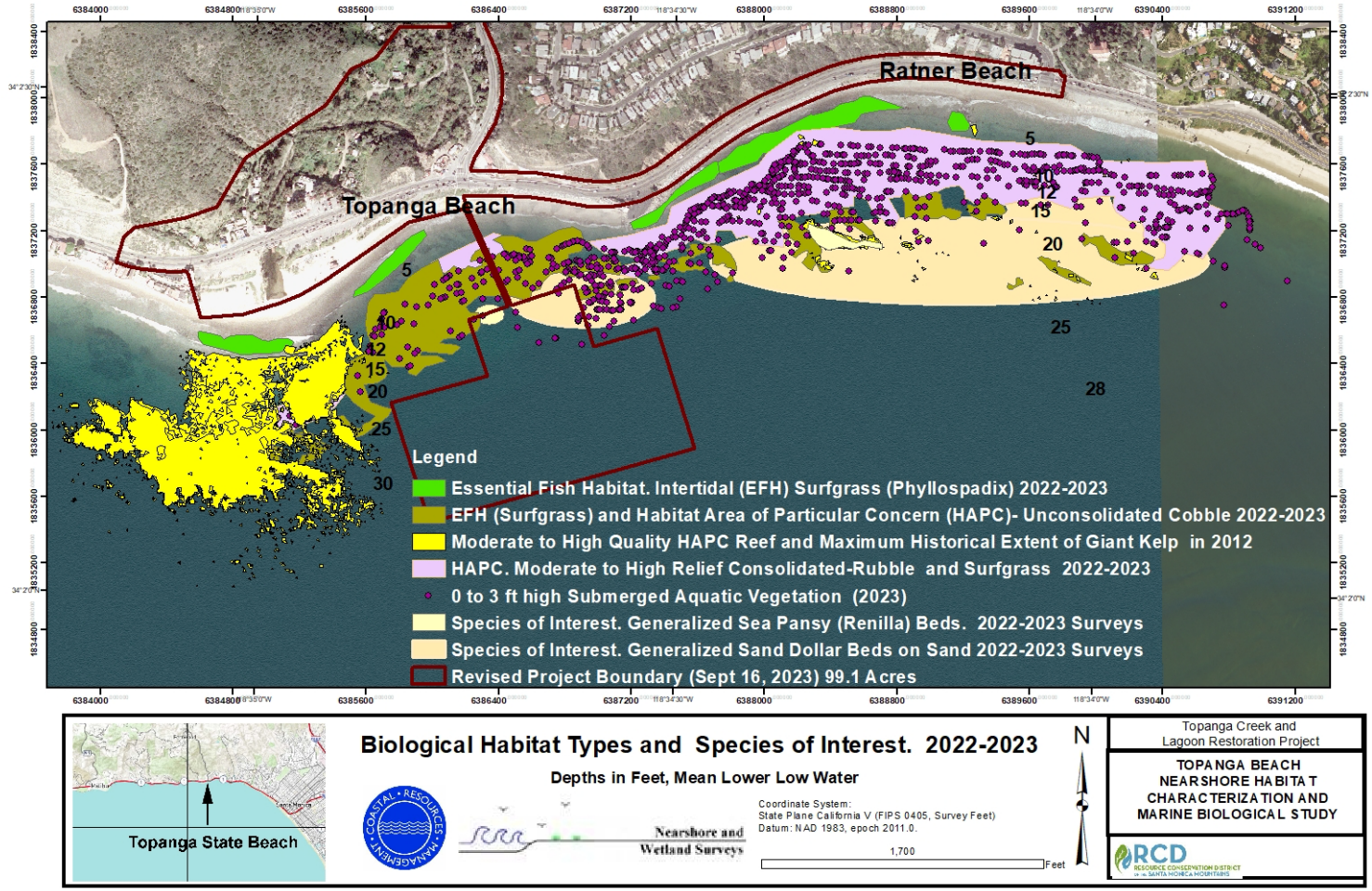

Figure 53. Major Marine Biological Habitats.

Table 5. Description of Biological Habitat Types and Species of Interest

Intertidal	**Description**	**Approximate Acreage and Depth Range**
Unconsolidated-Sand	Low-to-High Value. Potentially high value due to presence of California Grunion spawning habitat along both Topanga and Ratner beaches. Invertebrates (amphipods, sand crabs, polychaetes, and clams support shorebirds populations and fish on higher tides. Portions of the sand habitat is mixed with cobble.	11.7 acres; 2.7 acres of sand/cobble mix -2 to +7 ft MLLW
Unconsolidated-Cobble	Essential Fish Habitat-Rocky Reef Habitat of Particular Concern (HAPC). Low-Moderate Biological Value. t. Generally supports short-lived, sand tolerant and sand loving species of algae (i.e., coralline algae, encrusting red/brown algae, low turf algae (i.e., Gelidium and Zonaria) opportunistic green algae) due to regular periods of accretion and erosion. Characteristics of the high and mid Topanga intertidal also present at Ratner Beach. Portions mixed in with rubble fields	4.6 acres; 11.7 acres of Rubble/Cobble mix -2 to +7 ft MLLW
Consolidated-Rock (Rubble)	Essential Fish Habitat- Rocky Reef HAPC. Moderate-to-High Value. Rubble/Boulder habitat is more common at Ratner Beach than Topanga Beach. Greater degree of tide pool depressions supporting intertidal invertebrates and algae. Supports a greater diversity of Aquatic Bed-Algae (i.e., foliose reds and brown algae) as well as small sand tolerate/loving algae, and colonial tube worms (*Phragmatopoma*) at the base of the rocks. Supports Aquatic-Bed Rooted vascular plants (surfgrass).	0.5 acre boulder/bedrock platform; 11.7 acres of Rubble/Cobble mix (see above) -2 to +7 ft MLLW

Aquatic Bed-Algae	Common to both Topanga and Ratner beaches. Low-moderate biological value in unconsolidated cobble/gravel fields; moderate-to-high value in Consolidated-Rock (boulder/bedrock) habitat particularly at Ratner Beach due to increased habitat stability and biological diversity of algal community	16.8 acres -2 to +5 ft MLLW
Aquatic Bed-Rooted Vascular (Surfgrass, Phyllospadix)	Essential Fish Habitat and HAPC. Common to both Topanga and Ratner rocky intertidal, although healthier intertidal surfgrass beds are found in the Ratner Beach intertidal. Less healthy and patchier intertidal surfgrass in the Topanga intertidal likely due to less stable habitat (unconsolidated cobble/gravel) and effects of Topanga Creek/Lagoon runoff.	4.0 acres -2 to +1 ft MLLW
Subtidal		
Unconsolidated-Sand	Low-Moderate Value. Species of interest in the sand habitat include the sand dollar (*Dendraster excentricus*) that form extensive, and low-to-dense beds offshore of Topanga Beach and Ratner Beach and the sea pansy (*Renilla kollekerii*) which is present in a low density aggregation off of Topanga Beach at an approximate depth of -15 ft MLLW. Other species found within this habitat include a community of benthic infauna, and macro-epibenthic sand stars, cancer crabs, occasional lobsters, whelks, hermit crabs, sand bass, halibut, and sting rays.	137.3 acres -2 to -30 ft MLLW
Unconsolidated-Cobble	Essential Fish Habitat-Rocky Reef HAPC. Low-Moderate Biological Value. Similar to the intertidal, Cobble generally supports short-lived, sand tolerant and sand loving species of algae (i.e., coralline algae, encrusting red and brown algae, low turf algae, and. opportunistic green algae) due to regular periods of habitat instability, and sand accretion and erosion. Dominant but not continuous and mixed with sand from the Topanga Point Break to areas approaching Maestro's Point to depths of about -17 ft. Similarly occurs off Ratner Beach, but not as common as offshore Topanga Beach.	16.7 acres -2 to -17 ft MLLW

Consolidated-Rock (Rubble)	Essential Fish Habitat (Rocky Reef). Moderate-to-High Value. Rock (Rubble/Boulder/Bedrock) habitat is more common offshore of Ratner Beach than Topanga Beach. Supports a greater biodiversity of marine life than cobble/gravel habitat, including invertebrates and algae. Species of interest in the project area include Supports a greater diversity of Aquatic Bed-Algae than cobble/gravel intertidal i.e., foliose reds and brown algae) as well as and small sand tolerate/loving algae as the base of the rock. Supports Aquatic-Bed Rooted vascular plants (surfgrass). Lobsters commonly observed in Consolidated Rock habitat off of both Topanga and Ratner beaches in 2023.	36.6 acres -2 to -17 ft MLLW
Aquatic Bed-Submerged Aquatic Vegetation (Algae)	Algae <3 ft in height is common to both Topanga and Ratner subtidal habitats, includes turf covering and upright reds and brown algae. Cover and habitat for invertebrates, fish, and foraging habitat for fish. Low-moderate biological value in unconsolidated cobble/gravel fields; moderate-to-high value in Consolidated-Rock (boulder/bed rock habitat, particularly at Ratner Beach due to increased habitat stability and biological diversity of algal community. Giant kelp (*Macrocystis pyrifera*) is absent from either area, although historically it formed a canopy as recently as 2012 off of the Topanga point break in front of Topanga Creek and to a much smaller degree, off Ratner Beach. Other kelps (>3 ft high) are uncommon and include E*gregia menziesii* and *Desmarestia ligulata*. Invasive seaweeds present include *Sargassum muticum* which was uncommon at either Topanga or Ratner during the 2023 dive surveys.	53 acres -2 to -17 ft MLLW
Aquatic Bed-Rooted Vascular Surfgrass *Phyllospadix torreyi*)	Essential Fish Habitat-Habitat Area of Particular Concern. Present in the Topanga and Ratner subtidal extending from -2 to approximately 15’ MLLW. Larger and healthier surfgrass beds are found off of Ratner Beach than off of Topanga Beach. Observed in low relief habitat partially covered by sand as well as in higher relief Consolidated-Rock habitat. Nursery habitat for California lobsters (Panulirus interruptus).	36.6 acres -2 to -17 ft MLLW

Canopy-Kelp (*Macrocystis pyrifera*)	Essential Fish Habitat-Habitat Area of Particular Concern. Canopy kelp HAPC includes those waters, substrate, and other biogenic habitat associated with canopy-forming kelp. Historical kelp canopy areas in the project area include the Point surf break in front of Topanga Creek at depths from -5 to -40 ft, and a minor bed off of Ratner Beach at a depth of approximately -20. Currently, there are no areas in the project area where kelp expresses any surface canopy.	35 acres -5 to -40 ft MLLW
Reef-Sandcastle Tube Worms (*Phragmatopoma californica*)	Sandcastle tube worms-Phragmatopoma californica. *Phragmatopoma* is a reef-building polychaete worm that collectively builds honeycomb-like tubes out of sand grains filtered out of turbulent eddies around reef bases. Found individually or in colonies on sand-influenced reefs. Present off of Topanga Beach and Ratner Beach; more abundant in the Ratner Beach subtidal.	No estimate, but presumed to be throughout hard bottom areas. -2 to -17 ft MLLW
Reef-Gorgonians (*Muricea californica* and M. *fruticosa*,	Gorgonians (sea whips) form colonies on rocky reefs in areas of moderate-to-high water movement. Present off of Topanga and Ratner Beaches. Denser colonies off of Ratner Beach primarily in Consolidated Rubble habitat.	No estimate, but presumed to be through hard bottom areas. -10 to -17 ft MLLW
Species of Interest Reef-California Spiny Lobster (*Panulirus interruptus*)	Juvenile and adult lobsters were common offshore of both Topanga and Ratner beaches primarily in Consolidated-Rock/Rubble due to the protective features of crevices and overhangs, secondarily in Unconsolidated Coble Gravel and Unconsolidated Sand where they appeared to be foraging.	No estimate, but presumed to be through hard bottom areas.
Consolidated Sand-Sand Dollars (*Dendraster excentricus*)	Found in Unconsolidated Sand habitat. Present in low-density to high-density beds offshore of both Topanga and Ratner beaches in clean sand habitat.	36 acres 5 to -15 ft MLLW

Sea Pansy (*Renilla kollekerii*)	Present in Unconsolidated Sand habitat in a small concentrated area immediately west of the inner edge of the proposed dredge nourishment area at depths between -12 and -15 ft MLLW-	0.4 acre -12 to -15 ft MLLW

3.6.1 Descriptions of Biological Habitats and Species of Interest

Aquatic Vegetation-Algae. The distribution of benthic (bottom) algae was determined a combination of the downlooking sonar SAV survey and biological observations made during the August 2022 and July 2023 surveys. The dominant forms of algae attached to low-relief subtidal boulders are forms known to be opportunistic, sand resistant, or psammophytic (sand loving) due to constant scour or sand deposition, such as articulated and encrusting coralline algae, This habitat, shown in Figures 54-56 is characteristic of Topanga and Ratner intertidal and subtidal habitat to depths of approximately -17 ft.. A high diversity of foliose red algae, and understory kelps (i.e., *Egregia* and *Desmarestia*) is more commonly associated with more stable boulder and bedrock reefs, particularly off of Ratner Beach, compared to Topanga Beach.

Figure 54. Cobble and Boulder field partially buried in sand with algal cover on the surface of rocks not sanded in. Some algae is observable growing through sand.

Figure 55. Low relief boulder reef heavily influenced by sand. Upright red algae (*Gracilariopsis*), articulated coralline algae present on the rocks.

Figure 56. Reef top of 3 ft high boulder with the red algae *Gelidium* encrusted with ectoprocts (bryozoans).

Larger, brown algal taxa were rarely observed. *Sargassum muticum* and *Cystoseira osmundacea* were occasionally observed mixed in with algae on the upper areas of the boulder reefs.

Aquatic Bed-Rooted Vascular Vegetation-Surfgrass, *Phyllospadix torreyi*. Surfgrass is a sensitive rocky intertidal and subtidal plant because it provides protective cover and nursery habitat for many invertebrates and fish some of which are commercially important including California spiny lobster (Engle, 1979). It is considered a Habitat Area of Particular Concern (HAPC) for Fisheries Management Plan (FMP) species under the Magnuson-Stevens Fishery Conservation and Management Act.

Like other species living in the surf zone and nearshore shallow subtidal environment, surfgrass is susceptible to seasonal and long-term effects of burial and high turbidity. Its sensitivity is also related its susceptibility to long-term damage because it is a very slow growing species. Revegetation occurs naturally through seeding and eventually spreading of roots and rhizomes over surfaces of rocks.

Figure 57. Surfgrass, -5 ft MLLW off Ratner Beach

Surfgrass is present in the intertidal and subtidal habitats of both Topanga Beach and Ratner Beach. However, the health of the surfgrass appears to be better and the areal cover of surfgrass is higher at Ratner Beach than Topanga Beach.

Subtidally, it was present in the nearshore waters of Topanga in 1974, marginally present in 1994, absent in 1997, and marginally present during the 2022 survey (Egstrom, 1974; CRM, 1994 and 1997). Detailed dives conducted offshore of Topanga and Ratner Beach in 2023 identified surfgrass beds at depths of between -5 and -15 ft (Figure 53). It was not a major component of the rock bottom areas at Topanga Beach in 2022 or 2023 nor was it historically. However, it was recorded east of Mastro's Point in surveys conducted between 1974 and 1997 and the 2023 dive surveys off of Ratner Beach confirmed it is more abundant east of Mastro's Point than at Topanga Beach. Its depth distribution is between the lower intertidal zone and approximately -20 ft MLLW.

Reef-Kelp Canopy. Giant Kelp, *Macrocystis pyrifera*. Giant Kelp is considered a Habitat Area of Particular Concern (HAPC) for Fisheries Management Plan (FMP) Species under the Magnuson-Stevens Fishery Conservation and Management Act. Giant kelp was absent from the project area in 2022 and 2023 but the hard bottom is favorable for re-establishment. Based on California Department of Fish and Wildlife kelp historical data, maximum kelp acreage was approximately 44 acres off the Topanga Point Surf Break in 2012 and to a much less extent, east off of Mastro's Point and Ratner Beach. The bed off of Ratner Beach attained a maximum area of 0.65 acre in 2012.

Reef-*Muricea californica* and *M. fruticosa.* Gorgonians (sea whips) are colonial, suspension feeding sessile invertebrates and attach to rocks in areas of moderate to high water movement. Muricea dominated the upper surfaces of the low relief reefs at Topanga and Ratner both species (*M. californica* and *M. fruticosa*). Gorgonians can be affected by sediment movement that either buries, scours, or detaches individuals from the substrate (Rosenthal et al., 1974). Gorgonians likely occur on the upper surfaces of low relief reef habitat along other portions of the Topanga shallow subtidal habitat.

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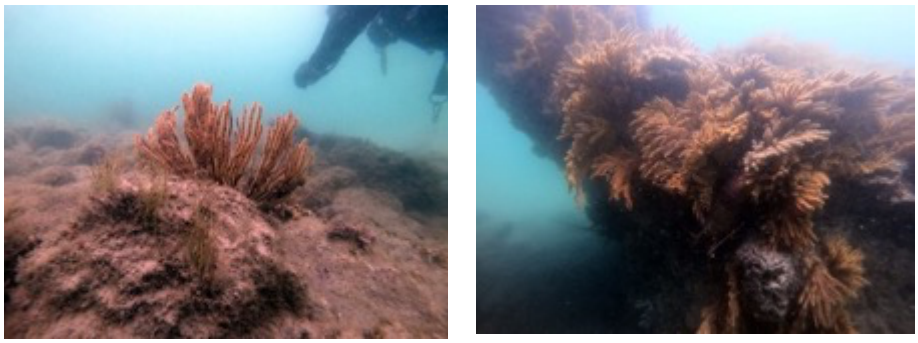

Figures 58a and 58b. *Muricea* spp. Topanga low relief (-12 ft MLLW, left) and Ratner high relief (-12 ft MLLW, right)

Reef-Sandcastle Tube Worm *Phragmatopoma californica*. *Phragmatopoma* is a common reef-building polychaete worm that forms colonies in rocky intertidal and rocky subtidal habitats (Figure 59). They commonly occur at the rock/sand interface and in low reef areas where turbulence suspends sediments. They actively cement suspended sand grains and particles to form extensive masses on rocks. In doing so, the habitat also increases biological diversity and habitat for other invertebrates. Healthy colonies were observed between the low tide zone and depths of -12 ft MLLW off of both Topanga and Ratner beaches.

Figure 59. Reef-building colony of the Sandcastle Tube Worm, *Phragmatopoma californica*.

Reef-Spiny Lobster, *Panulirus interruptus.* Spiny lobsters are an important keystone predator within the southern California nearshore ecosystem and supports a valuable commercial fishery and a significant recreational fishery Between Santa Monica and Malibu, they comprise 3.1% of the total recreational catch between San Diego and to Malibu Point. Rigid hoop nets (40.9%), free-diving (26.1%), and SCUBA diving (26%) are the main types of gear used to harvest lobster. (https://wildlife.ca.gov/Conservation/Marine/Lobster).

Spiny lobsters were commonly found during the 2023 transect dives off of both Topanga and Ratner beaches at depths between -5 and -15 ft MLLW. Individuals were sheltered in crevices, but also observed out in the open on reef surfaces as well as on the sand bottom (Figures 60a-60b).

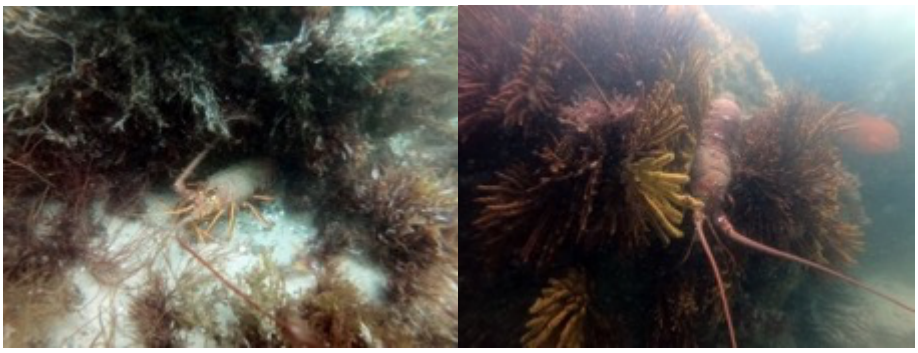

Figure 60a and 60b. Lobsters observed in crevices and in open areas of the reef.

***Un*consolidated Bottom-Sand Dollar (*Dendraster excentricus*)** Beds. In the sandy nearshore environment, sand dollar populations are unique but do not have any special species status locally, within the State of California, or on a federal level. However, sand dollar beds provide a microhabitat for other small organisms that congregate around and on sand dollars in an otherwise barren sandy bottom habitat.

Offshore of Topanga and Ratner Beach, mature and juvenile sand dollars were found in low-to-high densities at depths between -10 and -20 ft MLLW in 2022 and 2023 (Figure 61). Beds were located within a portion of the proposed dredge material disposal zone, along the eastern boundary. Bed density can easily range between 500 and 1,200 per square meter (Morin et al., 1985). During the 2022 dive survey, Topanga sand dollar beds were estimated to be between 200 and 1,100 per square meter. Density during the 2023 survey also fell within this range. Large sand dollar beds are found offshore of Will Rogers

State Beach and other nearshore sandy bottom habitats along the Malibu Coastline (Egstrom, 1974; CRM, 1994 and 1997).

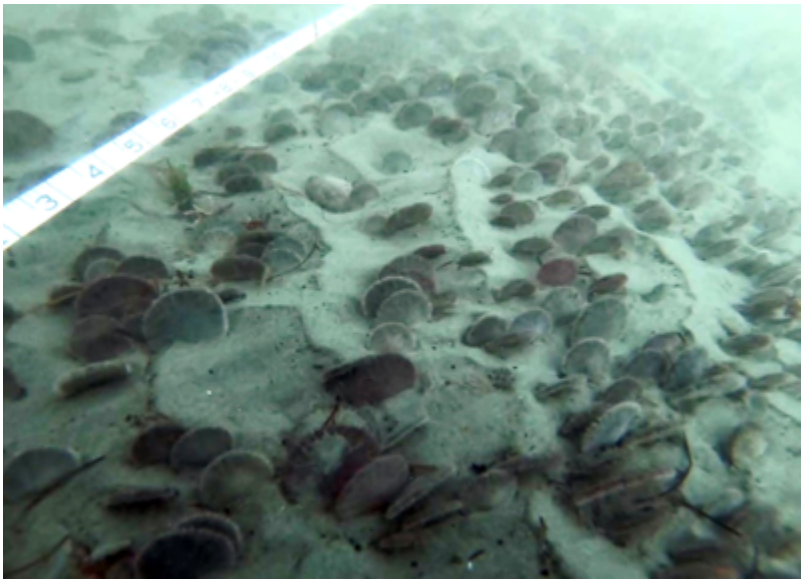

Figure 61. Dense Sand Dollar Bed (*Dendraster excentricus*) off of Topanga, 2022.

Unconsolidated Sand-Sea pansy *Renilla kollekerii*. The sea pansy, a relative of the jelly fish, was found in the nearshore sand habitat offshore of Topanga Beach at depths between -12 and -15 ft MLLW immediately west of the proposed dredge material disposal site. This sessile cnidarian anchors itself in the sand with a peduncle and its flat, oval body is situated just below the surface. Stinging cells on the dorsum are activated to kill small prey; it also has a mucous net that aids in capturing small organisms. This species is not considered a sensitive species, but it is a unique species within the sand bottom habitat.

Unconsolidated Bottom-*Diopatra* spp. community. The most abundant sand dwelling invertebrate in the nearshore Topanga area was the polychaete tube worm *Diopatra* spp. complex (*D. ornata* and *D. spendidissima)* which is also one of the most abundant nearshore sand bottom community taxa of invertebrates found throughout southern California sand bottom habitat (Figure 62). Di*opatra* was distributed between depths of -15 to -30 ft MLLW. A suspension feeding worm, *Diopatra* constructs parchment tubes to live in and cements debris such as algae, organic debris, and shells on their rubes. The tubes also act as refuges, or "islands" of stable habitat for many small invertebrates such as other worms, clams, amphipods, and caprellid. *Diopatr*a was also commonly aggregated around the bases of reefs, where surge and eddy currents trap large amounts of detritus and particulates. *Diopatra* is preyed upon by sand stars and sea stars.

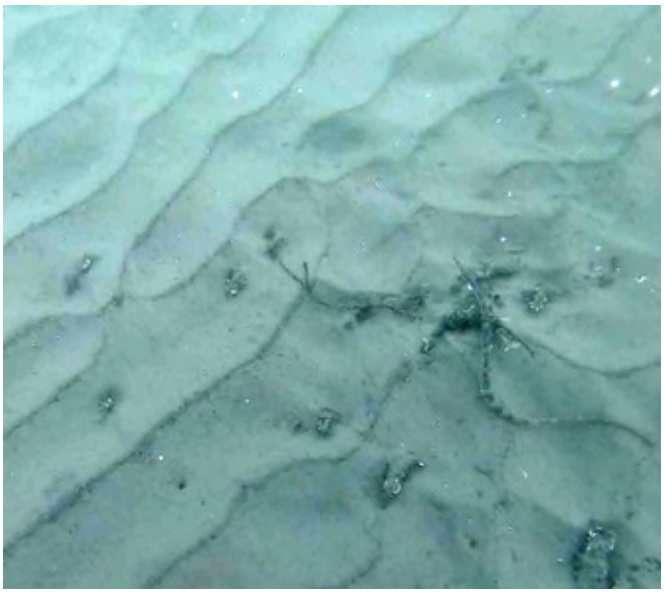

Figure 62. *Diopatra* spp. Ornate Tube Worms. A pipefish (*Sygnathus leptorhynchus)* is next to the tube, likely feeding on amphipods or caprellids that use *Diopatra* tubes as attachment.

Other regular occurring members of the sand bottom community that were present off of Topanga included the sand star (*Astropecten armatus*), the sea star *Pisaster giganteus*, the sea pen *Virgularia* sp., and juvenile and sub adult cancer crabs (*Romaleion antennarium)*.

Fishes (All habitats). Thirteen species of fish were observed off of Topanga and Ratner beaches in 2022 and 2023. In 2022, only a few specie4s were observed due to low visibility. Those observed over sand bottom habitat included pipefish (S*ygnathus leptorhynchus*), California halibut (*Paralichthys californicus*), speckled sand dab (*Citharichthys stigmaeus*), round sting ray (*Urobatis californica),* barred sand bass (*Paralabrax nebulifer*), and spotted sand bass (*P. maculatofasciatus*). In rocky areas, Painted greenlings (*Oxylebius pictu*s) were present in the rocky habitat at the east end of the survey area. Additional species observed during the 2023 dive survey in rocky bottom habitat included kelp perch (*Brachyistius frenatus*), black perch (*Embiotoca jackson*i), sargo (*Anisotremus davidsonii*), kelp bass (*P. clathratus*), garibaldi (*Hypsypops rubicundus*), and horn sharks (*Heterodontus franciscanus*).

Bait fish balls were frequently observed in both the sidescan sonar and downlooking sonar data. Most sightings were over sand bottom habitat.

3.7 LISTED AND OTHERWISE SENSITIVE SPECIES

Appendix 4 summarizes federal-and-state listed and otherwise sensitive species and their potential to occur within the Topanga project area. Most species listed in Appendix 4 are either not present in the Topanga or Ratner Beach project area or have a low potential to be present. Those that have a moderate or high potential to be present are discussed below.

3.7.1 Plants

Surfgrass (*Phyllospadix torreyi*). Surfgrass is a non-listed, sensitive marine resource that occurs in rocky shoreline and rocky subtidal habitats at depths to approximately 20 feet. Its sensitivity is related to its use by invertebrates and fishes as nursery habitat and its susceptibility to long-term damage because it is a very slow growing species. Revegetation occurs very slowly through initial seeding and eventually the spreading of roots and rhizomes over surfaces of rocks. Surfgrass is considered to be a Habitat of Particular Concern by the National Marine Fisheries Service, because juvenile olive rockfish (*Sebastes serranoides*), a Fisheries Management Plan groundfish species, utilize surfgrass beds as nursery habitat. Surfgrass is also an extremely important nursery habitat for juvenile lobsters.

Surfgrass, as discussed earlier, is present in the low intertidal and shallow subtidal depths within the Topanga project area as well as east of Mastro's Point along Ratner Beach where it grows in larger and healthier beds and patches.

Giant Kelp *(Macrocystis pyrifera*). Giant kelp has historically been present offshore of Topanga Beach near the mouth of the Topanga Lagoon off of the Topanga Point Surf Break, reaching a maximum size of 44 acres in 2012. . A small bed has been present off of Ratner Beach, with a maximum of 0.65 acres in 2012. However, kelp is currently absent from the Topanga Beach or Ratner Beach project area.

3.7.2 Invertebrates

Neither black abalone (*Haliotis cracherodii*) or white abalone ***(****H. sorensen*i) are expected to be in the intertidal or nearshore project area due to both low population levels and/or depth limitations as is the case for the white abalone.

3.7.3 Fishes

Tidewater Goby (*Eucyclogobius newberryi*). This species is currently found in Topanga Lagoon and lower reaches of Topanga Creek. Its distribution is between San Diego northward to Humboldt County waters where the salinity is less than 10 parts per thousand. The population of the tidewater goby is depleted due to lowering or elimination of flows in the lower reaches of coastal streams, pollution, and the filling in, channelization, or physical alterations of their habitats. The population disappeared from about 74 percent of the coastal lagoons from Morro Bay southward to San Diego (U.S. Fish and Wildlife, 1994). This species occurs within Topanga Lagoon, and only when the sand bar to the ocean is breached may tidewater gobies enter the nearshore marine environment.

Bocaccio *(Sebastes paucispinis)***.** Bocaccio are found throughout southern California reefs and soft bottoms typically at depths below 60 ft, although they can occasionally be found shallower, especially juveniles. While populations of bocaccio are endangered in the northwest, they are common in California and are a Federal Fisheries Management Plan (FMP) Groundfish species. They are caught both commercially and recreationally. They have a moderate potential to be in the general area of Topanga, but unlikely to be present in the Topanga sediment nourishment project area due to a lack of quality reef habitat.

California Halibut (*Paralichthys californicus*). Juvenile and adult halibut have a moderate-to-high potential to occur in the shallow sandy bottom areas of the project area The California halibut does not have a formal special species status, but it is considered a sensitive species by resource agencies because of its commercial value and a continued region-wide reduction of its nursery habitat in bays and wetlands.

California Grunion *(Leuresthes tenuis).* Grunion use the high intertidal sandy beach habitat of many southern California beaches as spawning habitat (Walker, 1952), They spawn along Los Angeles County open coastal beaches between Cabrillo Beach and Malibu, and utilize both Topanga and the shoreline east of Mastro's Point (Ratner Beach) as spawning areas (Karen Martin, Pepperdine University, pers. com. with R. Ware, September 7th, 2023). There is a moderate-to-high potential for grunion to be present between March and August in the near-shore habitat as well as on the beaches during spawning events but spawning beaches are not necessarily occupied on a year-to-year basis.

The grunion is a member of the silversides family, Atherinidae, along with the jacksmelt and topsmelt. They normally occur from Point Conception, California, to Point

Abreojos, Baja California. Occasionally, they are found farther north to Monterey Bay, California and south to San Juanico Bay, Baja California. They inhabit the nearshore waters from the surf to a depth of 60 feet. The grunion is a non-migratory species. Grunion use the energy of waves to strand themselves onto sandy beaches generally over a 3–4-night period following the highest semi lunar tides. Typically, grunion "runs" last about 1 to 2 hours (Walker, 1952). Females dig themselves tail-first into wet sand. The males then curl around the females and deposit milt. Normally, the eggs develop above the water line buried in moist sands and are triggered to hatch in nine days at the high tide of the next new or full moon by waves that reach high enough on shore to wash out the sand and carry the eggs into the ocean (Walker, 1952; Middaugh et al., 1983 in Darken et al., 1998). If the eggs are washed out to sea during the next high tides, they hatch rapidly into free-swimming larvae (Walker, 1952). If the waves do not reach the eggs, as happens frequently along the southern California coast, the eggs are able to remain viable for at least two more weeks (Walker, 1952) and up to 35 days (Darken et al., 1998). This period encompasses the next two highest semi lunar tides. However, hatching success decreases over time (Darken et al., 1998).

Spawning occurs from March through August, and occasionally in February and September. Peak spawning period is between late March and early June. After July, spawning is erratic, and the number of fish observed in a grunion run greatly decreases. (Walker, 1952).

The California grunion is not a formally listed federal-or-state rare, threatened, or endangered species, but grunion spawning habitat (sandy beaches) is considered "sensitive" because of the overlap between beach spawning activity and shoreline management activities such as (1) the removal of debris and grooming beaches by mechanical means that rake, remove, or crush eggs (2) beach erosion; 3) harbor construction; (4) pollution, as well as beach nourishment activities.

3.7.4 Marine Reptiles. Several species of federally listed threatened and endangered sea turtles could potentially occur in the nearshore waters of Topanga Beach These include the endangered leatherback sea turtle (*Dermochelys coriacea*), the threatened green sea turtle (*Chelonia mydas*), loggerhead sea turtle (*Caretta caretta*), and the olive ridley sea turtle *(Lepodochelys olivacea*). However, only green sea turtles might be expected in the vicinity of the proposed project. Recently (July 2023), NOAA proposed critical habitat for the green sea turtle in nearshore waters (from the mean high water line to 20 meters depth), including the US West Coast. The proposed critical habitat covers a large amount of the nearshore water habitat in the southern California region (Figure 63) between the Mexican Border and Santa Monica Bay including the Topanga Beach project area.

(https://www.fisheries.noaa.gov/action/proposed-rule-designate-critical-habitat-green-sea-turtles).

Figure 63. Proposed Critical Habitat for the Green Sea Turtle. Source: (https://www.fisheries.noaa.gov/action/proposed-rule-designate-critical-habitat-green-sea-turtles).

In the eastern North Pacific, green turtles have been sighted from Baja California to southern Alaska, but most commonly occur from San Diego south. Sea turtle stranding data and tagging data indicate that sea turtles occur within the San Gabriel River where they encounter the warmer, discharged waters of the power generating facilities located farther up the River, the nearshore waters between Long Beach and Huntington Beach, as well as within Alamitos Bay, Anaheim Bay, Anaheim Estuary, and Huntington Harbour (Dan Lawson, National Marine Fisheries Service; and Dan Crear CSULB, unpublished data). While their numbers are not high, their presence is significant. There is no evidence that these species breed in Santa Monica Bay or the area between Santa Monica

and Malibu. Green turtles are mostly herbivorous. They spend most of their time feeding on algae in the sea and seagrasses that grow in shallow waters, which may be an attractant for individuals. While eelgrass (*Zostera pacifica*) is present along the Malibu coastline, it does not occur in the Topanga project area although surfgrass (*Phyllospadix torreyi*) does. Both species represent a possible food source for green sea turtles. As juveniles, they eat plants and other organisms such as: jellyfish, crabs, sponges, snails, and worms. As adults, they are strictly herbivorous (Ernst, 1994; Crite, J., 2000).

Other areas where green sea turtle have occasionally been seen along the California Coast (often in El Niño years when the ocean temperature is higher than normal) include San Francisco, Catalina Island, San Clemente Island, Newport Beach, Santa Monica Bay, Marina Del Rey Harbor, San Diego Bay, La Jolla, Ventura, Seal Cove and Año Nuevo State Reserve in San Mateo County, Monterey County and Bodega Bay.

http://www.californiaherps.com/turtles/pages/c.mydas.html#description;
https://www.thelog.com/local/sea-turtle-sighting-in-santa-monica-bay-is-a-rare-event/

Green turtle strandings have occurred in Santa Monica Bay. At least four green turtle strandings were reported in Redondo Beach since the mid-1980s, three of which were entrainments at the Redondo Beach Generating Station within King Harbor. One dead turtle was found in 2017 floating dead in the water just offshore Redondo Beach. Other strandings from other parts of Santa Monica Bay have occurred and it really isn't clear where any specific preferred areas might be there compared to just a general understanding that occurrence throughout Santa Monica Bay is at least occasional (Dan Lawson, MFS Protected Resources Division, West Coast Region email to R. Ware, Coastal Resources Management, Inc. November 19th, 2019). Therefore, based on green sea turtle sightings in Santa Monica Bay, it is possible that a green sea turtle may pass by Topanga Beach but it would be an extremely rare event.

3.7.5 Marine Mammals

California Gray Whale (*Eschrichtius robustus*). Gray whales have a moderate-to-high potential be present offshore of Topanga between December and May and individuals could be found nearshore near or passing through the Topanga project area. The potential for individuals to be closer to shore is greatest between March and May when cow/calf pairs travel closer to shore on their northbound migration, sometimes as close as the surf zone, although the vast majority are found traversing between Palos Verdes and Point Dume on a more direct route that bypasses the inshore waters of western Los Angeles County.

The California gray whale eastern pacific population was removed from the Federal Endangered Species List in 1994, due to recovery of population numbers to near the estimated sustainable population size. Gray whales migrate through the Southern California Bight (SCB) twice each year, traveling between its feeding grounds in Alaska and its breeding grounds in Baja California. The southern migration between Point Conception and the Mexican Border occurs from December through February, with pregnant females moving through the area first. The northward migration begins in February and lasts through May, peaking in March (Bonnell and Dailey, 1993). Solitary animals generally lead the northbound migration with cow-calf pairs following 1 to 2 months later (Foster and Schiel 1985). Gray whales migrate within 125 miles (200 km) of the shoreline and many are sighted within 9 miles (15 km) of shore. On the northbound migration, cow-calf pairs more closely follow the shoreline rather than the offshore route (Bonnell and Dailey, 1993).

3.8 INVASIVE SPECIES

Many species of plant, invertebrates, and fish are non-native to southern California and have been introduced primarily through commercial shipping via discharges of ballast water from cargo vessels. Other sources include hulls, anchors and chains, piping and tanks, propellers, and suction grids, while other non-vessel sources include aquarists and restaurant live fish trade (Foss et al., 2007, Ray, 2005). Invasive species can compete with or prey upon native species and alter local ecology, have impacts on restoration project, infrastructures, and local economies (Ray et al., 2005). In the project area, the brown algae *Sargassum muticum,* the red algae *Caulacanthus ustulatus*), the mussel *Mytilus galloprovincialis*, and the bryozoan (ectoproct) *Bugulina neritina* have been reported from the Topanga and Ratner Beach intertidal and/or nearshore project area, In addition, the brown algae *U. pinnatifida* could potentially occur. Other invasive species that have not been found at Topanga but are known to be potential threats to the marine and estuarine environment include the green algae *Caulerpa taxifolia* and *C. prolifera*. These two species are regularly monitored during pre-and-post construction surveys along the southern California coast, and in bays and estuaries. Nonnative, introduced, and invasive species in California and their distributions are available at: https://invasions.si.edu/nemesis/calnemo/

Invasive Algae *(Caulerpa spp.)* *Caulerpa taxifolia* (Figure 18) and *C. prolifera* has a potential to cause ecosystem-level impacts on California's bays and nears-shore systems due to its extreme ability to out-compete other algae and seagrasses. Neither species were recorded at Topanga project site during CRM dive surveys in August 2022. However, *C. taxifolia*

was found (and eradicated) in Agua Hedionda Lagoon and Huntington Harbour in 2000, while *C. prolifera* was recently found in Newport Bay in 2021 and is still present. C*aulerpa* grows as a dense smothering blanket, covering and killing all native aquatic vegetation in its path when introduced in a non-native marine habitat. Fish, invertebrates, marine mammals, and sea birds that are dependent on native marine vegetation can be displaced or die off from the areas where they once thrived. It is a tropical-subtropical species that is used in aquariums. *C. taxifolia* was introduced by way of individuals likely dumping their aquaria waters into storm drains, or directly into the lagoons. *C. prolifera* likely originated from a similar source or discharge. The Water Resources Board, through the National Marine Fisheries Service and the California Department of Fish and Game require that projects that have potential to spread this species through dredging and bottom-disturbing activities conduct pre-construction surveys to determine if this species is present using standard agency-approved protocols and by National Marine Fisheries Service/California Department of Fish and Game Certified Field Surveyors.

Sargassum muticum (**Brown Algae**). *S. muticum* has a high potential to be in the Topanga project area. It was present in surveys conducted by CRM in 1994 and recently in August 2022. This algae is a large, yellowish-brown or olive-brown seaweed that can be distinguished from most other Pacific coast seaweeds by its small, spherical float bladders. It grows on rocks, shells or other hard objects, attached by a stout, spongy holdfast. On the Pacific Coast, plants grow up to about 2 m long in northern Washington and British Columbia, but in southern California a large plant can be 3-4 m long and plants up to 10 m long have been reported. It is commonly found in harbors, marinas, and bays on boat floats, rip rap, jetties, and breakwaters, as well as the low intertidal and shallow subtidal reefs. *S. muticum* is present-to-common throughout southern California coastal waters. In southern California, it is abundant at 4-8 m depth and has been found at depths up to 24 m. There are many reports of *Sargassum muticum* competing with and displacing native species of seaweed and eelgrass, at least in part by shading and reduction of light levels. There are no current efforts to eradicate this species.
http://www.exoticsguide.org/species_pages/s_muticum.html.

Undaria pinnatifida-Wakame. The brown macrophyte *Undaria pinnatifida* has been recorded in southern CA bays, harbors, and on Catalina Island Anaheim Bay This species was not observed during the Topanga August 2022 survey but has a low potential to occur on reefs and rip rap in the nearshore areas along Topanga Beach.

***Caulacanthus ustulatus*.** This species was identified from the boulder intertidal field at Topanga Beach in October 2022. It was introduced from Asia and first discovered in southern California in 1999. Although *Caulacanthus* is a non-native invasive species that has been shown to displace some invertebrates (such as barnacles, limpets, and

periwinkle snails), in the high intertidal zone specifically, it facilitates a more diverse suite of other animals and algae (Smith et al., 2014). This could be because of the formation of novel turf habitat in the upper intertidal zone where turf algae is not usually found. Algal turfs such as *Caulacanthus* have been shown to increase habitat complexity, trap sediment, and decrease desiccation during low tide; this could benefit some animals and seaweeds by providing food, habitat, and/or refuge from becoming dried out (Smith et al., 2014). https://marine.ucsc.edu

Mytilus galloprovincialis (Bay Mussel). This mussel occurs in the Topanga boulder intertidal areas. On the West Coast of North America, *M. galloprovincialis* has invaded communities formerly dominated by the similar *M. trossulus* and the date of invasion is unknown. However, in southern California in the 1940s, a dramatic increase in abundance of 'Bay' or 'Blue' mussels was noticed, causing some naturalists to suspect either an invasion or a resurgence of a native species (Coe 1946, cited by Carlton 1979). The occurrence of *M. galloprovincialis* was first discovered in California (San Diego, Los Angeles Harbor, Port San Luis, San Francisco Bay, Muir Beach, and Tomales Bay) by amino-acid electrophoresis of samples collected in 1987 (McDonald and Koehn 1988). The invasion appears to have begun somewhere between Point Conception and San Diego, where the native *M. trossulus* is now rare or absent. This species is a major ecosystem engineer on rocky shores, so it competes not just with other attached bivalves, but competes for space with such shore species as limpets, anemones, and seaweeds. In southern California, dense settlements of mussels in the 1940s (probably *M. galloprovincialis*) were reportedly 'smothering' local fauna (Carlton 1979).

4.0 PRELIMINARY BIOLOGICAL EFFECTS ANALYSIS OF PROPOSED SEDIMENT NOURISHMENT ON NEARSHORE MARINE LIFE

The following preliminary assessment of the effects of sediment disposal on nearshore marine biological communities is based upon Moffatt Nichol's Initial October 5th, 2022 Sediment Reuse Memo (Moffat Nichol, 2022) that describes proposed sediment reuse options to nourish the nearshore littoral cell offshore of Topanga Beach and a Moffatt & Nichol September 2023 sediment transport modeling effort that described sediment movement and sediment elevations at intervals of one and five years post sediment material disposal offshore of Topanga Beach. See Appendix 1 for a general description of nourishment alternatives.

Sediments will be placed within the proposed discharge location using hydraulic nearshore placement methods. The material will be discharged via a discharge line from a derrick barge that will settle to the bottom. The pipeline will either be sunk in place or anchored on the bottom to prevent migration. In the placement site, the pipeline will be moved around to fill the site relatively evenly. The initially-proposed pipeline route to the nearshore disposal location is shown in Figure 64.

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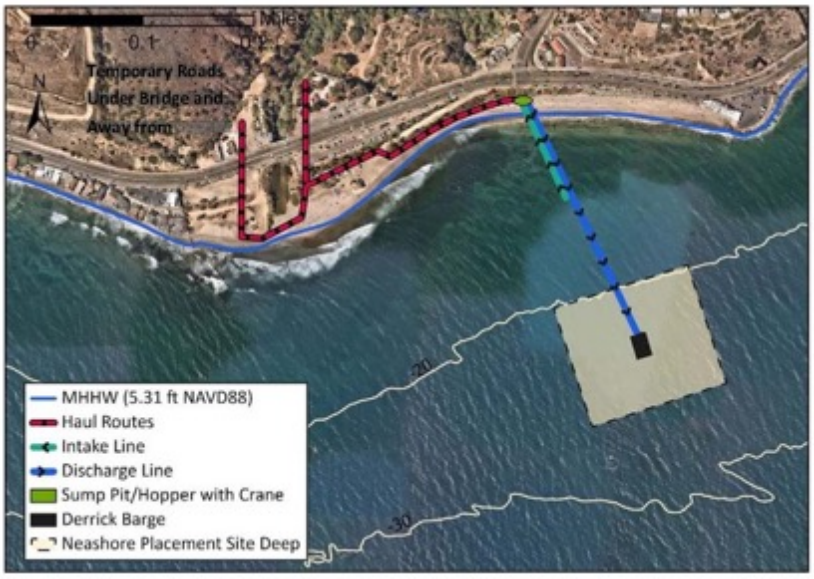

Figure 64. Initial Hydraulic Nearshore Nourishment Option
and Discharge Pipeline Route (Source: Moffatt & Nichol, 2022)

Based upon the Moffatt & Nichol September 2023 modeling results, (Figure 65), sediments will be remain primarily in the nearshore marine environment and marginally reach intertidal habitat. The initial sediment mound will be 10 ft in height over the

proposed 9-acre area with a 1V:10H side slope. Results indicate that more sediment movement/dispersion will be in the shallow water depths than in the deeper depths, as waves are more energetic nearshore. Sediments will move inshore (north) of the placement box. At Topanga, sediments will be move north (inshore) into Unconsolidated Cobble habitat. Over 2 ft of sediment will migrate easterly and affect Consolidated-Rubble habitat offshore of Mastro's Ocean Club, and Unconsolidated Sand habitat surrounding the sediment placement box. Sediments that are transported east past Mastro's Point will travel in two components; an offshore dispersion component where sediment elevations will increase less than 1 ft increase in sediment elevation and will affect sand bottom habitat, and an inshore dispersion component where sediment elevation will increase more than 1 to 2 ft in elevation that will affect Ratner Beach shallow subtidal cobble and rubble (rock) areas. A minimal amount of material is expected to affect the intertidal zone.

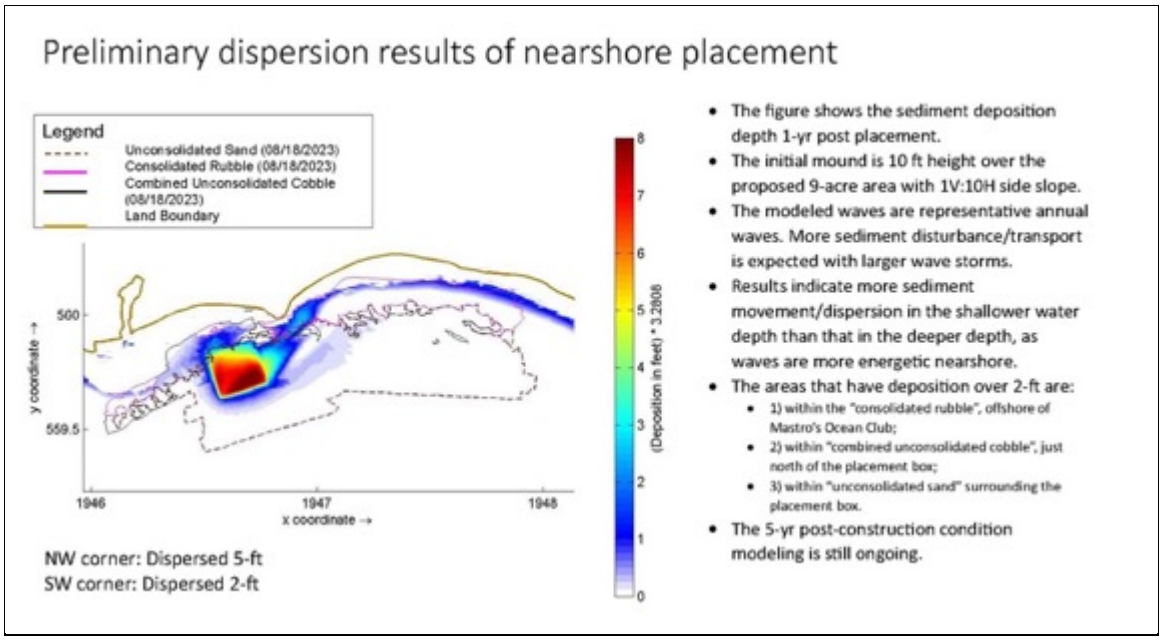

Figure 65. Preliminary Sediment Dispersion Model (Source: Moffatt & Nichol)

Sediment transport and sediment thickness estimates at periods of one and five years post disposal generally indicate that between less than one foot and up to two feet of sand will be present in these areas for a period of five years.

In an effort to reduce the effects on nearshore Unconsolidated Cobble and Consolidated Rubble (Rock Reef) Resources, an updated Project Boundary was designed (Figure 66). This area would add additional acreage for sediment discharge, as well as extend the offshore disposal limit to a depth of approximately 30 ft MLLW. By discharging at deeper depths, it is hypothesized that less sediment would migrate inshore, as a result of

reduced swell and energy. From a biological standpoint, this option is favored over the limited 9 acre, inshore disposal area. It would also result in less migration of sediments to the east, around Mastro's Point and would reduce burial effects on Unconsolidated Cobble and Consolidated Rubble (Rocky Reef), and Unconsolidated Sand habitat that is known to be colonized by sand dollars.

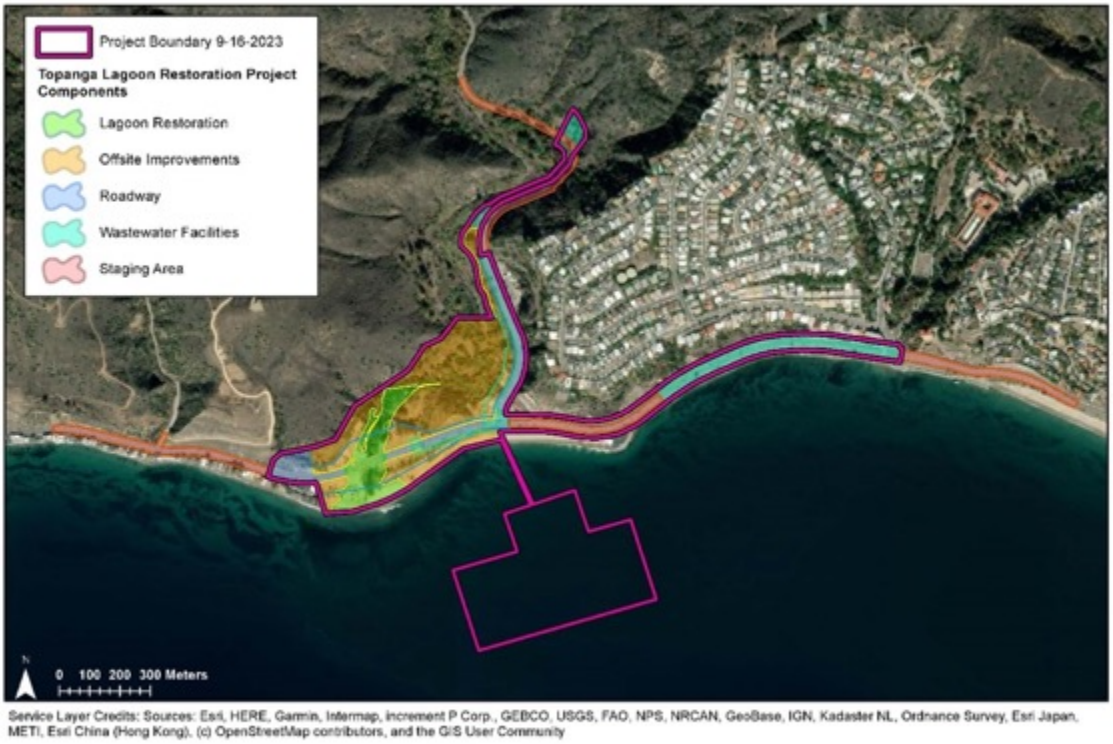

Figure 66. Revised Hydraulic Nearshore Nourishment Option
Source: Moffatt & Nichol (September 16th, 2023 Design)

The intertidal and subtidal areas of Topanga Beach and to the east of Mastro's Point are a combination of sand, low relief cobble, and low-to-high relief more stable boulder and bedrock habitat. These areas are intermixed, and sand is approximately 70% of the habitat, and rock is approximately 30% at depths between -5 and -15 ft MLLW based on diver observations in 2023. Both Topanga and Ratner intertidal and subtidal habitats are heavily sand-influenced to a depth of at about -17 ft MLLW and are likely to be affected by at least one foot of sediment accretion or erosion on a year-to-year basis.

Effects on Rocky Intertidal and Rocky Subtidal Organisms. The intertidal and shallow subtidal plant communities at Topanga and off of Ratner Beach (also known as Coastline) have over time, demonstrated consistency in the types of flora and fauna inhabiting the boulder field intertidal and the nearshore sandy seafloor and low-relief

rubble reefs. The dominant type of organisms that live in these areas include a core group of surf and sand-tolerant taxa commonly found throughout southern California. The algal association is represented by species which typically experience a high degree of natural disturbance such as boulder overturning, sanding in, and scour (Sousa 1979, 1980; Murray and Bray, 1993). These species typically include initial colonizers and short-lived opportunists such as green algae (*Ulva* and *Enteromorpha*) following sanding-in events; sand resistant perennial species such as crustose brown and red algae, coralline algae turf, and filamentous sand-holding red turf associates. Surfgrass is a sand-loving form that can cover the very low intertidal zone on low reef platforms and rubble fields out to a depth of approximately -20 ft MLLW and can to a certain degree, tolerate bedload sediment burial.

Reef animals and plants are susceptible to damage because excessive bedload sediment transport could bury their hard bottom habitat. Reduced light levels from increased levels of suspended sediments generated from turbidity could affect light levels necessary for seaweeds and surfgrass to survive. Giant kelp is particularly sensitive to reduction in light levels due to increased turbidity and sedimentation effects that affect sporophyll production (Foster and Schiel, 1985). Mortalities of the tunicate *Styela montereyensis*, the gorgonians *Muricea californica* and *M. fruticosa* in the Del Mar kelp bed offshore of San Diego County were related to sediment movement that buried, scoured, or detached individuals from the substrate (Rosenthal et al. ,1974). *Muricea californica* is susceptible to damage from storms, sediment burial, and abrasion which are major causes of its mortality (Grigg,1975). Juvenile *Muricea* colonies that are not as tall as adult colonies are more susceptible, particularly if they live nearer the base of the boulder. Mid-and higher reef occurring solitary corals *Balanophyllia elegans* are sensitive to burial and sedimentation, which may inhibit the food-acquiring habitats of the polyps, and they are unable to cleanse themselves of heavy sediment loads (ACOE, 1982). Recovery of reef-associated organisms to disturbances may take up to five years (Turner et. al, 1969). Using artificial substrates, Turner monitored the recolonization and successional sequence of several different species that exhibit both slow and fast-growing life cycles. Recolonization was quickest for barnacles, hydroids, mollusks, polychaetes, ascidians, sponges, and ectoprocts, which recolonized the first year. Anemones and gorgonians recolonized between the second and fourth years, while stony corals recolonized the substrate only after a five-year period. Typically, these species are highly resilient to episodes of sanding in and erosion and are commonly found in boulder field and low platform reef environments.

Up to two feet of sediment could bury plants and sessile organisms living in the rocky areas inshore of the proposed Topanga sediment discharge area and east of Mastro's Point. If sediments are disposed in the deeper portions of the sediment placement area, then the shallower inshore Unconsolidated Cobble habitat may be less affected by sediment dispersion. Rocks in the Unconsolidated Cobble zone tend to be isolated and small-to-

moderate sized, and are typically low in biological diversity due to constant scour and burial that naturally occurs in the project area. Higher and stable rock reefs in the Consolidated Rubble (Rock) habitat are more susceptible along the lower rock-sand interface than higher on the reefs. Motile invertebrates such as lobsters and sea stars are unlikely to be affected by the increase in sediment elevation although some dispersal may occur due to instances where rock surfaces are covered, and rock crevices and protective habitat for lobsters become sanded-in.

Algae, surfgrass, and sessile-or-motile- organisms that are dependent on hard substrate (i.e., limpets and barnacles, ectoprocts, gorgonians, and sandcastle tube worms that live along the lower reef margins at Topanga and Ratner beaches have a potential to be buried for an extended period of time resulting in some degree of mortality. The length of burial could be up to five years, although it is dependent on the period of time over which sediment is discharged, the volume of discharge, the rate of spread, and prevailing swell and currents. With the exception of surfgrass and gorgonians, adverse impacts, if they occur, are expected to be short-term. Full recovery is expected over the course of one-to-five years.

Surfgrass and gorgonians could be affected over an extended period of time and recovery could take as long as 10 years, and only if hard bottom habitat resurfaces and recovers from sediment burial. By moving sediment discharges to deeper portions of the sediment placement area, the effects on both surfgrass and gorgonians could be reduced to the short-term.

Kelp canopy habitat will not be affected within the proposed sediment placement zone. However, even though kelp currently does not grow in the project area, kelp canopy habitat does occur (rocky reef) immediately west of the sediment placement zone, and east in the vicinity of Mastro's Point and off of Ratner Beach. The burial of kelp canopy habitat would result in a reduction of, and an adverse impact Kelp Canopy Habitat Area of Particular Concern. Surfgrass grows subtidally and intertidally inshore and east of the sediment placement area and burial-either short-term or long-term- will potentially result in the reduction of surfgrass habitat, and an adverse impact on a HAPC. Both of these HAPCS are associated with Rock Reef Essential Fish Habitat. Mitigation measures to reduce the effect of sediment discharge and sediment dispersal in the project area are provided in the discussion below.

Construction-Related Impacts. The placement of a discharge pipeline, vessel anchors, and anchor chains across hard bottom habitat between the shoreline and the sediment placement zone could adversely affect hard bottom habitat and damage sensitive resources such as surfgrass beds and gorgonian colonies. Thus, mitigation measures should be implemented to avoid damage to these resources. See the discussion below for a list of potential

mitigation measures to reduce potential adverse impacts related to construction-related activities.

Effects on Sand Bottom Organisms. Sand bottom, epibenthic organisms such as tube-dwelling polychaete worms, sand dollars, sea pansies, sand stars, sea stars, and cancer crabs are the most common organisms that might be in the pathway of nearshore bedload sediment redistribution. These organisms could be adversely affected by full or partial burial offshore of Topanga Beach and to the east of Mastro's Point, off Ratner Beach.

Sand dollar beds were located approximately 400 ft directly inshore of the proposed discharge point at depths between -14 to -20 ft MLLW. However, the leading (offshore edge) could seasonally migrate offshore nearer to the discharge point during fall/winter periods (Morin et al, 1985) and thus be more susceptible by sediment discharge and bedload movement. Depending on the rate, volume, thickness of dredge disposal material and direction of movement, sand dollars, and other sand bottom species could be initially buried and potentially suffer high mortality where sediment thickness exceeds the animals' ability to dig themselves out. Seasonally, sand dollars and other sand-dwelling organisms can recover from periodic shallow burial related to swell and surge activity particularly if burial is slow and/or does not cover the organism. Other sand bottom dwelling organisms, like sea pansies, motile sand stars, sea stars, and cancer crabs can behaviorally react to sediment bedload increases and respond quicker than sessile organisms like sand dollars or tube worms.

The placement of a discharge pipe, anchors, and anchor chains in the sand bottom habitat could result in damage to sand dollar beds and the small sea pansy bed located immediately to the west of the proposed sediment discharge area off of Topanga Beach. Mitigation measures should be implemented to avoid damage, where possible, to sand dollar beds and sea pansy beds.

Based upon the preliminary, predicted sediment redistribution analysis, there will be some degree of mortality of both infaunal organisms (those living in the sediments such as worms, crustaceans, and clams) and epifaunal organisms (sand dollars and sea pansies) living within the initial sand bottom discharge zone and in areas east of Mastro's Point. In particular, mortality of sand dollars and sea pansies will occur where burial is quick and deep. With increasing distance to the east, burial effects will be reduced because (1) rate of sediment redistribution will likely be slower and (2) depth of burial will be reduced. Infaunal organisms and epibenthic organisms within the zone of discharge will be initially buried, but over time, larval settlement will occur and the seafloor will again be colonized by infaunal organisms and epifaunal organisms.

Recovery of benthic infaunal and epibenthic community affected by sediment discharge will begin upon cessation of sediment discharge, and recovery will occur over a period of one-to-five years. Sand dollar beds and sea pansy beds would recover through settlement of their planktonic larvae.

Mitigation Measures to Reduce Impacts to Habitats and Marine Life

Project Design for the Sediment Placement Area

- Implement the revised project design that increases the area offshore to depths of approximately -30 ft MLLW and elongates the east-to-west axis of the sediment placement area. This will result in reduced effects on reefs, kelp canopy habitat, surfgrass, gorgonians, and other low-relief reef associated plants and animals.

Construction-Activity Potential Impacts

- Avoid, where feasible, placement of pipelines across rocky intertidal and subtidal cobble/boulder fields, surfgrass beds, gorgonians, and sandcastle tube worm colonies and kelp bed or kelp bed habitat, sand dollar beds, and sea pansy beds. If possible, use risers to avoid impacts to these areas, or reroute pipelines into sand channels between reefs and around kelp beds and sand dollar beds; and

- Avoid anchoring of support vessels over hard bottom habitat to minimize damage to sensitive habitat and surfgrass beds.

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APPENDICES

APPENDIX 1
PROPOSED SEDIMENT DISCHARGE ALTERNATIVES
(Source: Moffatt Nichol 2022)

Preliminary Design Alternatives

Four lagoon design alternatives are currently under consideration for the Topanga Lagoon Restoration Project. These alternatives consider a variety of benefits and challenges of the differing restoration approaches and provide multiple options on how to manage the future of the lagoon. The four design alternatives are as follows:

- Alternative 1: No Action/Managed Decline
- Alternative 2: Maximum Lagoon Habitat
- Alternative 3: Limited Lagoon Habitat Expansion
- Alternative 4: Maximum Managed Retreat

Excavation volumes from Alternative 2 will be used as the basis of analysis because it generates the largest quantity of sediment at 256,00 cubic yards (cy). As stated, a design has not yet been selected, but for scaling purposes the design with the largest volume will be used when discussing sediment beneficial reuse options. If another design is selected, the reuse options can be scaled down to meet the needs of the selected design (Moffatt Nichol, 2022).

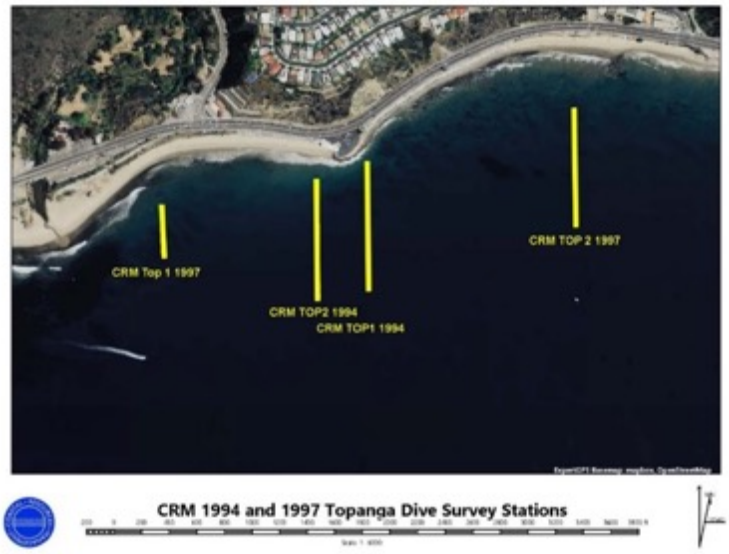
In addition, the analysis assumes the material is mechanically removed from the Lagoon and hydraulically placing it the nearshore environment at a depth of -24 ft NVDG (Alternative 2, Option 1 of sediment reuse options).

Note: The sediment material discharge location was revised by Moffatt & Nichol (September 16th, 2023) and is illustrated below.

Proposed Sediment Discharge Boundaries (Source: Moffatt & Nichol, September 16th, 2023. Depths range between -16 and -30 feet (Mean Lower Low Water).

APPENDIX 2. HISTORICAL SURVEYS CONDUCTED AT TOPANGA BEACH

Egstrom, 1972



Coastal Resources Management, Inc., 1994 and 1994

APPENDIX 3. 2022 AND 2023 INTERTIDAL AND SUBTIDAL SPECIES LISTS

Note: Occurrence designations (Abundant, Common, and Present) are relative abundance classifications based upon the professional judgement of the field biologists conducting the survey and are designed to give a general indication of species abundances relative to other species observed during the survey.

Note: Yellow Designation indicates that the species is an invasive species

SITE	Topanga Intertidal (IT) and Subtidal (ST) Habitats		
DATE	8/31/22 and 9/27/2022		
CODE	A=Abundant, C=Common, P=Present	IT	ST
SPECIES			
CHLOROPHYTA	(DIVISION) GREEN ALGAE		
ENTEROMORPHA SP.		A	
ULVA CALIFORNICA		C	C
PHAEOPHYTA	(DIVISION) BROWN ALGAE		
COLPOMENIA SINUOSA		P	P
ECTOCARPOID FUZZ		A	C
EGREGIA MENZIESII		P	P
ENDARACHNE BINGHAMIAE		C	C
RALFSIA SP.		C	C
SARGASSUM MUTICUM		P	P
ZONARIA FARLOWII		P	
RHODOPHYTA	(DIVISION) RED ALGAE		
BOSSIELLA ORBIGNIANA		P	
CAULACANTHUS USTULATUS		P	
CORALLINA PINNATIFOLIA		P	
CORALLINA VANCOUVERIENSIS		C	C
CORALLINA SP.			C
ERYTHROCYSTIS SACCATA		P	
FILAMENTOUS RED ALGAE		A	C
GELIDIUM COULTERI		C	P
GELIDIUM ROBUSTUM			P
LAURENCIA PACIFICA		C	
LITHOPHYLLUM SP		C	C
LITHOTHRIX ASPERGILLUM		p	

PEYSSONNELIA SP.		P	C
OTHER PLANTS			
PHYLLOSPADIX TORREYI	(DIVISION) FLOWERING PLANTS	C	P
SCHIZYMENIA COLONIAL DIATOMS		A	
CNIDARIA	(PHYLUM)		
ANTHOPLEURA SOLA	solitary anemone	P	
MURICEA CALIFORNICA	sea fan gorgonian		C
MURICEA FRUCTICOSA	sea fan gorgonian		P
VIRGULARIA SP	sea pen		C
POLYCHAETA	(CLASS)		
CHAETOPTERUS VARIOPEDATUS	parchment tube worm		P
DIOPATRA SPP	tube worms		A
PHRAGMATOPOMA CALIFORNICA	sand-castle worm	C	C
SERPULIDAE, UND	calcareous tube worm	C	C
ARTHROPODA	(PHYLUM)		
CHTHAMALUS DALLI/FISSUS	shotgun barnacle	C	
ISOCHELES PILOSUS	hermit crab		P
LOXORHYNCHUS GRANDIS	Sheep crab		P
PAGURUS HIRSUTIUSCULUS	hairy hermit crab	C	
PAGURUS SAMUELIS	blue-clawed hermit crab	A	
PACHYGRAPSUS CRASSIPES	purple lined shore crab	C	
PANULIRUS INTERUPTUS	spiny lobster		P
ROMALEON ANTENNARIUM	rock crab		P
MOLLUSCA	(PHYLUM)		
LOTTIA LIMATULA	file limpet	C	
LOTTIA SCABRA	rough limpet	P	
LOTTIA STRIGATELLA		C	
FISSURELLA VOLCANO	keyhole limpet	P	
MEGASTRAEA UNDOSA	wavy top snail	P	C
LITTORINA SPP	(=L. planaxis)	C	
TEGULA FUNEBRALIS	black turban snail	C	
CALIFORNICONUS CALIFORNICUS	California cone snail		P
MACRON SP	snail	P	P
OPISTOBRANCHIA	(SUBCLASS) SEA SLUGS		
APLYSIA CALIFORNICA	california sea hare	P	
APLYSIA VACCARIA		C	

POLYPLACOPHORA	(CLASS) CHITONS		
NUTTALINA CALIFORNICA		P	
BIVALVIA	(CLASS) CLAMS OR BIVALVES		
MYTILUS CALIFORNIANUS	california mussel	P	
MYTILUS EDULIS/GALLOPROVENCIALIS	bay mussel/edible mussel	P	
PSEUDOCHAMA EXOGYRA		P	
UNID CLAM	boring clams	P	
BRYOZOA			
BUGULINA CALIFORNICA		P	C
CEPHALAPODA	(CLASS) CEPHALOPODS		
OCTOPUS BIMACULATUS/BIMACULOIDES		P	
ECINODERMATA	(PHYLUM) SEASTARS, ETC.		
ASTERINA MINIATA	bat star		P
ASTROPECTEN ARMATUS	sand star		C
DENDRASTER EXCENTRICUS	sand dollar		C
STRONGYLOCENTROTUS PURPURATUS	purple sea urchin	P	P
AMPHIODIA OCCIDENTALIS	brittle star		P
PISASTER GIGANTEUS	sea star		P
CHORDATA	**Fish**		
CITHARICHTHYS STIGMAEUS	sand dab		P
OXYLEBIUS PICTUS	painted greenling		P
PARALABRAX NEBULIFER	barred sand bass		P
PARALICHTHYS LEPTORHYNCHUS	california halibut		P
SYGNATHUS CALIFORNIENSIS	pipefish		P
UROBATIS HALLERI	round sting ray		P

2023 INTERTIDAL SURVEY SPECIES LIST			
DATE		**June 8th, 2023**	**June 9th, 2023**
AREA		**TOPANGA**	**RATNER**
CODE	A=Abundant, C=Common, R=Rare		
SPECIES			
SCHIZYMENIA COLONIAL DIATOMS		A	C
CHLOROPHYTA	(DIVISION) GREEN ALGAE		
ENTEROMORPHA SP.	Green alga	A	A
ULVA CALIFORNICA	Green algae	A	A
PHAEOPHYTA	(DIVISION) BROWN ALGAE		
COLPOMENIA SINUOSA		C	C
ECTOCARPOID FUZZ		C	C
EGREGIA MENZIESII		C	R
ENDARACHNE BINGHAMIAE		C	C
RALFSIA SP.		C	C
SARGASSUM MUTICUM		R	C
ZONARIA FARLOWII		C	C
SCYTOSIPHON LOMENTARIA		C	
			C
RHODOPHYTA	(DIVISION) RED ALGAE		
CERAMIUM/POLYSIPHONIA/CENTROCERAS		A	A
CORALLINA PINNATIFOLIA		C	C
CORALLINA VANCOUVERIENSIS		C	C
ERYTHROCYSTIS SACCATA		R	C
PLOCAMIUM CARTILAGINEUM			
FILAMENTOUS RED ALGAE		A	

GELIDIUM COULTERI		C	C
GELIDIUM PUSILLUM	`	A	A
LAURENCIA PACIFICA		C	C
LITHOPHYLLUM SP		C	C
LITHOTHRIX ASPERGILLUM		C	C
MELOBESIA MEDIOCRIS		C	C
PEYSSONNELIA SP.		R	R
PTEROCLADIELLA CAPILLACEA		C	C
CHONDRACANTHUS CANALICULATUS			A
SMITHORA NAIADUM			C
RHODYMENIA CALIFORNICA			C
GASTROCLONIUM SUBARTICULATUM			A
HYPNEA VALENTIAE			C
CRYPTOPLEURA CRISPA			C
MAZZAELLA LEPTORHYNCHOS			C
OTHER PLANTS	(DIVISION) FLOWERING PLANTS		
PHYLLOSPADIX TORREYI	Surfgrass	C	A
PORIFERA			
UNID ENCRUSTING SPONGE		R	R
CNIDARIA	(PHYLUM)		
ANTHOPLEURA ELEGANTISSIMA	Elegant anemone	C	A
ANTHOPLEURA SOLA		A	A
POLYCHAETA	(CLASS)		
PHRAGMATOPOMA CALIFORNICA	sandcastle worm	A	A
SERPULID		C	C

ARTHROPODA	(PHYLUM)		
CHTHAMALUS DALLI/FISSUS	shotgun barnacle	C	C
BALANUS GLANDULA			C
PAGURUS HIRSUTIUSCULUS	hairy hermit crab	C	C
PAGURUS SAMUELIS	blue-clawed hermit crab	A	A
PACHYGRAPSUS CRASSIPES	purple lined shore crab	C	C
LIGIA SP.	Rock louse	C	A
POLLICIPES POLYMERUS	Gooseneck barnacle		C
TETRACLITA RUBESCENS	Barnacle		R
MOLLUSCA	(PHYLUM)		
LOTTIA LIMATULA	file limpet	C	C
LOTTIA SCABRA	rough limpet	R	R
LOTTIA PELTA		R	
CALIFORNICONUS CALIFORNICUS	California cone	R	
ACANTHINA SPIRATA		C	C
LOTTIA GIGANTEA		A	C
LOTTIA STRIGATELLA		C	C
FISSURELLA VOLCANO	keyhole limpet	R	R
MEGASTRAEA UNDOSA		R	
LITTORINA SPP	(=L. planaxis	C	C
CHOROSTOMA FUNEBRALIS	black turban snail	C	C
TEGULA AUREOTINCTA		C	C
ROPERIA POULSONI		A	
THYLACODES SQUAMIGERUS		R	R
LOTTIA DIGITALIS		R	
OPISTOBRANCHIA	(SUBCLASS) SEA SLUGS		
APLYSIA CALIFORNICA	california sea hare	C	C

POLYPLACOPHORA	(CLASS) CHITONS		
NUTTALINA CALIFORNICA		C	C
MOPALIA MUSCOSA		R	R
BIVALVIA	(CLASS) CLAMS OR BIVALVES		
MYTILUS CALIFORNIANUS	california mussel	C	A
MYTILUS EDULIS/GALLOPROVENCIALIS	bay mussel/edible mussel	R	
PSEUDOCHAMA EXOGYRA		C	C
ZIRFEA PILSBURY	boring clams	R	
BRYOZOA			
BUGULINA CALIFORNICA		R	
ECINODERMATA	(PHYLUM) SEASTARS, ETC.		
STRONGYLOCENTROTUS PURPURATUS	purple sea urchin	R	A
PISASTER OCHRACEUS			R
CHORDATA			
UNID TUNICATE A			C
UNID TUNICATE B			R
UNID TUNICATE C			R

2022 SUBTIDAL DIVE SURVEY SPECIES LIST AND RELATIVE ABUNDANCE

Species/Transect	**T1**	**T2**	**T3**	**T4**
Low Relief Reef Taxa				
Corallina chiliensis	R	R	C	A
Endarchne sp		C		C
Gelidium robustum				C
Gracilariopsis sp.	R		P	P
Pessyonnelia sp.	R	R	R	R
Phyllospadix torreyi				C
Ralfsia sp.	R	R	C	C
Rhodymenia californica			P	P
Asterina miniata			P	
Bugulina neritina			P	P
Californiconus californicus	P			
Ectoprocts, unid.				P
Loxorhynchus grandis		R		
Megastraea undosa			C	
Mitrella carinata				P
Muricea californica			A	A
Muricea fruticosa				C
Panulirus interruptus	P	R		
Serpulorbis squamigerus				P
Oxylebius pictus				R
Sand Bottom Taxa				
Amphiodia occidentalis			P	
Astropecten armatus	A		R	
Bullidea, unid.	C			
Denstraster excentricus		C	A	A
Diopatra spp.	A	A	A	A
Isocheles pilosus	P			
Pisaster giganteus			P	P
Renilla kollekerii	R			
Romaleion antennarium	C	P	C	
Virgularia sp.	R		P	P
Citharichthys stigmaeus	P		P	

Paralabrax nebulifer		P		P
Paralichthys californiensis			R	
Sygnathus leptorhyncus			R	
Urobatis halleri			R	
Number of Taxa	**14**	**10**	**20**	**20**

2023 SUBTIDAL DIVE SURVEY SPECIES LIST

2023 TOPANGA SUBTIDAL DIVE SURVEY SPECIES LIST	**TOPANGA**					
JULY 28-30, 2023	**T5'**	**T10'**	**T12'**	**T15'**	**Total**	**% Occ**
SPECIES						
BACCILARIOPHYCAE						
SCHIZYMENIA COLONIAL DIATOMS	C	C		C	x	75
CHLOROPHYTA						
ENTEROMORPHA SP.						
ULVA CALIFORNICA	C	C	C		x	75
PHAEOPHYTA						
COLPOMENIA SINUOSA	C	C	C		x	75
ECTOCARPOID FUZZ						
EGREGIA MENZIESII	C	C			x	50
ENDARACHNE BINGHAMIAE						
RALFSIA SP.						
SARGASSUM MUTICUM		LC		LC	x	50
ZONARIA FARLOWII	C	C	C		x	75
SCYTOSIPHON LOMENTARIA						
TAONIA LENNEBACKERIAE	C	C	C	C	x	100
DESMARESTIA LIGULATA	C	C	C		x	75
Cystoseira osmundacea	C	C	LC	LC	x	100
RHODOPHYTA						
CERAMIUM/POLYSIPHONIA/CENTROCERAS						
CORALLINA PINNATIFOLIA						
CORALLINA CHILIENSIS	C	C	C	C	x	100
CORALLINA VANCOUVERIENSIS	C	C	C	C	x	100
ERYTHROCYSTIS SACCATA						
PLOCAMIUM CARTILAGINEUM						
FILAMENTOUS RED ALGAE						
GELIDIUM COULTERI						
GELIDIUM SPP.	C	C	C	C	x	100
GELIDIUM PUSILLUM						
LAURENCIA PACIFICA						
LITHOPHYLLUM SP	C	C	C	C	x	100
LITHOTHRIX ASPERGILLUM	C	C	C	C	x	100
MELOBESIA MEDIOCRIS						
PEYSSONNELIA SP.						
PTEROCLADIELLA CAPILLACEA						
CHONDRACANTHUS CANALICULATUS	C	C			x	50
CHONDRACANTHUS SP.						
SMITHORA NAIADUM						
RHODYMENIA CALIFORNICA						

RHODYMENIA SP.	C	C	C		x	75
GASTROCLONIUM SUBARTICULATUM						
HYPNEA VALENTIAE						
CRYPTOPLEURA CRISPA						
MAZZAELLA LEPTORHYNCHOS						
AHNFELTIA PLICATA	C	C	C		x	75
GYMNOGONGRUS LEPTORHYNCUS	C	C	C		x	75
GRACILIARIA SP.		C	C	C	x	100
SPERMATOPHYTA						
PHYLLOSPADIX TORREYI	LC	LC			x	50
PORIFERA						
UNID ENCRUSTING SPONGE						
CNIDARIA						
ANTHOPLEURA ELEGANTISSIMA						
ANTHOPLEURA SOLA						
MURICEA FRUCTOCOSA						
MURICEA CALIFORNICA		LC	LC	LC	x	75
AGLAOPHENIA STRUTHOINIDES			C		x	25
RENILLA KOELLIKERI				C	x	25
POLYCHAETA						
PHRAGMATOPOMA CALIFORNICA	C	C			x	50
SERPULID						
DIOPATRA ORNATA		C		C	x	50
ARTHROPODA						
CHTHAMALUS DALLI/FISSUS						
BALANUS GLANDULA						
PAGURUS HIRSUTIUSCULUS						
PAGURUS SAMUELIS						
PACHYGRAPSUS CRASSIPES						
LIGIA SP.						
POLLICIPES POLYMERUS						
TETRACLITA RUBESCENS						
TETRACLITA RUBESCENS						
PANULIRUS INTERRUPTUS	C	C	C	C	x	100
LOXORYNCHUS GRANDIS	LC			LC	x	50
CANCER ANNTENARIUS		LC	LC		x	50
MOLLUSCA-GASTROPODA						
LOTTIA LIMATULA						
LOTTIA SCABRA						
LOTTIA PELTA						
CALIFORNICONUS CALIFORNICUS						
ACANTHINA SPIRATA						
LOTTIA GIGANTEA						

LOTTIA STRIGATELLA						
FISSURELLA VOLCANO						
MEGASTRAEA UNDOSA	C	C	C		x	75
LITTORINA SPP						
CHOROSTOMA FUNEBRALIS						
TEGULA GALLINA						
ROPERIA POULSONI						
THYLACODES SQUAMIGERUS						
LOTTIA DIGITALIS						
CALLIANAX BIPLICATA	LC	C	C	C	x	100
MOLLUSCA-CEPHALOPODA						
OCTOPUS BIMACULOIDES		LC			x	25
MOLLUSCA-OPISTOBRANCHIA						
APLYSIA CALIFORNICA	C	C	C		x	75
MOLLUSCA-NUDIBRANCHIA						
FLABELLINA IODINEA						
MOLLUSCA-POLYPLACOPHORA						
NUTTALINA CALIFORNICA						
MOPALIA MUSCOSA						
MOLLUSCA-BIVALVIA						
MYTILUS CALIFORNIANUS						
MYTILUS EDULIS/GALLOPROVENCIALIS						
PSEUDOCHAMA EXOGYRA						
ZIRFEA PILSBURY						
BRYOZOA						
BUGULINA CALIFORNICA						
ENCRUSTING BRYOZOA, UNID	C	C		C	x	75
HIPPLODIPOSIA INSCULPTA		C	C		x	50
DIAPORECIA CALIFORNICA						
ECHINODERMATA						
STRONGYLOCENTROTUS PURPURATUS						
PISASTER OCHRACEUS						
DENDRASTER EXCENTRICUS		LC	C	A	x	75
ASTROPECTEN ARMATUS				C	x	25
UROCHORDATA						
UNID TUNICATE A						
UNID TUNICATE B						
UNID TUNICATE C						
STYELA MONTEREYENSIS						
CHORDATA						
CITHARICHTHYS STIGMAEUS						
OXYLEBIUS PICTUS						
PARALABRAX CLATHRATUS	C	C	C	C	x	100

PARALABRAX NEBULIFER	C	C	C	C	x	100
PARALABRAX MACULOFACIATUS	C	C	C	C	x	100
PARALICHTHYS CALIFORNICUS						
SYGNATHUS LEPTORYNCHUS						
BRACHYISTIUS FRENATUS	C	C			x	50
ANISOTREMUS DAVIDSONII						
EMBIOTOCA JACKSONII						
HYPSYPOPS RUBICUNDUS						
HETERODONTUS FRANCISCI			C		x	25
UROBATIS HALLERI	C	C	C	C	x	100
Total Number of Taxa	**T5'**	**T10'**	**T12'**	**T15'**	**All Transects**	**Occurrence**
Number of Common Taxa	27	31	26	18	42	102
Number of Less Common Taxa	3	6	3	4		16
Number of Very Abundant Taxa	0	0	0	1		1
Total Number	**30**	**37**	**29**	**23**		**119**

2023 RATNER SUBTIDAL DIVE SURVEY	**RATNER**				
JULY 28-30, 2023	**R5'**	**R10'**	**R12'**	**R15'**	**Total**
SPECIES					
BACCILARIOPHYCAE					
SCHIZYMENIA COLONIAL DIATOMS	C	C		C	X
CHLOROPHYTA					
ENTEROMORPHA SP.					
ULVA CALIFORNICA	C	C	C	C	X
PHAEOPHYTA					
COLPOMENIA SINUOSA	C	C			X
ECTOCARPOID FUZZ					
EGREGIA MENZIESII	C	C			X
ENDARACHNE BINGHAMIAE					
RALFSIA SP.					
SARGASSUM MUTICUM					
ZONARIA FARLOWII	C	C			X
SCYTOSIPHON LOMENTARIA					
TAONIA LENNEBACKERIAE	C	C	C	C	X
DESMARESTIA LIGULATA	C	C			X
Cystoseira osmundacea	C	C			X
RHODOPHYTA					
CERAMIUM/POLYSIPHONIA/CENTROCERAS					
CORALLINA PINNATIFOLIA					
CORALLINA CHILIENSIS	C	C	C	C	X
CORALLINA VANCOUVERIENSIS	C	C	C	C	X
ERYTHROCYSTIS SACCATA					
PLOCAMIUM CARTILAGINEUM					
FILAMENTOUS RED ALGAE				C	X
GELIDIUM COULTERI					
GELIDIUM SPP.	C	C	C	C	X
GELIDIUM PUSILLUM					
LAURENCIA PACIFICA		C			X
LITHOPHYLLUM SP	C	C			X
LITHOTHRIX ASPERGILLUM	C	C	C		X
MELOBESIA MEDIOCRIS					
PEYSSONNELIA SP.					
PTEROCLADIELLA CAPILLACEA					
CHONDRACANTHUS CANALICULATUS	C	C			X
CHONDRACANTHUS SP.		C			X
SMITHORA NAIADUM					
RHODYMENIA CALIFORNICA					
RHODYMENIA SP.	C	C	C	C	X
GASTROCLONIUM SUBARTICULATUM					

HYPNEA VALENTIAE					
CRYPTOPLEURA CRISPA					
MAZZAELLA LEPTORHYNCHOS					
AHNFELTIA PLICATA	C	C			X
GYMNOGONGRUS LEPTORHYNCUS	C	C			X
GRACILIARIA SP.	C	C	C		X
SPERMATOPHYTA					
PHYLLOSPADIX TORREYI	A	A	C		X
PORIFERA					
UNID ENCRUSTING SPONGE					
CNIDARIA					
ANTHOPLEURA ELEGANTISSIMA					
ANTHOPLEURA SOLA					
MURICEA FRUCTOCOSA			LC		X
MURICEA CALIFORNICA		A	A		X
AGLAOPHENIA STRUTHOINIDES			C		X
RENILLA KOELLIKERI					
POLYCHAETA					
PHRAGMATOPOMA CALIFORNICA	A	C	C		X
SERPULID					
DIOPATRA ORNATA			C		X
ARTHROPODA					
CHTHAMALUS DALLI/FISSUS					
BALANUS GLANDULA					
PAGURUS HIRSUTIUSCULUS					
PAGURUS SAMUELIS					
PACHYGRAPSUS CRASSIPES					
LIGIA SP.					
POLLICIPES POLYMERUS					
TETRACLITA RUBESCENS					
TETRACLITA RUBESCENS					
PANULIRUS INTERRUPTUS	C	C	A	C	X
LOXORYNCHUS GRANDIS	LC	LC			X
CANCER ANNTENARIUS			LC		X
MOLLUSCA-GASTROPODA					
LOTTIA LIMATULA					
LOTTIA SCABRA					
LOTTIA PELTA					
CALIFORNICONUS CALIFORNICUS		C			X
ACANTHINA SPIRATA					
LOTTIA GIGANTEA					
LOTTIA STRIGATELLA					
FISSURELLA VOLCANO					

MEGASTRAEA UNDOSA	C	C			X
LITTORINA SPP					
CHOROSTOMA FUNEBRALIS					
TEGULA GALLINA					
ROPERIA POULSONI					
THYLACODES SQUAMIGERUS					
LOTTIA DIGITALIS					
CALLIANAX BIPLICATA	C	C	C	C	X
MOLLUSCA-CEPHALOPODA					
OCTOPUS BIMACULOIDES					
MOLLUSCA-OPISTOBRANCHIA					
APLYSIA CALIFORNICA	C	LC	LC		X
MOLLUSCA-NUDIBRANCHIA					
FLABELLINA IODINEA		LC	LC		X
MOLLUSCA-POLYPLACOPHORA					
NUTTALINA CALIFORNICA					
MOPALIA MUSCOSA					
MOLLUSCA-BIVALVIA					
MYTILUS CALIFORNIANUS					
MYTILUS EDULIS/GALLOPROVENCIALIS					
PSEUDOCHAMA EXOGYRA			C	C	X
ZIRFEA PILSBURY		C			X
BRYOZOA					
BUGULINA CALIFORNICA					
ENCRUSTING BRYOZOA, UNID	C	C	C	C	X
HIPPLODIPOSIA INSCULPTA		C	C	C	X
DIAPORECIA CALIFORNICA				C	X
ECHINODERMATA					
STRONGYLOCENTROTUS PURPURATUS					
PISASTER OCHRACEUS					
DENDRASTER EXCENTRICUS			C	A	X
ASTROPECTEN ARMATUS					
UROCHORDATA					
UNID TUNICATE A					
UNID TUNICATE B					
UNID TUNICATE C					
STYELA MONTEREYENSIS		LC			X
CHORDATA					
CITHARICHTHYS STIGMAEUS					
OXYLEBIUS PICTUS					
PARALABRAX CLATHRATUS	C	C	C	C	X
PARALABRAX NEBULIFER	C	C	C	C	X
PARALABRAX MACULOFACIATUS	C	C	C	C	X

PARALICHTHYS CALIFORNICUS					
SYGNATHUS LEPTORYNCHUS					
BRACHYISTIUS FRENATUS	C	C			X
ANISOTREMUS DAVIDSONII		C	C		X
EMBIOTOCA JACKSONII		C			X
HYPSYPOPS RUBICUNDUS		C	C		X
HETERODONTUS FRANCISCI	LC				X
UROBATIS HALLERI			C	C	X
Total Number of Taxa	**R5'**	**R10'**	**R12'**	**R15'**	**Total Taxa**
Number of Common Taxa	27	35	23	18	51
Number of Less Common Taxa	2	4	4	0	
Number of Very Abundant Taxa	2	2	2	1	
Total	31	41	29	19	

APPENDIX 4 SPECIAL STATUS SPECIES

Scientific Name	Common Name	Federal Status	CDFG Status	Habitat	Potential to Occur
Plants					
Macrocystis pyrifera	giant kelp	Habitat Area of Particular Concern (HAPC) for Fisheries Management Plan (FMP) Species	-	Nearshore rocky subtidal habitat	Low-to-moderate potential depending of yearly recruitment and habitat quality. Giant kelp has only been incidentally reported in the project area and no surface canopy was present in the project area during 2022 and 023 surveys. HAPC-Kelp Canopy Habitat present.
Phyllospadix torreyi	surfgrass	HAPC for FMP Species	–	Nearshore rocky intertidal/rocky subtidal	Moderate potential at depths to -20 ft MLLW on higher relief boulder and reef habitat. Inshore of sediment placement area and to the east of Mastro's Point.
Zostera marina/Z pacifica	eelgrass	HAPC for FMP Species	–	Present in the nearshore waters off of Malibu in sandy sediments. Not known from Topanga nearshore area.	No potential. Not known from Topanga nearshore area.
Invertebrates					
Haliotis cracherodii	Black abalone	FE		Rocky intertidal and subtidal reefs	Low potential but status unknown due to lack of surveys. Individuals may rarely occur in the low boulder intertidal but would be incidental due to low population numbers.
Haliotis sorenseni	White abalone	FE		Rocky subtidal reefs to depths exceeding 100 ft	No potential- this is a deeper occurring species.
Fishes					
Thaleichthys pacificus	Eulachon	FT		Northern smelt species that occurs between northern California and	No potential. Out of geographic range.

				southwest Alaska	
Acipenser medirostris	Green sturgeon	FT Southern and Northern DPS located in Sacramento/San Joaquin Rivers and north into Oregon		Anadromous species. Range is Ensenada to Bering Sea. Will enter large northern California bays and estuaries but rarely occurs south of Point Conception	No potential in project area; may occur farther offshore.
Eucyclogobius newberryi	Tidewater goby	FE	–	Spends all life stages in lagoons, estuaries, and river mouths. Lower reaches of streams, but can be flushed into nearshore waters following storm events that flush Topanga Creek.	Moderate-high potential in Topanga Lagoon. Low potential in nearshore waters. Project could have adverse effects for the species within the lagoon area.
Leuresthes tenuis	California grunion	Important Species	–	Spawns on local open coastal beaches	Moderate potential for grunion spawning in the vicinity of Topanga Beach between March and August. However, level of use unknown year-to-year
Sebastes rubernmus	Yelloweye rockfish	FE Puget Sound/Georges Basin DNP		Northwest species; food for salmon, other fish species, and seabirds	No potential- out of range
Paralichthys californicus	California halibut	Important species	–	Shallow coastal waters, open ocean	High potential within sand habitat of the project area.
Sebastes paucipinnis	Bocaccio	FMP groundfish species; FE status in Puget Sound/Georges Basin; not listed otherwise		Common in southern California reef areas- Common at depths of 60-100 ft and deeper.	Moderate potential offshore of project area; low potential in the Topanga project area but they are common on deeper reefs areas. Not observed at Topanga in historical surveys or August 2022 surveys.
Sphyrna lewini	Scalloped hammerhead shark	FE Eastern Pacific/DPS species		Tropical Waters	No potential. Not recorded in California

Reptiles					
Chelonia mydas	Green sea turtle	FE Eastern Pacific DPS Species	–	Bays and nearshore waters. Proposed NOAA Critical Habitat designation for the green sea turtle (July 2023) in southern Ca includes the area from Mean High Water to depths of -20 m, and a maximum of 10 km offshore	Low potential. Rare visitor. More commonly observed between Long Beach and San Diego
Dermochelys coriacea	Leatherback sea turtle	FE		Worldwide distribution	Low potential. Rare, infrequent visitor in offshore waters. One individual was found dead at Seal Beach in 2017.
Caretta caretta	Loggerhead sea turtle	FE		North Pacific population. Most abundant sea turtle in U.S. coastal waters but numbers are highest during anomalously higher temperature periods.	Low potential. Rare, infrequent visitor in offshore waters.
Lepidochelys olivacea	Olive Ridley sea turtle	FT		Tropical species	No potential. Not documented in project area.

Mammals					
Artcocephalus townsendi	Guadalupe fur seal	FT	T	Occasional visitor to southern California; small numbers are known from the Northern Channel Island.	Low potential. However, undernourished juveniles were rescued at La Jolla, Zuma Beach and Santa Monica in August 2022.
Eumetopias jubatus	Steller sea lion	FT	FT	Rare in southern California	Low potential.
Tursiops truncatus	Bottlenose dolphin	MMPA		Nearshore and open ocean waters; may enter bays/harbors	Low potential. Occasionally present in the nearshore waters along Los Angeles County.
Eschrichtius robustus	California gray whale	FDR		Nearshore and open ocean waters; may enter bays/harbors	Gray whales have a moderate potential to be present offshore of Topanga project area primarily

					during northbound migration when gray whales are closer to shore.
Megaptera novaeangliae	Humpback whale	FE		Offshore ocean waters	No potential within the project area;; may be present farther offshore between spring and autumn in very low numbers.
Balaenoptera physalus	Finback whale	FE		Offshore deep ocean waters, usually away from the coast	No potential to be present in the nearshore project area; may occur farther offshore; rare visitor primarily during summer and autumn
Balaenoptera musculus	Blue whale	FE		Offshore deep ocean waters, usually away from the coast. Abundance in Southern California has increased, probably due to increased use of feeding areas and not population increases.	No potential to be present in the nearshore project area. May occur farther offshore between spring and autumn.
Balaenoptera brydei	Bryde's whale	FE		Offshore deep ocean waters, usually away from the coast.	No potential to be present in the nearshore project area; rare visitor summer to autumn
Eubalaena japonica	North Pacific right whale	FE		Rarest of whale species	No potential. North Pacific population is not known from southern CA
Balaenoptera borealis	Sei whale	FE		Worldwide distribution. Offshore species	No potential in the nearshore project area. May occasionally be present farther offshore along the southern CA coast.
Orcinus orca	Killer whale	MMPA; FE for two populations (Southern Resident DPS and AT1 Transient Stock		Worldwide distribution; Southern Resident DPS from Central California to Alaska	No potential in the project area; Low Potential offshore. Rare occurrences in the nearshore waters. Pods have been observed offshore of Orange County and

					Long Beach.
Physeter microcephalus	Sperm whale	FE		Worldwide; Offshore species	No potential to be present in the nearshore project area.

FE – Federal Endangered; FT – Federal Threatened; MMA – Protected under Marine Mammal Protection Act; FDR-Federally Delisted; DPS=Distinct Population Segment of an Endangered Species
California Department of Fish and Game
SDR-State Delisted Species
CE – California Endangered
SSC – Species of Special Concern
HAPC are subsets of Essential Fish Habitat (EFH) which are rare, particularly susceptible to human induced degradation, especially ecologically important, or located in an environmentally stressed area. Designated HAPC are not afforded any additional regulatory protection under the Magnuson Stevens Fishery Conservation and Management Act (MSA); however, federally permitted projects with potential adverse impacts to HAPC will be more carefully scrutinized during the consultation process (NMFS 2008a)

APPENDIX
O

Appendix M, Plant Species Observed

Common Name	*Scientific name*
FERNS AND ALLIES	
Equisetaceae (Horsetail Family)	
giant horsetail	*Equisetum telmateia*
CONIFERS	
Araucariaceae (Araucarian Family)	
*monkey puzzle	*Araucaria cunninghamii*
Cupressaceae (Cypress Family)	
*Mexican cypress	*Cupressus lusitanica*
cypress	*Cupressus sempervirens*
juniper	*Juniperus* sp.
Pinaceae (Pine Family)	
*deodar cedar	*Cedrus deodara*
*Canary Island pine	*Pinus canariensis*
*Aleppo pine	*Pinus halepensis*
*Monterey pine	*Pinus radiata*
Podocarpaceae (Yellow-Wood Family)	
*Oteeneque yellowwood	*Afrocarpus falcatus*
FLOWERING PLANTS-DICOTS	
Acanthaceae (Acanthus Family)	
*bear's breeches	*Acanthis mollis*

*clockvine species	*Thunbergia* sp.
Adoxaceae (Muskroot Family)	
blue elderberry	*Sambucus mexicana*
Aizoaceae (Fig-Marigold Family)	
*iceplant	*Carpobrotus edulis*
* coppery mesemb	*Malephora crocea*
*heart-leaf ice plant	*Mesembryanthemum cordifolium*
*New Zealand spinach	*Tetragonia teragonioides*
Anacardiaceae (Sumac Family)	
laurel sumac	*Malosma laurina*
lemonade berry	*Rhus integrifolia*
sugarbush	*Rhus ovata*
*Peruvian peppertree	*Schinus molle*
*Brazilian peppertree	*Schinus terebinthifolia*
poison oak	*Toxicodendron diversilobum*
Apiaceae (Carrot Family)	
*poison hemlock	*Conium maculatum*
*wild fennel	*Foeniculum vulgare*
Apocynaceae (Dogbane Family)	
*oleander	*Nerium oleander*
*greater periwinkle	*Vinca major*
Araliaceae (Ginseng Family)	
*English ivy	*Hedera helix*

Asteraceae (Sunflower family)	
sacapellote	*Acourtia microcephala*
ragweed	*Ambrosia psilostachya*
silver beach bur	*Ambrosia chamissonis*
California sagebrush	*Artemisia californica*
mugwort	*Artemisia douglasiana*
coyote brush	*Baccharis pilularis*
mule fat	*Baccharis salicifolia*
California Brickellbush	*Brickellia californica*
*Italian thistle	*Carduus pycnocephalus*
*tocalote	*Centaurea melitensis*
*bull thistle	*Cirsium vulgare*
common sandaster	*Corethrogyne filaginifolia*
*cape ivy	*Delairea odorata*
clustered tarweed	*Deinandra fasciculata*
*African daisy	*Dimorphotheca* sp.
California brittlebush	*Encelia californica*
Palmer's goldenbush	*Ericameria palmeri*
*flax-leaved horseweed	*Erigeron bonariensis*
horseweed	*Erigeron canadensis*
golden yarrow	*Eriophyllum confertiflorum*
gumweed	*Grindelia camporum*
saw-toothed goldenbush	*Hazardia squarrosa*

*Crete weed	*Hedypnois rhagadioloides*
*common sunflower	*Helianthus annuus*
*bristly ox-tongue	*Helminthotheca echioides*
telegraph weed	*Heterotheca grandiflora*
*annual cat's ear	*Hypochaeris glabra*
coast goldenbush	*Isocoma menziesii*
marsh jaumea	*Jaumea carnosa*
*prickly lettuce	*Lactuca serriola*
cliff aster	*Malacothrix saxatilis*
two-color rabbit tobacco	*Pseudognaphalium bioleti*
California cudweed	*Pseudognaphalium californicum*
Wright's cudweed	*Pseudognaphalium microcephalum*
*milk thistle	*Silybum marianum*
*prickly sow-thistle	*Sonchus asper*
*common sow-thistle	*Sonchus oleraceus*
*prickly goldenfleece	*Urospermum picroides*
canyon sunflower	*Venegasia carpesoides*
rough cocklebur	*Xanthium strumarium*
Berberidaceae (Barberry Family)	
*sacred bamboo	*Nandina domestica*
Betulaceae (Birch Family)	
white alder	*Alnus rhombifolia*
Bignoniaceae (Bigonia family)	

*scarlet trumpet vine	*Amphilophium buccinatorium*
*jacaranda	*Jacaranda mimosifolia*
*cape honeysuckle	*Tecoma capensis*
Boraginaceae (Borage Family)	
common fiddleneck	*Amsinckia menziesii*
large-flowered cryptantha	*Cryptantha intermedia* var *intermedia*
eucrypta	*Eucrypta chrysanthemifolia*
*pride of Madeira	*Echium candicans*
giant flowered phacelia	*Phacelia grandiflora*
branching phacelia	*Phacelia ramosissima*
sticky phacelia	*Phacelia viscida*
Brassicaceae (Mustard Family)	
*black mustard	*Brassica nigra*
*Sahara mustard	*Brassica tournefortii*
*European sea rocket	*Cakile maritima*
*hoary mustard	*Hirschfeldia incana*
*wild radish	*Raphanus* sp.
*London rocket	*Sysimbrium irio*
Cactaceae (Cactus Family)	
*Eve's needle cactus	*Austrocylindropuntia subulata*
*San Pedro cactus	*Echinopsis pachanoi*
coast prickly pear	*Opuntia littoralis*
*mission prickly pear	*Opuntia ficus-indica*

*octopus cactus	*Stenocereus alamosensis*
Chenopodiaceae (Goosefoot Family)	
big saltbush	*Atriplex lentiformis*
*Australian saltbush	*Atriplex semibaccata*
*nettle leaf goosefoot	*Chenopodium murale*
pickleweed	*Salicornia pacifica*
*Russian thistle	*Salsola australis*
*Russian thistle	*Salsola tragus*
Convolvulaceae (Morning Glory Family)	
island morning glory	*Calystegia macrostegia*
dodder	*Cuscuta* sp.
*common morning glory	*Ipomoea purpurea or I. indica*
Crassulaceae (Stonecrop Family)	
*jade plant	*Crassula ovata*
chalk dudleya	*Dudleya pulverulenta*
Cucurbitaceae (Gourd Family)	
wild cucumber	*Marah macrocarpa*
Euphorbiaceae (Spurge Family)	
*gopher spurge	*Euphorbia lathyrism*
*Geraldton carnation spurge	*Euphorbia terracina*
*castor bean	*Ricinus communis*
Fabaceae (Legume Family)	
*Cootamundra wattle	*Acacia baileyana*

*silver wattle	*Acacia dealbata*
*black acacia	*Acacia melanoxylon*
*everblooming acacia	*Acacia retinodes*
Spanish lotus	*Acmispon americanus*
deerweed	*Acmispon glaber*
lotus species	*Acmispon* sp.
*okie bean	*Dipogon lignosus*
lupine	*Lupinus* sp.
*yellow sweetclover	*Melilotus indicus*
*Spanish broom	*Spartium junceum*
Fagaceae (Oak Family)	
coast live oak	*Quercus agrifolia*
Geraniaceae (Geranium Family)	
*red-stemmed filaree	*Erodium cicutarium*
*domestic geranium	*Pelargonium* sp.
Grossulariaceae (Gooseberry Family)	
golden currant	*Ribes aureum*
fuchsia-flowered gooseberry	*Ribes speciosum*
Juglandaceae (Walnut Family)	
*pecan tree	*Carya illinoinensis*
**black walnut	*Juglans californica*
Lamiaceae (Mint Family)	
*henbit	*Lamium amplexicaule*

*white horehound	*Marrubium vulgare*
*peppermint	*Mentha x piperita*
white sage	*Salvia apiana*
purple sage	*Salvia leucophylla*
black sage	*Salvia mellifera*
white-stemmed hedge nettle	*Stachys albens*
Lauraceae (Laurel Family)	
*avocado	*Persea americana*
California bay laurel	*Umbellularia californica*
Lythraceae (Crape Myrtle Family)	
*pomegranate	*Punica granatum*
Malvaceae (Mallow Family)	
*Palmer's abutilon	*Abutilon palmeri*
*cow-itch tree	*Lagunaria patersonia*
chaparral bush mallow	*Malacothamnus fasciculatus*
*bull mallow	*Malva nicaeensis*
*cheeseweed	*Malva parviflora*
Moraceae (Fig Family)	
*weeping fig	*Ficus benjamina* sp.
*rubber fig	*Ficus elastica*
*fig	*Ficus* sp.
Myrtaceae (Myrtle Family)	
*red gum	*Eucalyptus camaldulensis*

*spider gum	*Eucalyptus conferruminata*
*blue gum	*Eucalyptus globulus*
*silver dollar gum	*Eucalyptus polyanthemos*
*magenta cherry	*Syzygium paniculatum*
Nyctaginaceae (Four O'Clock Family)	
*bougainvillea	*Bougainvillea* sp.
four o'clock	*Mirabilis jalapa*
desert wishbone bush	*Mirabilis laevis*
Oleaceae (Olive Family)	
*shamel ash	*Fraxinus uhdei*
*glossy privet	*Ligustrum lucidum*
*European olive	*Olea europea*
Onagraceae (Evening Primrose Family)	
fringed willowherb	*Epilobium ciliatum*
Oxalidaceae (Wood Sorrel Family)	
California wood sorrel	*Oxalis californica*
*Bermuda buttercup	*Oxalis pes-caprae*
Papaveraceae (Poppy Family)	
California poppy	*Eschscholzia californica*
Coulter's Matilija poppy	*Romneya coulteri*
Phyrmaceae (Lopseed Family)	
southern bush monkeyflower	*Diplacus longiflorus*
Pittosporceae (Cheesewood Family)	

*Japanese cheesewood	*Pittosporum tobira*
Plantaginaceae (Plantain Family)	
heart-leaved keckiella	*Keckiella cordifolia*
*English plantain	*Plantago lanceolata*
*common plantain	*Plantago major*
*water speedwell	*Veronica anagallis-aquatica*
Plumbaginaceae (Leadwort Family)	
*Perez's sea lavender	*Limonium perezii*
*blue plumbago	*Plumbago auriculata*
Platanaceae (Sycamore Family)	
western sycamore	*Platanus racemosa*
Primulaceae (Primrose Family)	
*scarlet pimpernel	*Lysimachia arvensis*
Polygonaceae (Buckwheat Family)	
ashyleaf buckwheat	*Eriogonum cinereum*
California buckwheat	*Eriogonum fasciculatum*
*common knotweed	*Polygonum aviculare* ssp. *depressum*
*curly dock	*Rumex crispus*
Ranunculaceae (Buttercup Family)	
western virgin's bower	*Clematis ligusticifolia*
Rhamnaceae (Buckthorn Family)	
bigpod ceanothus	*Ceanothus megacarpus*
greenbark ceanothus	*Ceanothus spinosus*

California coffeeberry	*Frangula californica*
hollyleaf redberry	*Rhamnus ilicifolia*
Rosaceae (Rose Family)	
chamise	*Adenostoma fasciculatum*
mountain mahogany	*Cercocarpus betuloides*
*silverleaf cotoneaster	*Cotoneaster pannosus*
toyon	*Heteromeles arbutifolia*
*apricot	*Prunus armeniana*
*Catalina cherry	*Prunus ilicifolia* ssp. *lyonii*
*firethorn	*Pyracantha* sp.
*horticultural rose	*Rosa* sp.
California blackberry	*Rubus ursinus*
Rubiaceae (Coffee Family)	
narrow-leaf bedstraw	*Galium angustifolium*
climbing bedstraw	*Galium nuttallii*
Rutaceae (Rue Family)	
*lemon	*Citrus aurantifolia*
Salicaceae (Willow Family)	
sandbar willow	*Salix exigua*
Fremont cottonwood	*Populus fremontii*
arroyo willow	*Salix lasiolepis*
red willow	*Salix laevigata*
Scrophulariaceae (Figwort Family)	

*ngaio tree	*Myoporum laetum*
*myoporum	*Myoporum* sp.
Simaroubaceae (Quassia Family)	
*tree of heaven	*Ailanthus altissima*
Solanaceae (Nightshade Family)	
jimsonweed	*Datura wrightii*
*blue potatobush	*Lycianthes rantonnettii*
*tree tobacco	*Nicotiana glauca*
American black nightshade	*Solanum americanum*
white nightshade	*Solanum douglasii*
purple nightshade	*Solanum xanti*
Strelitziaceae (Strelitzia Family)	
*giant white bird of paradise	*Strelitzia nicolai*
*bird of paradise	*Strelitzia reginae*
Tamaricaceae (Tamarisk Family)	
*tamarisk	*Tamarix ramosissima*
Tropaeolaceae (Nasturtium Family)	
*nasturtium	*Tropaeolum majus*
Vitaceae (Grape Family)	
*cultivated grapevine	*Vitus vinifera*
Ulmaceae (Elm Family)	
*Chinese elm	*Ulmus parvifolia*
*elm	*Ulmus* sp.

Urticaceae (Nettle Family)	
*dwarf nettle	*Urtica urens*
Verbenaceae (Vervain Family)	
*lantana	*Lantana camara*
common verbena	*Verbena lasiostachys var. scabrida*
FLOWERING PLANTS-MONOCOTS	
Amaryllidaceae (Amaryllis family)	
*culinary scallion	*Allium* sp.
*Jersey lily	*Amaryllis belladonna*
*natal swamplily	*Crinum moorei*
Arecaceae (Palm Family)	
*Canary island date palm	*Phoenix canariensis*
*date palm	*Phoenix dactylifera*
*queen palm	*Syagrus romanzoffiana*
*Mexican fan palm	*Washingtonia robusta*
*fan palm	*Washingtonia* sp.
Asparagaceae (Asparagus Family)	
*century plant	*Agave americana*
*asparagus grass	*Asparagus aethiopicus*
*common asparagus fern	*Asparagus setaceous*
*dragon tree	*Dracaena draco*
*mother-in-law's tongue	*Dracaena trifasciata*
chaparral yucca	*Hesperoyucca whipplei*
*spineless yucca	*Yucca gigantea*

Asphodelaceae (Asphodel Family)	
*ornamental aloe	*Aloe* sp.
*onionweed	**Asphodelus fistulosus*
Cyperaceae (Sedge Family)	
*umbrella plant	*Cyperus involucratus*
California bulrush	*Schoenoplectus californicus*
Iridaceae (Iris Family)	
*horticultural iris	*Iris pseudacorus*
Liliaceae (Lily Family)	
Catalina mariposa lily	*Calochortus catalinae*
Muscaceae (Banana Family)	
*banana	*Musa* sp.
Poaceae (Grass Family)	
*giant reed	*Arundo donax*
*wild oats	*Avena barbata*
*bamboo species	(Subfamily Bambusoideae, genus unknown)
*ripgut brome	*Bromus diandrus*
*soft chess	*Bromus hordeaceus*
*red brome	*Bromus rubens*
*pampas grass	*Cortaderia selloana*
*Bermuda grass	*Cynodon dactylon*
salt grass	*Distichlis spicata*
giant wildrye	*Elymus condensatus*

*Italian rye grass	*Festuca perennis*
small flowered melic	*Melica imperfecta*
*Mexican feather grass	*Nassella tenuissima*
*crimson fountain grass	*Pennisetum setaceum*
*fountain grass	*Pennisetum* sp.
*rabbitsfoot grass	*Polypogon monspeliensis*
*golden bamboo	*Phyllostachys aurea*
foothill needlegrass	*Stipa lepida*
purple needlegrass	*Stipa pulchra*
*smilo grass	*Stipa miliacea*
Themidaceae (Brodiaea Family)	
blue dicks	*Dipterostemon capitatus*
Typhaceae (Cattail Family)	
broadleaf cattail	*Typha latifolia*
Total Species	**253**
Total Native Species	**99**
Total Non-Native Species	**154**

** = nonnative / invasive plant species*
*** = special status species*
Source: DPR surveys 2020-22, Jurisdictional Delineation (WRA 2020), Protected Tree and Oak Tree Report (RCDSMM 2022)

APPENDIX
P

Appendix N, Animal Species Observed

Common Name	*Scientific Name*
INVERTEBRATES	
horsehair worm[3]	Nematamorpha, Gordioida
spittle bug[3]	Insecta, Hemiptera-Cercopidea family
bladder or physid snail[3]	Mollusca, Gastropods, Physidae
Jerusalem cricket[3]	Insecta, Ortohoptera, Stenopelmatidae
blue-fronted dancer damselfly[3]	Insecta, Odonata, Coenagrionidae, *Argia apicalis*
bumblebee, unidentified[3]	*Bombus* sp.
white cabbage butterfly[3]	Insecta, Lepidoptera, Pieridae, (*Pieris* sp.),
tussock moth[3]	Insecta, Lepidoptera, Erebidae, Lymantriinae
morning cloak butterfly[3]	Insecta, Lepidoptera, Nymphalidae (*Nymphalis antiopa)*,
Lorquin's admiral butterfly[3]	Insecta, Lepidoptera, Nymphalidae, *Limenitis lorquini*),
Red admiral butterfly[3]	Insecta, Lepidoptera, Nymphalidae, *Vanessa atalanta*
sulphur butterfly[3]	Insecta, Lepidoptera, Pieridae, *Colias* sp.
orangetip butterfly[3]	Insecta, Lepidoptera, Pieridae, *Anthocaris* sp.
European honeybee (*Apis* sp.)[3]	Insecta, Hymenoptera, A sppidae, Apis sp.
yellow swallowtail butterfly[3]	Insecta, Lepidoptera, Papilionidae, *Papilio sp.*
**monarch butterfly[3]	*Danaus plexippus*
gray buckeye butterfly	*Junonia grisea*
marine blue butterfly	*Leptotes marina*
anise swallowtail	*Papilio zelicaon*

*red swamp crayfish[3,4]	*Procambarus clarkii*
*praying mantis	*unknown*
FISH	
Atherinidae – Old World Silvesides	
topsmelt silverside[7]	*Atherinops affinis*
**California grunion	*Leuresthes tenuis*
*Mississippi silverside[7]	*Menida audens*
Cyprinidae – Carp or Minnow Family	
*goldfish[7]	*Carassius auratus*
Gobiidae - Gobies	
**tidewater goby[3,4,7]	*Eucyclogobius newberryi*
Leuciscidae – True Minnows	
**arroyo chub[7]	*Gila orcuttii*
Mugilidae – Mullets	
juvenile mullet[7]	*Mugil cephalus*
Salmonidae – Salmon	
**southern steelhead trout	*Oncorhynchus mykiss*
Fundulidae – Topminnows and Killifishes	
California killifish	*Fundulus parvipinnis*
REPTILES AND AMPHIBIANS	
Hylidae – Tree Frogs	
California tree frog[3]	*Pseudacris cadaverina*
pacific tree frog[3]	*Pseudacris regilla*

Phrynosomatidae – North American Spiny Lizards	
western fence lizard[2,3,4]	*Sceloporus occidentalis*
common side-blotched lizard[2,3]	*Uta stansburiana*
Colubridae – Colubrids	
striped-racer[3]	Coluber lateralis
**San Bernardino ringneck snake[2]	*Diadophis punctatus modestus*
**coast mountain kingsnake[3]	*Lampropeltis multifasciata*
***Thamnophis hammondii*[3]	two-stripe gartersnake
BIRDS	
Accipitridae – Kites, Eagles, and Hawks	
**Cooper's hawk[2,3,9]	*Accipiter cooperii*
red-tailed hawk[2,3,9]	*Buteo jamaicensis*
Aegithalidae – Bushtit	
bushtit[2,3,6,9]	*Psaltriparus minimus*
Alcedinidae – Kingfishers	
belted kingfisher[3,9]	*Megaceryle alcyon*
Anatidae – Waterfowl	
mallard[3,9]	*Anas platyrhynchos*
hooded merganser[9]	*Lophodytes cucullatus*
surf scoter[9]	*Melanitta perspicillata*
red-breasted merganser[9]	*Melanitta perspicillata*
Apodidae – Swifts	
white-throated swift[9]	*Aeronautes saxatalis*

Ardeidae – Herons, Bitterns, and Allies	
**great egret[3,9]	*Ardea alba*
**great blue heron[9]	*Ardea herodias*
green heron[9]	*Butorides virescens*
**snowy egret[3,9]	*Egretta thula*
**black-crowned night heron[3,9]	*Nycticorax nycticorax*
yellow-crowned night heron[9]	*Nycticorax violacea*
Cardinalidae – Cardinals, Piranga Tanagers, and Allies	
black-headed grosbeak[2,3]	*Pheucticus melanocephalus*
western tanager[2]	*Piranga ludoviciana*
Charadridae – Plovers and Relatives	
black-bellied plover[9]	*Pluvialis squatarola*
Columbidae – Pigeons and Doves	
*Eurasian collared-dove[2]	*Streptopelia decaocto*
mourning dove[2,3,6,9]	*Zenaida macroura*
*rock pigeon[3,9]	*Columbia livia*
Corvidae – Crows and Jays	
California scrub jay[2,3,9]	*Aphelocoma californica*
common raven[2,3,9]	*Corvus corax*
American crow[3,6,9]	*Corvus brachyrhynchos*
Fringillidae – Fringilline and Cardueline Finches	
house finch[2,3,6,9]	*Haemorhous mexicanus*
lesser goldfinch[2,3,6]	*Spinus psaltria*

Gaviidae – Loons	
common loon[9]	*Gavia immer*
Pacific loon[9]	*Gavia pacifica*
red-throated loon[9]	*Gavia stellata*
Haematopodidae – Oystercatchers	
black oystercatcher[9]	*Haematopus bachmani*
American oystercatcher[9]	*Haematopus palliatus*
Hirundinidae – Swallows	
barn swallow[3]	*Hirundo rustica*
cliff swallow[3]	*Petrochelidon pyrrhonota*
northern rough-winged swallow[2,3,9]	*Stelgidopteryx serripennis*
violet-green swallow[3]	*Tachycineta thalassina*
Icteridae – Blackbirds	
red-winged blackbird[3]	*Agelaius phoeniceus*
*brown-headed cowbird[6]	*Molothrus ater*
Bullock's oriole[2]	*Icterus bullockii*
hooded oriole[2,3]	*Icterus cucullatus*
great tailed grackle[3]	*Quiscalus mexicanus*
Laridae – Gulls, Terns, and Skimmers	
**Caspian tern[9]	*Hydroprogne caspia*
**California gull[3,9]	*Larus californicus*
ring-billed gull[9]	*Larus delawarensis*
glaucous-winged gull[9]	*Larus glaucescens*

Heermann's gull[9]	*Larus heermanni*
western gull[3,9]	*Larus occidentalis*
**elegant tern[9]	*Thalasseus elegans*
royal tern[9]	*Thalasseus maximus*
Mimidae – Mockingbirds and Thrashers	
California thrasher[2,3]	*Toxostoma redivivum*
northern mockingbird[2,3,6]	*Mimus polyglottos*
Pandionidae – Ospreys	
**osprey[3,9]	*Pandion haliaetus*
Paridae – Titmice and Chickadees	
oak titmouse[2,3,9]	*Baeolophus inornatus*
Parulidae – Wood-warblers	
common yellowthroat[2,3,6,9]	*Geothlypis trichas*
orange-crowned warbler[3,9]	*Vermivora celata*
Wilson's warbler[3,9]	*Cardellina pusilla*
yellow-rumped warbler (Audubon's)[2,9]	*Setophaga coronata auduboni*
**yellow warbler[9]	*Setophaga petechia*
Passerellidae – New World Sparrows and Towhees	
California towhee[2,3,6,9]	*Melozone crissalis*
spotted towhee[3,6,9]	*Pipilo maculatus*
song sparrow[2,3,6,9]	*Melospiza melodia*
dark-eyed junco[2,3]	*Junco hyemalis*
golden-crowned sparrow[2]	*Zonotrichia atricapilla*

spotted towhee[2,3]	*Pipilo maculatus*
white-crowned sparrow[9]	*Zonotrichia leucophrys*
Pelecanidae – Pelicans	
**brown pelican[3,9]	*Pelecanus occidentalis*
Phalacrocoracidae – Cormorants	
pelagic cormorant[9]	*Urile pelagicus*
Brandt's cormorant[9]	*Urile penicillatus*
**double-crested cormorant[9]	*Nannopterum auritum*
Picidae – Woodpeckers	
acorn woodpecker[2]	*Melanerpes formicivorus*
northern flicker[3,6]	*Colaptes auratus*
Nuttall's woodpecker[3,9]	*Picoides nuttallii*
Podicipedidae – Grebes	
western grebe[3,9]	*Aechmophorus occidentalis*
Psittacidae – African and New World Parrots	
*lilac-crowned parrot[2]	*Amazona finschi*
*Nanday parakeet[3,9]	*Aratinga nenday*
Ptilogonatidae – Silky Flycatcher	
phainopepla[2]	*Phainopepla nitens*
Rallidae – Rails, Coots, and Gallinules	
American coot[9]	*Fulica americana*
Scolopacidae – Sandpipers and Relatives	
sanderling[9]	*Calidris minutilla*

least sandpiper[9]	*Calidris minutilla*
marbled godwit[9]	*Limosa fedoa*
**long-billed curlew[9]	*Numenius americanus*
whimbrel[9]	*Numenius phaeopus*
willet[9]	*Tringa semipalmata*
red-necked phalarope[9]	*Phalaropus lobatus*
whimbrel[9]	*Numenius phaeopus*
Strigidae – Typical Owls	
great horned owl[3]	*Bubo virginianus*
Sturnidae – Starlings	
*European starling[9]	*Sturnus vulgaris*
Sylviidae – Sylviid Warblers	
wrentit[2,3,6,9]	*Chamaea fasciata*
Trochilidae – Hummingbirds	
Allen's hummingbird[2,3,9]	*Selasphorus sasin*
Anna's hummingbird[2,3,6,9]	*Calypte anna*
hummingbird sp.	
Troglodytidae – Wrens	
canyon wren[3]	*Catherpes mexicanus*
Bewick's wren[2,3,6]	*Thryomanes bewickii*
house wren[2,3,9]	*Troglodytes aedon*
Turdidae – Thrushes	
western bluebird[2]	*Sialia mexicana*

Tyrannidae – Tyrant Flycatchers	
ash-throated flycatcher[6]	*Myiarchus cinerascens*
black phoebe[2,3,6,9]	*Sayornis nigricans*
Cassin's kingbird[3]	*Tyrannus vociferans*
**olive-sided flycatcher[6]	*Contopus cooperi*
Pacific-slope flycatcher[3,6,9]	*Empidonax difficilis*
Say's phoebe[2,3,9]	*Sayornis saya*
western kingbird[2]	*Tyrannus verticalis*
Tytonidae – Barn Owls	
barn owl[3]	*Tyto alba*
Vireonidae – Vireos	
Hutton's vireo[2]	*Vireo huttoni*
MAMMALS	
Didelphidae – New World Opossums	
*opossum[5]	*Didelphis virginiana*
Sciuridae – Squirrels	
California ground squirrel[3,5]	*Spermophilus beecheyi*
*fox squirrel[5]	*Sciurus niger*
Cricetidae – New World Mice and Rats	
**San Diego desert woodrat[5]	*Neotoma lepida intermedia*
big-eared woodrat[5]	*Neotoma macrotis*
woodrat species[3]	*Neotoma* sp.
brush mouse[5]	*Peromyscus boylii*

cactus mouse[5]	*Peromyscus eremicus*
deer mouse[5]	*Peromyscus maniculatus*
Leporidae – Hares and rabbits	
desert cottontail[2,3,5]	*Sylvilagus audubonii*
brush rabbit[5]	*Sylvilagus bachmani*
Molossidae – Free-tailed bats	
Mexican free-tailed bat[1]	*Tadarida brasiliensis*
Vespertilionidae – Vesper and Evening Bats	
big brown bat[1]	*Eptesicus fuscus*
**silver-haired bat[1]	*Lasionycteris noctivagans*
**western red bat[1]	*Lasiurus frantzii*
California myotis[1]	*Myotis californicus*
**Yuma myotis[1]	*Myotis yumanensis*
canyon bat[1]	*ParaTadarida brasiliensisstrellus hesperus*
Felidae – Felines	
bobcat[5]	*Lynx rufus*
**mountain lion[5]	*Puma concolor*
Canidae – Canines	
coyote[3]	*Canis latrans*
gray fox[5]	*Urocyon cinereoargenteus*
Mephitidae – Skunks and Stink Badgers	
striped skunk[5]	*Mephitis mephitis*
Procyonidae – Raccoons and Relatives	

raccoon [3,5]	*Procyon lotor*
Cervidae – Deer	
mule deer [2,3,5]	*Odocoileus hemionus*

** = Nonnative / invasive plant species*
*** = Special status species per CDFW Special Animals List January 2022*
Source:
1=Central Coast Bat Survey 2021,
2= CJ Biomonitoring 2021,
3=CDPR/RCDSMM surveys 2020-22,
4=NPS 2021Mammal Surveys,
5=NPS Herpetofauna Surveys 2021,
6=USGS 2004 Bird Survey,
7=SMMRCD Steelhead Report 2021
8=(insert CRM marine species list, 9/20/23)
9=ebird, Topanga Lagoon, 2020-23

APPENDIX
Q

Appendix O, Potential for Occurrence – Special Status Plants

Common Name (*Scientific Name*)	Lifeform Blooming Period	Status (Federal / State/ CA Rare Plant Rank	Primary Habitat Associations	Potential to Occur (Absent, Low-High Potential, Present)
marsh sandwort *(Arenaria paludicola)*	Perennial herb March-Aug	FE / SE / 1B.1	Marshes, swamps and other freshwater areas that are wet year-round, at elevations from 3-170 m above sea level. Often found intermixed within dense mats of reeds, cattails, rushes, and bulrushes	**Absent.** Not known to occur in the Santa Monica Mountains. Not observed during surveys conducted during species blooming period.
Braunton's milk-vetch (*Astragalus brauntonii*)	perennial herb Jan-Aug	FE / None / 1B.1	Recent burns or disturbed areas, usually sandstone with carbonate layers in chaparral, coastal scrub, valley and foothill grassland at elevations from 4 to 640 m above sea level	**Absent.** Requisite calcareous soils are absent from the BSA. Not observed during surveys conducted during the blooming period for the species.
Ventura marsh milk-vetch (*Astragalus pycnostachyus* var. *lanosissimus*)	perennial herb June, Aug-Oct	FE / SE / 1B.1	Coastal dunes, coastal scrub, marshes and swamps (edges, coastal salt or brackish) at elevations from 0 to 35 m above sea level	**Absent.** Not known to occur in the Santa Monica Mountains. Not observed during surveys conducted during species blooming period.
coastal dunes milk-vetch (*Astragalus tener* var. *titi*)	annual herb March - May	FE / SE / 1B.1	Often vernally mesic areas in coastal bluff scrub (sandy), coastal dunes, coastal prairie (mesic) at elevations from 0 to 50 m above sea level	**Absent.** Not known to occur within the Santa Monica Mountains. Suitable habitats within the BSA are highly disturbed by human use and modification. Species not observed during surveys.
Coulter's saltbush (*Atriplex coulteri*)	perennial herb Mar-Oct	None / None / 1B.2	Coastal bluff scrub, coastal dunes, coastal scrub, valley and foothill grassland. substrate in coastal bluff scrub, coastal dunes, coastal scrub, valley & foothill grassland at elevations from 0 to 500 m above sea level	**Low Potential.** Rarely documented within the Santa Monica Mountains, and never within Topanga Canyon. Suitable habitats within the BSA are highly disturbed by human use and modification. Species not observed during blooming season surveys.

Common Name (*Scientific Name*)	Lifeform Blooming Period	Status (Federal / State/ CA Rare Plant Rank	Primary Habitat Associations	Potential to Occur (Absent, Low-High Potential, Present)
south coast saltscale (*Atriplex pacifica*)	annual herb Mar-Oct	None / None / 1B.2	Coastal scrub, coastal bluff scrub, playas, coastal dunes. substrate in alkali playa, coastal bluff scrub, , coastal dunes.coastal scrub at elevations from 0 to 300 m above sea level	**Absent.** Not known to occur within the Santa Monica Mountains. Suitable habitats within the BSA are highly disturbed by human use and modification. Species not observed during blooming season surveys.
Parish's brittlescale (*Atriplex parishii*)	annual herb Jun-Oct	None / None / 1B.1	Vernal pools, chenopod scrub, playas in alkali playa, chenopod scrub, meadow/seep, vernal pool, wetland at elevations from 0 to 430 m above sea level	**Absent.** Suitable habitats do not occur within the BSA.
Davidson's saltscale (*Atriplex serenana* var. *davidsonii*)	annual herb Apr-Oct	None / None / 1B.2	Coastal bluff scrub, coastal scrub in alkaline substrate from 10-200 m above sea level	**Absent.** Not known to occur within the Santa Monica Mountains. Plant not observed during surveys conducted during the species' blooming period.
Malibu baccharis (*Baccharis malibuensis*)	perennial deciduous shrub Aug-Sep	None / None / 1B.1	Chaparral, cismontane woodland, coastal scrub, Riparian woodland from 150 to 305 m above sea level	**Low Potential.** BSA is outside the known elevation range for the species, and no occurrences have been documented therein. Plant not observed during surveys conducted during the species' blooming period. Known 12 km to the N.
slender mariposa lily (*Calochortus clavatus* var. *gracilis*)	perennial bulbiferous herb Mar-Jun, Nov	None / None / 1B.2	Chaparral, coastal scrub, valley and foothill grassland at elevations from 320 to 1000 m above sea level	**Absent.** Per the consortium of CA herbaria (Jepson e-flora), no documented observations occur on the seaward side of the Santa Monica Mountains. This visible species was not observed during surveys conducted during the species blooming period.
Lewis' evening-primrose (*Camissoniopsis lewisii*)	annual herb Mar-Jun	None / None / 3	Cismontane woodland, coastal bluff scrub, coastal dunes, coastal scrub, valley and foothill grassland in clay (sometimes), sandy (sometimes) substrate from 0 to 300 m above sea level	**Low Potential.** Plant not observed during surveys conducted during the species' blooming period. Additionally, per the consortium of CA herbaria (Jepson e-flora), the species has not been documented in the Santa Monica Mountains since 1957 (Observed on Point Dume).

Common Name (*Scientific Name*)	Lifeform Blooming Period	Status (Federal / State/ CA Rare Plant Rank	Primary Habitat Associations	Potential to Occur (Absent, Low-High Potential, Present)
southern tarplant (*Centromadia parryi* ssp. *australis*)	annual herb Jun-Oct	None / None / 1B.1	Marshes and swamps, valley and foothill grassland, vernal pools from 0 to 480 m above sea level	**Absent.** Species is not known to occur within the Santa Monica Mountains. Suitable habitats within the BSA are very limited to absent. Not observed during surveys conducted during the species' blooming period.
Orcutt's pincushion (*Chaenactis glabriuscula* var. *orcuttiana*)	annual herb Apr-Jul	None / None / 1B.1	Coastal bluff scrub, coastal dunes from 0 to 100 m above sea level	**Low Potential.** Plant not observed during surveys conducted during the species' blooming period. Unsuitable habitats onsite. Closest known location was documented in 2006 40 km W in Circle X Ranch.
coastal goosefoot (*Chenopodium littoreum*)	annual herb Jun-Oct	None / None / 1B.2	Coastal dunes from 10 to 30 m above sea level	**Absent.** Plant not observed during surveys conducted during the species' blooming period. Species is not known to occur within the Santa Monica Mountains.
salt marsh bird's-beak (*Chloropyron maritimum* ssp. *maritimum*)	annual herb (hemiparasitic) May – Oct, Nov	FE / SE / 1B.2	Coastal dunes, marshes and swamps (coastal salt) at elevations from 0 to 30 m above sea level	**Absent.** Not known to occur within the Santa Monica Mountains. Potential habitat areas highly disturbed. Species not observed during blooming period surveys.
San Fernando Valley spineflower (*Chorizanthe parryi* var. *fernandina*)	annual herb Apr-Jun	None / SE / 1B.1	Coastal scrub, valley and foothill grassland from 150 to 1220 m above sea level	**Absent.** BSA is outside the known elevation range for the species, and no occurrences have been documented therein. Not observed during surveys conducted during the blooming period for the species.
Santa Susana tarplant (*Deinandra minthornii*)	perennial deciduous shrub Jul-Nov	None / SR / 1B.2	Rocky substrate in chaparral, coastal scrub at elevations from 280 to 760 m above sea level	**Absent.** BSA is outside the known elevation range for the species, and no occurrences have been documented therein. This obvious species was not observed during surveys conducted during the blooming period for the species.
beach spectaclepod (*Dithyrea maritima*)	perennial rhizomatous herb Mar-May	None / ST / 1B.1	Coastal dunes, coastal scrub (sandy) at elevations from 3 to 50 m above sea level	**Absent.** Not known to occur within the Santa Monica Mountains. Species not observed during surveys during the blooming period.
slender-horned spineflower (*Dodecahema leptoceras*)	annual herb May-Jun	FE / SE / 1B.1	Chaparral, cismontane woodland, coastal scrub in sandy substrate from 200 to 760 m above sea level	**Absent.** BSA is outside the known elevation range for the species, and no occurrences have been documented therein. Not observed during surveys conducted during the blooming period.

Common Name (*Scientific Name*)	Lifeform Blooming Period	Status (Federal / State/ CA Rare Plant Rank	Primary Habitat Associations	Potential to Occur (Absent, Low-High Potential, Present)
Blochman's dudleya (*Dudleya blochmaniae* ssp. *blochmaniae*)	perennial herb Apr-Jun	None / None / 1B.1	Chaparral, coastal bluff scrub, coastal scrub, valley and foothill grassland in clay (often), rocky, serpentinite substrate from 5 to 450 m above sea level	**Absent.** Species has rarely been documented within the Santa Monica Mountains. Requisite serpentine soils are absent from the BSA. Plant not observed during surveys conducted during the species' blooming period.
marcescent dudleya (*Dudleya cymosa* ssp. *marcescens*)	perennial herb May-Jun	FT / SR / 1B.2	Chaparral in rocky, volcanic substrate from 150 to 500 m above sea level	**Absent.** BSA is outside the known elevation range for the species, and no occurrences have been documented therein. Not observed during surveys conducted during the blooming period for the species.
Santa Monica dudleya (*Dudleya cymosa* ssp. *ovatifolia*)	perennial herb Mar-Jun	FT / None / 1B.1	Volcanic or sedimentary, rocky substrate in chaparral, coastal scrub at elevations from 150 to 1675 m above sea level.	**Low Potential.** Requisite rocky substrate is present in limited quantities in inaccessible areas on edge of project area, and outside of anticipated disturbance. These areas were surveyed by binoculars during the blooming season and the species was not observed.
Many-stemmed dudleya (*Dudleya multicaulis*)	perennial herb Apr-Jul	None / None / 1B.2	Often clay substrate in chaparral, coastal scrub, valley and foothill grassland at elevations from 15 to 790 m above sea level	**Absent.** Perennial plant not observed during surveys conducted during the species' blooming period. Additionally, per the consortium of CA herbaria (Jepson e-flora), the species documented range is entirely to the east / southeast of the BSA.
San Diego button-celery (*Eryngium aristulatum* var. *parishii*)	annual/perennial herb May-Jun	FE / CE / 1B.1	Coastal scrub, Valley and foothill grassland, wernal pools in Mesic areas from 20 to 620 m above sea level	**Absent.** Plant not observed during surveys conducted during the species' blooming period. Additionally, per the consortium of CA herbaria (Jepson e-flora), the species documented range is entirely well to the southeast of the BSA.
Island wallflower (*Erysimum insulare*)	perennial herb Mar-May	None / None / 1B.3	Coastal bluff scrub, coastal dunes from 0 to 300 m above sea level	**Absent.** Species is not known to occur on the mainland and not observed during blooming season surveys.
Vernal barley (*Hordeum intercedens*)	annual herb Mar-Jun	None / None / 3.2	Coastal dunes, coastal scrub, valley and foothill grassland, Vernal pools from 5 to 1000 m above sea level	**Absent.** Plant not observed during surveys conducted during the species' blooming period. Species is not known to occur within the Santa Monica Mountains.

Common Name (*Scientific Name*)	Lifeform Blooming Period	Status (Federal / State/ CA Rare Plant Rank	Primary Habitat Associations	Potential to Occur (Absent, Low-High Potential, Present)
Mesa horkelia (*Horkelia cuneata* var. *puberula*)	perennial herb Mar-Jul	None / None / 1B.1	Chaparral, cismontane woodland, Coastal scrub in gravelly (sometimes), sandy (sometimes) substrate from 70 to 870 m above sea level	**Absent.** Not known from Santa Monica Mountains (per Prigge and Gibson 2013), and plant not observed during surveys conducted during the species' blooming period. *Horkelia cuneata* var. *cuneata* (a different variety) known from western Santa Monica Mountains.
decumbent goldenbush (*Isocoma menziesii* var. *decumbens*)	perennial shrub Apr-Nov	None / None / 1B.2	Chaparral, coastal scrub from 10 to 135 m above sea level	**Absent.** Plant not observed during surveys conducted during the species' blooming period. This variety is known from points south and east of the project site (esp. San Diego Co., per the Consortium of CA Herbaria (CCH). The "decumbent" growth forms of *I. menziesii* along the immediate coast in the Malibu area have (now) been assigned to var. *sedoides* (see Prigge and Gibson 2013, iNaturalist), but differences among named varieties overlap, and the species (*I. menziesii*) is very common and variable locally.
southern CA black walnut (*Juglans californica*)	tree	None / None /4.2	Primarily found in riparian corridors, but also found in woodlands, grasslands, and chaparral. 150-900m.	**Present.** Six individuals were observed during the summer survey in the project area, but in areas that would not be graded. The trees were sporadically distributed in the riparian habitat north of Rodeo Grounds Ln, west of Topanga Creek, and east of Topanga Canyon Blvd.
Coulter's goldfields (*Lasthenia glabrata* ssp. *coulteri*)	annual herb Feb-Jun	None / None / 1B.1	Marshes and swamps, playas, vernal pools from 0 to 1220 m above sea level	**Absent.** Plant not observed during surveys conducted during the species' blooming period. Suitable habitats are absent from the BSA. Additionally, per the CCH (Jepson e-flora), the species has only once been documented in the Santa Monica Mountains, in 1933 (Observed in Malibu).
Davidson's bush-mallow (*Malacothamnus davidsonii*)	perennial deciduous shrub Jun-Jan	None / None / 1B.2	Chaparral, cismontane woodland, coastal scrub, riparian woodland from 185 to 1140 m above sea level	**Absent.** BSA is outside the known elevation range for the species, and no occurrences have been documented therein. It is not known from the Santa Monica Mountains and was not observed during surveys conducted during the blooming period for the species.

Common Name (*Scientific Name*)	Lifeform Blooming Period	Status (Federal / State/ CA Rare Plant Rank	Primary Habitat Associations	Potential to Occur (Absent, Low-High Potential, Present)
white-veined monardella (*Monardella hypoleuca* ssp. *hypoleuca*)	perennial herb Apr, May-Aug, Sep-Dec	None / None / 1B.3	Chaparral, cismontane woodland at elevations from 50 to 1525 m above sea level	**Low Potential.** Not observed during surveys conducted during species blooming period. Known ~ 6 km to NE, where found in deep, shady canyon environments.
mud nama (*Nama stenocarpa*)	annual/perennial herb Jan-Jul	None / None / 2B.2	Marshes and swamps from 5 to 500 m above sea level	**Absent.** Plant not observed during surveys conducted during the species' blooming period. Suitable habitats are absent from the BSA. Additionally, per the CCH (Jepson e-flora), the species has never been observed in the Santa Monica Mountains except for at the extreme eastern edge, and then not since 1902.
Gambel's watercress *(Nasturtium gambellii)*	perennial herb Apr-Jul, Aug-Oct	FE / ST / 1B.1	Marshes and swamps from 5-400 m above sea level	**Absent.** Not known to occur in the Santa Monica Mountains. Not observed during surveys conducted during species blooming period.
spreading navarretia *(Navarretia fossalis)*	annual herb Apr-Jun	FT / None / 1B.1	Freshwater marshes, swamps, and vernal pools from 30-655 m above sea level	**Absent.** Not known to occur within the Santa Monica Mountains. Species not observed during surveys during the blooming period.
Ojai navarretia (*Navarretia ojaiensis*)	annual herb May-Jul	None / None / 1B.1	Chaparral, coastal scrub, valley and foothill grassland from 275 to 620 m above sea level	**Absent.** BSA is outside the known elevation range for the species, and no occurrences have been documented therein. Not observed during surveys conducted during the blooming period for the species.
prostrate vernal pool navarretia (*Navarretia prostrata*)	annual herb Apr-Jul	None / None / 1B.2	Coastal scrub, meadows and seeps, valley and foothill grassland, vernal pools from 3 to 1,210 m above sea level	**Absent.** Not known to occur in the Santa Monica Mountains. Not observed during surveys conducted during species blooming period.
chaparral nolina (*Nolina cismontana*)	perennial evergreen shrub Mar, May-Jul	None / None / 1B.2	Chaparral, coastal scrub from 140 to 1275 m above sea level	**Absent.** BSA is outside the known elevation range for the species, and no occurrences have been documented therein. It is not known from the Santa Monica Mountains and was not observed during surveys conducted during the blooming period for the species.
CA Orcutt grass *(Orcuttia californica)*	annual grass-like herb Apr-Aug	FE / SE / 1B.1	Vernal pools from 15-660 m above sea level	**Absent.** Plant not observed during survey's conducted during the species' blooming period. Suitable habitat does not occur in the BSA.

Common Name (*Scientific Name*)	Lifeform Blooming Period	Status (Federal / State/ CA Rare Plant Rank	Primary Habitat Associations	Potential to Occur (Absent, Low-High Potential, Present)
Lyon's pentachaeta (*Pentachaeta lyonii*)	annual herb Feb -Aug	FE / SE / 1B.1	Chaparral, coastal scrub, valley and foothill grassland from 30 to 690 m above sea level	**Absent.** Plant not observed during surveys conducted during the species' blooming period. Additionally, per the consortium of CA herbaria (Jepson e-flora), the species has not been documented in the coastal zone of the Santa Monica Mountains.
south coast branching phacelia (*Phacelia ramosissima* var. *austrolitoralis*)	perennial herb Mar-Aug	None / None / 3.2	Chaparral, coastal dunes, coastal scrub, marshes and swamps from 5 to 300 m above sea level	**Low Potential.** Rarely seen in the Santa Monica Mountains; per the CCH (Jepson e-flora), the species was last observed within 16 km of the BSA in 1963 (observed in Malibu). Dubious taxon weakly differentiated from other named varieties, var. *austrolitoralis* would be expected in coastal dunes (e.g., at Playa del Rey), which are limited/absent on-site.
Brand's star phacelia (*Phacelia stellaris*)	annual herb Mar-Jun	None / None / 1B.1	Coastal dunes, coastal scrub from 0 to 400 m above sea level	**Absent.** Not known to occur in the Santa Monica Mountains. Not observed during surveys conducted during species blooming period.
Ballona cinquefoil (*Potentilla multijuga*)	perennial herb Jul-Aug	None / None / 1A	Meadows and seeps from 0 to 5 m above sea level	**Absent.** Not known to occur in the Santa Monica Mountains and considered extinct. Not observed during surveys conducted during species blooming period.
Nuttall's scrub oak (*Quercus dumosa*)	perennial evergreen shrub Feb-Apr, May-Aug	None / None / 1B.1	Chaparral, closed-cone coniferous forest, coastal scrub from 15 to 400 m above sea level	**Absent.** Conspicuous perennial not observed during surveys. Virtually unknown in the Santa Monica Mountains, restricted to sandstone bluffs and coastal hills >10 mi. west and southeast (CCH).
salt spring checkerbloom (*Sidalcea neomexicana*)	annual herb Apr-Jun	None / None / 2B.2	Wetlands, playas, chaparral, coastal scrub, lower montane coniferous forest, Mojavean desert scrub at elevations from 0 to 1500 m above sea level	**Absent.** Not documented in Santa Monica Mountains and presumably locally extinct. Not observed during surveys conducted during the blooming period for the species.
western bristly scaleseed (*Spermolepis lateriflora*)	annual herb Mar-Apr	None / None / 2A	Sonoran Desert scrub. at elevations from 365 to 670 m above sea level	**Absent.** BSA is outside the known elevation range for the species, and no occurrences have been documented therein. Not observed during surveys conducted during the blooming period for the species.

Common Name (*Scientific Name*)	Lifeform Blooming Period	Status (Federal / State/ CA Rare Plant Rank	Primary Habitat Associations	Potential to Occur (Absent, Low-High Potential, Present)
Greata's aster (*Symphyotrichum greatae*)	perennial rhizomatous herb Jun-Oct	None / None / 1B.3	Broadleafed upland forest, chaparral, cismontane woodland, lower montane coniferous forest, Riparian woodland from 300 to 2010 m above sea level	**Absent.** BSA is outside the known elevation range for the species, and no occurrences have been documented therein. Not observed during surveys conducted during the blooming period for the species.
Sonoran maiden fern (*Thelypteris puberula* var. *sonorensis*)	perennial rhizomatous herb Jan-Sep	None / None / 2B.2	Meadows and seeps (seeps and streams) at elevations from 50 to 610 m above sea level	**Absent.** Documented occurrences within the Santa Monica Mountains are restricted to Encinal Canyon to the west. Perennial plant not observed during surveys.

Species with a moderate potential, or greater, to be present, are shaded for emphasis.

**All species listed in the table above are CNDDB 9-quad search around the project area (terrestrial zone), USFWS iPAC list for the project area located online at; https://ipac.ecosphere.fws.gov/location/NYBI6EPYIVENBMIHWPC4CP6FDA/resources*

Status Key

FE=Federally listed as endangered
FT=Federally listed as threatened •
SE=State listed as endangered
SR=State listed as rare
ST=State listed as threatened

CA Rare Plant Ranks:

1=Presumed extirpated in CA and either rare or extinct elsewhere
1B=Rare or Endangered in CA and elsewhere
2A=Presumed extirpated in CA, but more common elsewhere
2B=Rare or Endangered in CA, but more common elsewhere
3=Plants for which we need more information – Review list
4=Plants of limited distribution – Watch list

APPENDIX
R

Appendix R, Potential for Occurrence – Special Status Animals

Common Name (Scientific Name)	Status (Federal / State/Local*)	Primary Habitat Associations	Potential to Occur (Absent, Low-High Potential, Present)
Invertebrates			
Crotch bumble bee (*Bombus crotchii*)	None / SCE	Coastal CA east to the Sierra-Cascade crest and south into Mexico. Food plant genera apparently varied, and has been reported to include *Antirrhinum*, *Phacelia*, *Clarkia*, *Dendromecon*, *Eschscholzia*, and *Eriogonum*.	**Moderate Potential.** Known food genera are present withing the BSA, and one *Bombus* sp. bee was observed that was potentially a member of the species, however, positive identification was not made with certainty.
vernal pool fairy shrimp (*Branchinecta lynchi*)	FT/None	Restricted to vernal pools depressions above an impervious soil layer or duripan in CA and southern Oregon (10-1,700 m).	**Absent.** Suitable habitats are absent from the BSA. Species not known in the Santa Monica Mountains, and closest locations are in the Carlsberg vernal pools in Ventura County, and in the Cruzan Mesa vernal pools in Los Angeles County. Not observed.
Riverside fairy shrimp (*Streptocephalus woottoni*)	FE / None	Endemic to western Riverside, Orange, and San Diego counties in areas of tectonic swales/earth slump basins in grassland and coastal sage scrub. Inhabit seasonally astatic pools filled by winter/spring rains. Hatch in warm water later in the season.	**Absent.** Suitable habitats are absent from the BSA, which is also outside of the known range of the species. Not observed.
monarch butterfly - California overwintering population (*Danaus plexippus*, population 1)	Candidate FE / None	Winter roost sites extend along the coast from northern Mendocino to Baja CA, Mexico. Roosts located in wind-protected tree groves (eucalyptus, Monterey pine, cypress), with nectar and water sources nearby. Otherwise, a very common year-round resident throughout CA, particularly the Los Angeles area.	**Present.** One potential overwinter site observed along project boundary in riparian woodland in November 2023 by CDPR and Xerxes Society staff. The species is very common in the area, and would be expected to occur in small numbers regularly. Occasional individuals observed during surveys.
El Segundo blue butterfly (*Euphilotes battoides allyni*)	FE / None	Restricted to remnant coastal dune habitat in Southern CA. Host plant is *Eriogonum parvifolium*; larvae feed only on the flowers and seeds; used by adults as major nectar source.	**Absent.** Suitable habitat (coastal bluff scrub) is limited and highly disturbed within the BSA, and food plant is absent. Species is not known to occur within the Santa Monica Mountains.

Common Name (Scientific Name)	Status (Federal / State/Local*)	Primary Habitat Associations	Potential to Occur (Absent, Low-High Potential, Present)
quino checkerspot butterfly (*Euphydryas editha quino*)	FE / None	Sunny openings within chaparral and coastal sage shrublands in parts of Riverside and San Diego counties. Hills and mesas near the coast. Need high densities of food plants *Plantago erecta*, *P. insularis*, and *Orthocarpus purpurescens*.	**Absent.** Considered extirpated from Los Angeles County. Species is not known from any modern records within the Santa Monica Mountains.
Fish			
tidewater goby (*Eucyclogobius newberryi*)	FE / None	Brackish water habitats along the CA coast from Agua Hedionda Lagoon, San Diego County to the mouth of the Smith River. Found in shallow lagoons and lower stream reaches, they need fairly still, but not stagnant water and high oxygen levels.	**Present**. Tidewater goby is known to occur in Topanga Creek / Lagoon, and the wetted areas of the BSA are considered critical habitat for the species by USFWS. Their presence is being accounted for in the planning of this project, which is expected to enhance goby habitat.
arroyo chub (*Gila orcuttii*)	None / SSC	Native to streams from Malibu Creek to San Luis Rey River basin. Introduced into streams in Santa Clara, Ventura, Santa Ynez, Mojave and San Diego River basins. Slow water stream sections with mud or sand bottoms. Feeds heavily on aquatic vegetation and associated invertebrates.	**Present.** Known to occur occasionally within Topanga Creek within the BSA when water is present. Common in reaches that are further upstream of the BSA.
CA grunion (*Leuresthes tenuis*)	None/ None/ CDPR	Primary marine species that spawn on Southern CA beaches during spring and summer months, on the nights following high semilunar tides of the new and full moons. They bury their eggs a few centim under the surface between the mean high tide (MHT) and highest high tide (HHT).	**Present.** Observed annually on beach spawning. Small schools observed in lagoon in March 2022.
steelhead - southern California (*Oncorhynchus mykiss irideus. Population 10*)	FE / SCE	Federal listing refers to populations from Santa Maria River south to southern extent of range (San Mateo Creek in San Diego County). Southern steelhead likely have greater physiological tolerances to warmer water and more variable conditions. .	**Present.** Although not observed during 2020-22 surveys in the BSA, the species is known to utilize creek and lagoon areas within the BSA. Ongoing surveys by RCDSMM and CDFW occur.

Common Name (Scientific Name)	Status (Federal / State/Local*)	Primary Habitat Associations	Potential to Occur (Absent, Low-High Potential, Present)
Amphibians			
arroyo toad (*Anaxyrus californicus*)	FE / SSC	Semi-arid regions near washes or intermittent streams, including valley-foothill and desert riparian, desert wash, etc. Rivers with sandy banks, willows, cottonwoods, and sycamores; loose, gravelly areas of streams in drier parts of range.	**Absent.** Not known to occur in the Santa Monica Mountains.
arboreal salamander (*Aneides legubris)*	None/ None / CDPR &NPS	Coastal oak woodland in moist microhabitats, riparian habitat.	**Low Potential.** Was already rare in the SMMs in the 1980s with few recent sightings (e.g., iNaturalist). Riparian habitat and adjacent oak woodland in the BSA may be suitable habitat, but species is poorly known.
CA red-legged frog (*Rana draytonii*)	FT / SSC	Lowlands and foothills in or near permanent sources of deep water with dense, shrubby or emergent riparian vegetation. Requires 11-20 weeks of permanent water for larval development. Must have access to estivation habitat.	**Absent.** Naturally-occurring populations extirpated from the Santa Monica Mountains. Red-legged frog populations have been reintroduced to several areas in the Santa Monica Mountains in recent years, but not Topanga creek. However, these have not been shown to disperse far beyond their introduction sites, which are >16 km from BSA.
western spadefoot (*Spea hammondii*)	FPT / SSC	Occurs primarily in grassland habitats, but can be found in valley-foothill hardwood woodlands. Vernal pools are essential for breeding and egg-laying.	**Absent.** Not known to occur in the Santa Monica Mountains. Not observed.
Reptiles			
California legless lizard (*Anniella* spp.)	None / SSC	Contra Costa County south to San Diego, within a variety of open habitats. This element represents CA records of *Anniella* not yet assigned to new species within the *Anniella pulchra* complex. Variety of habitats; generally in moist, loose soil. They prefer soils with a high moisture content in some areas, but also occur in arid, sandy soils, as on coastal dunes.	**Moderate Potential.** Legless lizards occur in SMMs and Simi Hills, but are very rarely observed (e.g., iNaturalist). The species designation of local animals is yet to be determined. This genus is rarely seen and difficult to survey for, but there is seemingly suitable habitat within the BSA.

Common Name (Scientific Name)	Status (Federal / State/Local*)	Primary Habitat Associations	Potential to Occur (Absent, Low-High Potential, Present)
Southern California legless lizard (*Anniella stebbinsi*)	None / SSC	Generally south of the Transverse Range, extending to northwestern Baja CA. Occurs in sandy or loose loamy soils under sparse vegetation. Disjunct populations in the Tehachapi and Piute Mountains in Kern County. Variety of habitats; generally, in moist, loose soil. They prefer soils with a high moisture content.	**Moderate Potential.** What appears to be this species is rarely seen and difficult to survey for, but there is suitable habitat within the BSA (see account for "*Anniella* spp.", above).
coastal whiptail (*Aspidoscelis tigris stejnegeri*)	None / CDFW WL	Found in deserts and semi-arid areas with sparse vegetation and open areas. Also found in woodland & riparian areas. Ground may be firm soil, sandy, or rocky.	**High Potential.** Very common throughout the Santa Monica Mountains. Not observed during surveys, but suitable habitat is present within the BSA, especially on the northern and western hillsides, and the species has been seen often in the region.
San Bernardino ringneck snake (*Diadophis punctatus modestus*)	None/CDFW SA	Most common in open, relatively rocky areas. Often in somewhat moist microhabitats near intermittent streams.	**Present.** Observed onsite in 2021. Occurs commonly throughout the SMMs. Suitable habitat on and near site.
western pond turtle (*Emys marmorata*)	FPT / SSC	A thoroughly aquatic turtle of ponds, marshes, rivers, streams, and irrigation ditches, usually with aquatic vegetation, below 2 km elevation. Needs basking sites and suitable (sandy banks or grassy open fields) upland habitat up to 0.5 km from water for egg-laying.	**Low Potential.** The species is known to occur in Topanga Creek, however the BSA does not contain an abundance of deep pools with adjacent basking sites. Breeding habitat is likewise very limited to absent from the BSA. Not observed onsite. Known 13 km to N.
coast mountain kingsnake (*Lampropeltis multifasciata*)	None / None/ CDPR &NPS	Wooded areas near streams with rock outcrops. Riparian, oak woodland, coastal sage scrub.	**Present**. Observed onsite in 2021. Occurs throughout SMMs, mostly in shady areas with oaks or riparian habitat.
coast horned lizard (*Phrynosoma blainvillii*)	None / SSC	Frequents a wide variety of habitats, most common in lowlands along sandy washes with scattered low bushes. Open areas for sunning, bushes for cover, patches of loose soil for burial, and abundant supply of ants and other insects.	**Moderate Potential.** Not observed during surveys, but disturbed suitable habitat is present within the BSA, and higher quality habitat in adjacent, less disturbed areas. Many records for this species occur throughout Topanga State Park.
coast patch-nosed snake (*Salvadora hexalepis virgultea)*	None/ SSC	Coastal sage scrub and chaparral, burrows in loose soils.	**Moderate Potential.** Rare in the SMMs but may be present in the suitable habitat adjacent to the site.

Common Name (Scientific Name)	Status (Federal / State/Local*)	Primary Habitat Associations	Potential to Occur (Absent, Low-High Potential, Present)
coast ranged newt (*Taricha torosa*)	None/ SSC	Primarily in valley-foothill hardwood, valley-foothill hardwood-conifer, coastal scrub and mixed chaparral from 0-1,830 m. Also known in annual grassland and mixed conifer types. Breeding/egg-laying in intermittent streams, rivers, permanent and semi-permanent ponds, lakes and large reservoirs. In the Santa Monica Mountains, tends to be found in rocky streams with deep pools in foothill-like environments.	**Low Potential**. In the mid-1980s, CA newts were observed in "Lower Topanga Creek", however, the exact location is not known so it is unclear if this included the lagoon area (De Lisle et al. 1987). Recent records along Topanga Canyon (iNaturalist) extend down to about 18,000 m north of BSA, but species is not common in the canyon and rarely observed. Present-day habitat does not support these species per NPS staff (2022). Species not observed onsite.
two-striped gartersnake (*Thamnophis hammondii*)	None / SSC	Coastal CA from vicinity of Salinas to northwest Baja CA. From sea level to about 2,200 m elevation. Highly aquatic, found in or near permanent fresh water. Often along streams with rocky beds and riparian growth.	**Present.** Observed in Topanga Creek during April 2022 CRAM survey and upstream 1 km. in September 2022 during steelhead surveys.
Birds			
Cooper's hawk (*Accipiter cooperi*)	None /CDFW WL (Nesting)	Resident in wooded areas throughout state, including urban woodland environments. Dense stands of live oak, riparian deciduous, or other forest habitats near water used most frequently, but since the 1990s has penetrated urban habitats and occurs essentially throughout cities and suburbs statewide. 0-2,700 m,	**High Potential.** Resident along Topanga Creek and surrounding hills. Although no nesting activity has been documented on BSA, could occur onsite and may breed in the future.
tricolored blackbird (*Agelaius tricolor*)	None / ST, SSC (Nesting colony)	Highly colonial species, most numerous in Central Valley and vicinity, but occurs sparingly in agricultural and pastoral environments in southern CA. Requires flooded agricultural habitat or freshwater marsh, dense thicket or reeds for breeding, and grassland/open foraging areas, usually associated with livestock, with abundant insect prey within a few km of the colony.	**Absent.** Conspicuous species very rare along the immediate coast of southern CA. Not observed during surveys. Limited to no breeding habitat within the BSA.

Common Name (Scientific Name)	Status (Federal / State/Local*)	Primary Habitat Associations	Potential to Occur (Absent, Low-High Potential, Present)
great egret *(Ardea alba)*	None / CDFW SA (Nesting colony)	Throughout CA, except for high mountains and deserts. Common year-round but breeds at Salton Sea/Colorado River. Feeds and rests in fresh, and saline emergent wetlands, along the margins of estuaries, lakes, and slow-moving streams, on mudflats and salt ponds, and in irrigated croplands and pastures.	**Low Potential (nesting colony).** Although individuals were occasionally observed foraging/resting near the lagoon in the project area, it is not anticipated to be onsite in its more sensitive nesting life stage. No nesting observed or expected onsite. Closest nesting colony is 13 km to W, near Malibu Lagoon.
Great blue heron (*Ardea herodias*)	None / CDFW SA (Nesting colony)	Found throughout CA year-round in low-mid elevations. Nesting in colonies tall tree in close proximity to coastal estuaries, large inland water bodies, and along major waterways or wetlands. Feeds on fish, amphibians, reptiles, invertebrates, small mammals, and small birds.	**Low Potential (nesting colony).** Although individuals occasionally observed foraging/resting near the lagoon in the project area, not anticipated to be onsite in its sensitive nesting life stage. Not known or expected to nest in the project area. Closest nesting colony is ~813 km to W, near Malibu Lagoon.
golden eagle *(Aquila chrysaetos)*	None / CDFW FP/WL (Nesting and wintering)	Rolling foothills, mountain areas, sage-juniper flats, and desert. Cliff-walled canyons provide nesting habitat in most parts of range; also, large trees in open areas.	**Low Potential.** Suitable habitats for breeding are absent from the BSA. Species is considered extirpated from the Santa Monica Mountains except for the far western flank (near Camarillo, Ventura Co., per NPS staff, 2022). Few confirmed modern records elsewhere in SMM. Species not observed onsite.
Burrowing owl *(Athene cunicularia)*	USFWS BCC / SSC (Burrow sites, some overwintering sites)	Open, dry annual or perennial grasslands, agricultural fields (including croplands), deserts, and scrublands characterized by low-growing vegetation. Subterranean nester, dependent upon burrowing mammals, most notably, the CA ground squirrel.	**Low Potential.** Preferred prey is present, but suitable extensive grassland or agricultural fields is absent within the BSA. Species not observed onsite.
Marbled murrelet *(Brachyramphus marmoratus)*	FT/SE (Nesting)	Feed primarily on fish and invertebrates in nearshore marine waters. Nests inland primarily in nature conifers in forested areas in central CA and more northern areas. May winter in areas in southern CA.	**Absent (nesting).** Outside the known breeding range of the species. Not documented onsite and few nearshore southern CA records.

Common Name (Scientific Name)	Status (Federal / State/Local*)	Primary Habitat Associations	Potential to Occur (Absent, Low-High Potential, Present)
Swainson's hawk (*Buteo swainsoni*)	None / ST (Nesting)	Breeds in grasslands with scattered trees, juniper-sage flats, riparian areas, savannahs, & agricultural or ranch lands with groves or lines of trees. Requires adjacent suitable foraging areas such as grasslands, or alfalfa or grain fields supporting rodent populations.	**Absent (nesting).** May pass through area during migration, but no records exist of the species within the BSA, and modern nesting range is far north of the Santa Monica Mountains.
western snowy plover (*Charadrius nivosus nivosus*)	FT / SSC (Nesting)	Sandy beaches, salt pond levees and shores of large alkali lakes. Needs sandy, gravelly, or friable soils for nesting.	**Absent.** Western snowy plover populations in the region are closely monitored, and they are not known to breed (or winter) at Topanga Beach. Suitable habitat within BSA is unsuitable for the species due to beach narrowness, and high levels of human disturbance year-round. Nearest wintering areas are located to the southeast (Will Rogers State Beach) and west (Malibu Lagoon).
western yellow-billed cuckoo (*Coccyzus americanus occidentalis*)	FT / SE (Nesting)	Summer resident: breeds in dense deciduous forests, usually dominated by willows, abutting slow moving watercourses, backwaters or seeps. Forages preferentially on caterpillars, large insects, fruit, small herpetofauna.	**Absent.** Not known or anticipated within the Topanga Creek watershed or anywhere in Los Angeles County, though was historically (to 1950s) present as a breeder in the Los Angeles Basin. Closest known extant populations are in northeast Kern County (South Fork Kern River), and along the lower Colorado River.
Olive-sided flycatcher *(Contopus cooperi)*	None / SSC (Nesting)	A summer resident and migrant throughout CA from mid-April through early October. Breeds primarily in late-successional conifer forests with open canopies, and not known to breed within the Santa Monica Mountains. Found in edges, openings, and clearings in dense forests. Prefers insects.	**Absent (nesting).** Although transient individuals were observed during surveys in 2004, it is not expected to be onsite during its sensitive breeding life stage, as project lies outside of known breeding range. Nearest nesting areas are in the San Gabriel Mountains north of Los Angeles.
yellow rail *(Coturnicops noveboracensis)*	None / SSC	Breeds in NE CA and out of state. Winters along coast, but more frequently in San Francisco Bay area. Requires densely vegetated freshwater marshlands with moist soil or shallow standing water. Feeds upon invertebrates and seeds.	**Absent.** Suitable habitats are absent within the BSA, and project is outside of breeding range.

Common Name (Scientific Name)	Status (Federal / State/Local*)	Primary Habitat Associations	Potential to Occur (Absent, Low-High Potential, Present)
Snowy egret *(Egretta thula)*	None/ CDFW SA (Nesting colony)	Common migrant and winter visitor and an uncommon breeding bird in southern CA. Found in wetland habitats, especially shallow marshy pools and mudflats. Eats small aquatic animals.	**Absent (nesting colony).** Although observed frequently along Topanga Lagoon, the species is closely monitored locally, and is not known or expected to nest onsite during its sensitive life stage. Closest known breeding colony is ~13 km to W near Malibu Lagoon.
southwestern willow flycatcher *(Empidonax traillii extimus)*	FE/SE (Nesting)	Summer resident in dense riparian habitats (cottonwood/willow and tamarisk vegetation) below 2,600 m, with adjacent saturated soils, standing water or streams. Forages primarily on flying insects.	**Absent (nesting).** The species (*E. traillii*) is expected as an uncommon transient in spring (May/June) and fall (mainly September). Some of these individuals *may* be referrable to *extimus*; however, this subspecies cannot be identified in the field, and given its low global population and tendency to migrate rapidly to breeding areas (which are mainly east of BSA), transients are likely other, more common subspecies. The species is closely monitored within the region, with no breeding records for the Santa Monica Mountains or anywhere in Los Angeles Co. Suitable habitat within BSA is also limited due to limited extent and high level of disturbance. Widely extirpated in the region, with few stable nesting populations in CA, closest known breeding areas include South Fork Kern River (Kern Co.), Prado Basin (San Bernardino/Riverside Co.), and locally in north San Diego Co. Historical nesting documented in Los Angeles Basin c. 100 years ago.
American peregrine falcon *(Falco peregrinus anatum)*	Delisted / Delisted (Nesting)	Forages widely, especially over wetlands, lakes, rivers, or other water; nests on cliffs, banks, dunes, mounds; also, locally on human-made structures. Nest consists of a scrape or a depression or ledge in an open site.	**Absent (nesting).** Expected as an uncommon transient overhead. Suitable habitats for breeding are absent from the BSA. Species not documented onsite.

Common Name (Scientific Name)	Status (Federal / State/Local*)	Primary Habitat Associations	Potential to Occur (Absent, Low-High Potential, Present)
Caspian tern *(Hydroprogne caspia)*	None / CDFW SA (Nesting colony)	Mainly a migrant through area, breeding locally in large tern colonies where present. Favors large freshwater body or rivers. Along the coast, uses islands, beaches, impoundments, river mouths, and estuaries for foraging. Eats fish nearshore or waterways.	**Absent (nesting colony).** Although transient individuals are documented occasionally foraging at Topanga Lagoon, the species does not breed in Los Angeles County, and so would not occur onsite during its protected life stage.
California gull (*Larus californicus*)	None / CDFW WL (Nesting colony)	Present year round in CA but does not breed along the southern CA coast. Found along sandy beaches, mudflats, rocky intertidal, and pelagic areas and fresh and saline emergent wetlands. Inland, frequents lacustrine, riverine, and cropland habitats, landfill dumps, and lawns. Omnivorous eating insects, young birds and trash.	**Absent (nesting colony).** Although individuals are frequent visitors to Topanga Beach and Lagoon year-round, this species does not breed in the region, so would not be found onsite during its sensitive life stage.
California black rail (*Laterallus jamaicensis coturniculus*)	None / ST, CDFW FP	Historically inhabited coastal salt marshes from Santa Barbara south through San Diego County, but very few modern records south of San Francisco Bay area away from the Imperial Valley/Lower Colorado River.	**Absent.** Extirpated in southern CA. Suitable habitats (extensive marsh) absent from the BSA.
long-billed curlew *(Numenius americanus)*	None/CDFW WL (Nesting colony)	Winter and non-breeding visitor to coastal CA to large coastal estuaries, upland herbaceous areas, and croplands. Feeds upon invertebrates, small fish and occasionally small birds.	**Absent (nesting colony).** Although occasional visitor to beach and lagoon edges, does not breed in region, and would not be present onsite during its protected life stage.
double-crested cormorant (*Nannopterum auritum)*	None/CDFW WL (Nesting colony)	Yearlong resident along coast of CA, and waterbodies statewide. Needs undisturbed nest sites by (often over) water on cliff ledges, rugged slopes, and large trees. Primarily eats fish, but also crustaceans and amphibians.	**Low Potential (nesting colony).** Although **a** frequent visitor to lagoon area, it is not expected onsite during its sensitive life stage except as an occasional forager from nesting colonies, the nearest located ~13 km to W near Malibu Lagoon.

Common Name (Scientific Name)	Status (Federal / State/Local*)	Primary Habitat Associations	Potential to Occur (Absent, Low-High Potential, Present)
black-crowned night heron (*Nycticorvax nycticorvax*)	None/ CDFW SA (Nesting colony)	Inhabit fresh, salt, and brackish wetlands and are the most widespread heron in the world. Breed in colonies of stick nests usually built over water.	**Low Potential (nesting colony).** Although individuals frequently observed in the trees bordering the lagoon near the PCH, the species is not known to nest onsite, though suitable habitat (dense trees or reeds near permanent water) is present. Closest known breeding colony ~16 km to SE at Marina del Rey.
osprey (*Pandion haliaetus*)	None / CDFW WL (Nesting)	Winter visitor to coastal southern CA, breeds mainly in northern CA, with scattered outpost at harbors and lakes in Orange and San Diego counties. Associated strictly with large, fish-bearing waters. Uses large snags and open trees. Preferentially preys upon fish.	**Low Potential (nesting).** Although individuals infrequently observed in the project area in the non-breeding season, species does not nest in Southern CA so would not be present during its protected life stage.
Belding's savannah sparrow (*Passerculus sandwichensis beldingi*)	USFWS BCC / SE	Inhabits coastal salt marshes from Santa Barbara south through San Diego County. Nests in pickleweed (*Sarcocornia)* on and about margins of tidal flats.	**Absent.** Suitable habitats (extensive tidal marsh) are absent from the BSA. Nearest population ~16 km to SE at Playa del Rey.
California brown pelican *(Pelecanus occidentalis californicus)*	Delisted /Delisted (Nesting colony & communal roosts)	Colonial nester on coastal islands of small to moderate size which afford immunity from attack by ground-dwelling predators. Roosts communally.	**Absent.** Suitable habitats for breeding are absent from the BSA. While birds are occasionally encountered standing on local beaches, species presence is primarily limited to transient over beach areas and foraging offshore.
short-tailed albatross (*Phoebastria albatrus*)	FE/SSC	Breeds on remote island in western Pacific Ocean. Ranges during the non-breeding season along the Pacific Rim as far south as Baja CA, primarily along the continental shelf. Feeds on squid, crustaceans and various fishes. Typically encountered >150 km offshore.	**Absent.** Presence would be limited to moving through or foraging in the far-offshore areas of the project, but few modern records for CA.

Common Name (Scientific Name)	Status (Federal / State/Local*)	Primary Habitat Associations	Potential to Occur (Absent, Low-High Potential, Present)
coastal California gnatcatcher (*Polioptila californica californica*)	FT / SSC	Obligate, permanent resident of extensive areas of coastal sage scrub below 800 m in scattered populations across Southern CA. Favors low, coastal sage scrub in arid washes, on mesas and slopes. Not all areas classified as coastal sage scrub are occupied, and species is absent in the Santa Monica Mountains except at the far western end (near Camarillo, Ventura Co.).	**Absent.** Suitable habitat within the BSA is very limited. Species not observed within or near the BSA.
Hawaiian petrel (*Pterodroma sandwichensis)*	FE / ---	Nesting limited to the Hawaiian island mountains, far travel during foraging trips (up to 10,000 km Documented along CA coast, but no closer than ~150 km offshore. Feeds primarily on squid but also fish, crustaceans, and plankton.	**Absent.** Species presence would be limited to the infrequent foraging or movement through the project area, at least 150 kms offshore.
Cassin's Auklet (*Ptychoramphus aleuticus)*	None/SSC (Nesting colony)	Breeds on islands offshore. Occurs in offshore waters year-round, usually within 50 km of nesting colonies, and typically in upwelling areas. Feeds upon small crustaceans, small fish and squid.	**Absent (nesting colony).** Individuals last documented in 2009 offshore from Topanga Lagoon. Species presence would be limited to the infrequent foraging or movement offshore of the project area. The species would not be present during its protected life stage.
light-footed Ridgway's (clapper) rail (*Rallus obsoletus levipes*)	FE / SE, CDFW FP	Inhabits coastal marshes, lagoons, and some freshwater habitats in Southern CA and northern Baja CA. Utilizes freshwater marsh and mudflat habitats.	**Absent.** Closest extant population is Pt Mugu Lagoon 50 km to W. Historically near Playa del Rey ~16 km to SE. Marginal habitat onsite in project area.
bank swallow (*Riparia riparia*)	None / ST (Nesting)	Colonial nester; nests primarily in riparian and other lowland habitats west of the desert, from Monterey and Mono County north. Requires vertical banks/cliffs with fine-textured/sandy soils near streams, rivers, lakes, ocean to dig nesting hole.	**Absent (nesting).** Colonial nester and forager not observed during surveys. May occur as a rare transient through the area, but unlikely to nest within the BSA (or anywhere in southern CA).

Common Name (Scientific Name)	Status (Federal / State/Local*)	Primary Habitat Associations	Potential to Occur (Absent, Low-High Potential, Present)
yellow warbler *(Setophaga petechia)*	None/SSC (Nesting)	Breeds in riparian woodlands from coastal and desert lowlands up to 2500 m in Sierra Nevada in CA and migrates S during the winter. Nest is an open cup placed 0.6 to 5 m above ground in a deciduous sapling or shrub. Eats insects, spiders, and occasionally berries.	**Moderate potential (nesting).** Documented (as a transient) in fall in project area (eBird). May potentially nest onsite along the creek corridor, but breeding-season records in the coastal Santa Monica Mountains are few and appears to favor inland habitats in Topanga Creek watershed. Expected as a common transient through BSA.
California least tern (*Sternula antillarum browni*)	FE / SE, CDFW FP (Nesting colony)	Nests in small, scattered colonies along the coast from San Francisco Bay south to northern Baja CA. Colonial breeder on bare or sparsely vegetated, flat substrates: sand beaches, alkali flats, landfills, or paved areas.	**Absent (nesting colony).** California least tern populations in the region are closely monitored, and they are not known to breed at Topanga beach, nor regularly anywhere between Venice and Point Mugu. May occur in small numbers as a transient offshore, or during foraging visits from nesting colonies in the region. Recent nesting records from Malibu Lagoon apparently have not resulted in a regular, stable population there. Suitable habitat within BSA is highly disturbed and frequented by humans.
elegant tern *(Thalasseus elegans)*	USFWS BCC/CDFW WL (Nesting)	Summer visitor. Primarily breeds in Mexico, but colonies occupied each year north to southern Los Angeles County (Terminal Island). Uses inshore coastal waters, bays, estuaries, and harbors; rarely occurs far offshore, and never inland. Primarily feeds upon fish in shallow ocean waters beyond the turbulent breaker zone, but also may forage in protected bays and lagoons.	**Absent (nesting).** Although individuals are frequently seen offshore, and occasionally along the shoreline of the project area, the species would not nest onsite, which is its protected life stage.

Common Name (Scientific Name)	Status (Federal / State/Local*)	Primary Habitat Associations	Potential to Occur (Absent, Low-High Potential, Present)
least Bell's vireo (*Vireo bellii pusillus*)	FE / SE (Nesting)	Localized summer resident of Southern CA in low-stature riparian vegetation near permanent water or (less frequently) in dry river bottoms; below 600 m. Nests placed along margins of bushes or on twigs, usually willow, *Baccharis*, mesquite.	**Low Potential (nesting).** No records exist of the species within or immediately surrounding the BSA, which is largely disturbed, and the species was not detected during protocol surveys in 2021 or 2022 (including during five protocol-level surveys in 2021). However, there is structurally-suitable habitat within the riparian woodland habitats found within BSA. The species is not known to occur as a breeder in the Santa Monica Mountains, though in 2022, a family group was noted in Calabasas, ~16 km to N (*pers. comm.* C. Dellith, USFWS).
Mammals			
pallid bat *(Antrozous pallidus)*	None / SSC	Deserts, grasslands, shrublands, woodlands and forests. Most common in open, dry habitats with rocky areas for roosting. Roosts must protect bats from high temperatures. Very sensitive to disturbance of roosting sites.	**Low Potential.** Limited suitable habitat due to disturbance onsite. Disturbance level of site is high, with adjacent busy roadways and constant human use of area. Documented within greater SMM by NPS.
spotted bat *(Euderma maculatum)*	None / SSC	Occupies a wide variety of habitats from arid deserts and grasslands through mixed conifer forests. Feeds over water and along washes. Feeds almost entirely on moths. Needs rock crevices in cliffs or caves for roosting.	**Low Potential.** Suitable habitats for roosting are limited in BSA. If present, species likely only a transient over project area. Documented within greater SMM by NPS.
western mastiff bat (*Eumops perotis californicus*)	None / SSC	Many open, semi-arid to arid habitats, including conifer & deciduous woodlands, coastal scrub, grasslands, chaparral, etc. Roosts in crevices in cliff faces, high buildings, trees and tunnels.	**Low Potential.** Preferred habitats are limited within the BSA. Portions of the BSA that have suitable habitat have limited potential roosting sites, with no buildings or trees within the open and arid portions on the hillsides and limited rock faces. Documented within greater SMM by NPS.
silver-haired bat (*Lasionycteris noctivagans)*	None/CDFW SA	North temperate zone conifer and mixed conifer/hardwood forests. Low elevational xeric habitats in winter and during seasonal migrations. Roosts in tree hollows or behind exfoliating bark of large diameter snags. Also in rock crevices, and occasionally under wood piles or leaf litter.	**Present.** Documented uncommonly during 2021 audio surveys of project area. Suitable foraging and roosting habitat (trees, litter, and wood piles) present.

Common Name (Scientific Name)	Status (Federal / State/Local*)	Primary Habitat Associations	Potential to Occur (Absent, Low-High Potential, Present)
western red bat (*Lasiurus frantzii*)	None / SSC	Roosts primarily in trees, 0.5-12 m above ground, from sea level up through mixed conifer forests. Prefers habitat edges and mosaics with trees that are protected from above and open below with open areas for foraging.	**Present.** Rarely documented during audio surveys in project area in 2021. Suitable foraging and roosting habitat (trees, rock crevices) are present.
California leaf-nosed bat (*Macrotus californicus)*	None / SSC	Desert riparian, desert wash, desert scrub, desert succulent scrub, alkali scrub and palm oasis habitats. Needs rocky, rugged terrain with mines or caves for roosting.	**Absent.** Suitable habitats are absent within the BSA.
south coast marsh vole (*Microtus californicus stephensi*)	None / SSC	Tidal marshes in Los Angeles, Orange and southern Ventura counties.	**Absent.** Suitable habitats are absent within the BSA. Saltmarsh onsite is limited to highly disturbed small patch of *Distichlis spicata*.
Yuma myotis (*Myotis yumanensis*)	None/CDFW SA	Riparian, scrublands, deserts, and forests near permanent water. Roosts in bridges, buildings, cliff crevices, caves, mines, and trees. Forages over ponds, slow-moving streams.	**Present.** Rarely documented during 2021 audio surveys. May roost (structures, crevices or trees) or forage onsite.
San Diego desert woodrat (*Neotoma lepida intermedia*)	None / SSC	Coastal scrub of Southern CA from San Diego County to San Luis Obispo County. Moderate to dense canopies preferred, especially with cactus present, and avoids high dense chaparral. They are particularly abundant in rock outcrops, rocky cliffs, and slopes.	**Present.** Trapped during 2021 small mammal surveys especially in areas near coastal sage scrub.
Los Angeles pocket mouse (*Perognathus longimembris brevinasus*)	None / SSC	Lower elevation grasslands and coastal sage communities in and around the Los Angeles Basin. Open ground with fine, sandy soils. May not dig extensive burrows, hiding under weeds and dead leaves instead.	**Absent.** No recorded observations within or near the BSA. Potentially suitable habitats within the BSA are highly disturbed.
Pacific pocket mouse (*Perognathus longimembris pacificus*)	FE / SSC	Inhabits the narrow coastal plains from the Mexican border north to El Segundo, Los Angeles County. Seems to prefer soils of fine alluvial sands near the ocean, but much remains to be learned.	**Absent.** Not within geographic range. No recorded observations within or near the BSA. Potentially suitable habitats within the BSA are highly disturbed.

Common Name (Scientific Name)	Status (Federal / State/Local*)	Primary Habitat Associations	Potential to Occur (Absent, Low-High Potential, Present)
mountain lion (*Puma concolor)*	None/Protected during CESA review/NPS & CDPR	Resident throughout Santa Monica Mountains, utilizing essentially any habitat with cover, including various shrub and woodland communities.	**Present.** Documented moving through project area by NPS via radio telemetry. Anticipated to be an occasional visitor.
southern California saltmarsh shrew (*Sorex ornatus salicornicus*)	None / SSC	Coastal marshes in Los Angeles, Orange and Ventura counties. Requires dense vegetation and woody debris for cover.	**Absent.** Suitable habitats are absent within the BSA. Saltmarsh onsite is limited to highly disturbed small patch of *Distichlis spicata*.

Species with a moderate potential, or greater, to be present, are shaded for emphasis.

All species statuses identified from California Natural Diversity Database (CNDDB). January 2024. Special Animals List. California Department of Fish and Wildlife. Sacramento, CA. Except Hawaiian Petrel from https://ecos.fws.gov/ecp/species/6746.

All species listed in the table above are CNDDB 9-quad search around the project area (terrestrial zone), USFWS iPAC list for the project area located online at; https://ipac.ecosphere.fws.gov/location/NYBI6EPYIVENBMIHWPC4CP6FDA/resources, or

**All species listed in the table above are in the CDFW Special Animals list are generally considered sensitive at the local level by CDPR or SMMNRA when present and are therefore considered locally sensitive. When species are only considered sensitive at the local level and not found in the CDFW Special Animals list. they are noted. This includes grunion and arboreal salamander.*

Status Key:

CDFW FP=CA Department of Fish and Wildlife Fully Protected
CDFW SA=CDFW Specia Animal (on list)
CDFW WL=CDFW Watch List
CDPR=Considered sensitive by CA Department of Parks and Recreation in the Santa Monica Mountains
CESA=CA Endangered Species Act
F=Federal candidate species (former Category 1 candidates)
FE=Federally listed as endangered
FT=Federally listed as threatened •
FPE=Federally proposed for listing as endangered
FPT=Federally proposed for listing as threatened
FP =Federally proposed for delisting
NPS=Considered sensitive by National Park Service within the Santa Monica Mountains National Recreation Areas (SMMNRA)
SCD=State candidate for delisting
SCE=State candidate for listing as endangered
SCT=State candidate for listing as threatened
SCD State candidate for delisting
SSC=CDFW Species of Special Concern
SE=State listed as endangered
SMMNRA=Santa Monica Mountains National Recreation Area, managed by National Park Service
ST=State listed as threatened
USFWS BCC=U.S. Fish and Wildlife Service Birds of Conservation Concern

Appendix L

Conceptual Habitat Restoration Management Plan (ESA 2023)

The Appendices herein contain supporting information. These Appendices contain highly detailed figures and other graphic information, which are difficult to translate for screen reading software; therefore, the Appendices have not been translated into an auditory format. If you have a disability and/or have difficulty accessing any material in this document, please contact us by mail, email, or telephone, and we will work with you to make all reasonable accommodations. Please indicate 1) the nature of the accessibility need; 2) your preferred format; 3) the material you are trying to access and its location within this document; and 4) how to reach you if questions arise while fulfilling your request. You can direct your requests to:

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TOPANGA LAGOON RESTORATION PROJECT

Conceptual Habitat Restoration and Adaptive Management Plan

Prepared for
Resource Conservation District of the
Santa Monica Mountains

February 2024

ESA

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TABLE OF CONTENTS

Conceptual Habitat Restoration and Adaptive Management Plan

Page

1.0 Introduction 1
- 1.1 Project Location 2
- 1.2 Project Objectives 2
- 1.3 Project Description and Alternatives 2
- 1.4 Estimating Habitat Gains 4
- 1.5 Project Construction 9

2.0 Topanga Creek and Lagoon Ecosystem Existing Conditions 10
- 2.1 Hydrology 10
- 2.2 Climate 12
- 2.3 Stormwater 12
- 2.4 Water Quality 12
- 2.5 Geology 13
- 2.6 Soils 13
- 2.7 Groundwater 14
- 2.8 Flood Hazards 14
- 2.9 Aquatic Resources 15
- 2.10 Vegetation Communities 16
- 2.11 Sensitive Animal Species 17

3.0 Project Team Roles and Responsibilities 17
- 3.1 Project Proponents 17
- 3.2 Discretionary Approvals Required for the Project 18
- 3.3 Responsibilities and Qualifications of Project Engineer, Restoration Ecologist, and Contractors 18
- 3.4 Nursery (Seed/Plant Procurement) 19
- 3.5 Pre-Construction Meeting 20

4.0 Implementation Plan 20
- 4.1 Installation Schedule and Protection of Species 20
- 4.2 Site Preparation 23
- 4.3 Project Grading 26
- 4.4 Planting Plan and Specifications 26

5.0 Maintenance Program 42
- 5.1 Maintenance Activities and Schedule 42
- 5.2 Non-Native Plant Control 43
- 5.3 Temporary Irrigation 44
- 5.4 Trash Removal 44
- 5.5 Erosion Control 44
- 5.6 Sediment Erosion and Deposition 45
- 5.7 Replacement Planting and Seeding 45

Page

5.8 Vandalism and Site Protection 45
5.9 Sensitive Species Issues 46

6.0 Monitoring and Reporting Program 46
6.1 Monitoring and Reporting Schedules 46
6.2 Implementation Monitoring 47
6.3 Maintenance Monitoring 47
6.4 Annual Monitoring 48
6.5 Performance Goals 51

7.0 Completion of Restoration 54
7.1 Notice of Completion 54
7.2 Long-Term Management – Operations and Maintenance 54
7.3 Funding 56

8.0 Remediation Measures 56
8.1 Adaptive Management 56
8.2 Natural Disaster 57

9.0 References 57

Figures

Figure 1 Vegetation Communities and Land Cover Map 11

Tables

Table 1 Summary of Estimated Habitat Gains for the Project Build Alternatives (in Acres) 5
Table 2 Lagoon Restoration Construction Sequence 9
Table 3 Summary of Potential CWA Section 404/401 Jurisdictional Areas within the Project area 15
Table 4 Summary of Potential CDFW and Los Angeles County SMM LCP Jurisdictional Areas within the Project area 15
Table 5 Permits, Approvals, and Regulatory Requirements 18
Table 6 Topanga Lagoon Restoration Plan Checklist 21
Table 7 Current and Future Conditions Habitat Elevations (Feet NAVD) 28
Table 8 Conceptual Planting Arrangement Based on Relative Habitat Elevation 29
Table 9 Upland Sage Scrub Seed Mix and Plant Palette 32
Table 10 Riparian Upland Transition-Seed Mix and Plant Palette 33
Table 11 Riparian Woodland Seed Mix and Plant Palette 34
Table 12 Emergent Marsh -Seed Mix and Plant Palette 35
Table 13 Salt Marsh Plant Palette 36
Table 14 (Un)vegetated Flat Plant Palette 36
Table 15 Southern Foredune Seed Mix and Plant Palette 37
Table 16 Maintenance Schedule 43
Table 17 Monitoring Schedule 46
Table 18 Performance Goals 52

Appendix

A Topanga Lagoon Restoration Alternatives Analysis Report

TOPANGA LAGOON RESTORATION PROJECT

Conceptual Habitat Restoration and Adaptive Management Plan

1.0 Introduction

The California Department of Parks and Recreation (CDPR) has prepared an Environmental Impact Report (EIR) as the Lead Agency, pursuant to the requirements of the California Environmental Quality Act (CEQA), in coordination with County of Los Angeles Department of Beaches and Harbors (DBH) and the California Department of Transportation (Caltrans). The EIR assesses the potential effects of implementing the Topanga Lagoon Restoration Project (Proposed Project). The EIR evaluates four restoration alternatives, three Build Alternatives (Alternatives 2 through 4) and one No Build Alternative (Alternative 1).

The Proposed Project involves the expansion of the Topanga Creek and Lagoon ecosystem, the replacement of the aging Pacific Coast Highway (PCH) bridge (SR-1 #53-0035) that spans the lagoon, and either remove or restore some of the Topanga Ranch Motel to allow for development of new visitor services. The Proposed Project would facilitate implementation of an integrated, multiagency plan to improve coastal access by relocating existing visitor services including parking, pedestrian beach access routes, the lifeguard and public restroom building, and helicopter pad on Topanga Beach, and a business concession within the Project area. The Proposed Project also includes construction of new visitor services at the intersection of PCH and Topanga Canyon Boulevard (TCB) referred to as the "Gateway Corner." The Proposed Project also evaluates beneficial reuse options for excavated sediment to be placed at a nearshore location.

This Conceptual Habitat Restoration and Adaptive Management Plan (CHRAMP or Plan) has been prepared to provide guidance on plant palettes, planting densities and arrangements for several habitat types associated with the restoration of Topanga Lagoon. This Plan provides a conceptual framework for wetland establishment and enhancement; restoration of upland habitats; and includes design resilience to address and offset projected future sea level rise (SLR). The Proposed Project is intended to increase the size and quality of native habitats for two endangered native fish species, the tidewater goby (*Eucyclogobius newberryi*) and steelhead trout (*Onchorynchus mykiss*) in the Topanga Creek and Lagoon ecosystem. The Plan also identifies potential adaptive management considerations and measures, and maintenance, monitoring and reporting requirements for the restoration activities.

1.1 Project Location

The Proposed Project is located on the unincorporated Pacific Ocean coastline in Los Angeles County, California within the Santa Monica Mountains National Recreation Area. The Proposed Project area includes two publicly managed areas, lower Topanga State Park (Park) managed by CDPR, and Topanga Beach (Beach) managed by DBH. The closest access to the Project area is from the PCH and TCB (**Figure 1**).

1.2 Project Objectives

Based on feedback from the community engagement meetings, and other stakeholder input since 2001, CDPR has identified the following objectives of the Proposed Project:

- Expand the lagoon ecosystem to improve estuarine hydrologic functions and to protect endangered species
- Enhance coastal resilience for essential facilities in the Project area.
- Optimize beneficial re-use of excavated sediment by increasing sediment replenishment via nearshore placement and long-term conveyance increased by wider bridge to the littoral cell[1] while maintaining the integrity of the surf break.
- Protect the surf break and beach recreation.
- Improve water quality and restore coastal wetland habitat and species diversity within the Topanga Creek Watershed.
- Increase safety and coastal access for pedestrians, cyclists, including for visitors with disabilities.
- Improve evacuation and emergency service routes through the Project area.
- Improve and enhance coastal access and recreational facilities.
- Manage and maintain the lagoon ecosystem consistent with the guidelines in the Topanga State Park General Plan.
- Replace the narrow 1933 PCH bridge to accommodate lagoon restoration and anadromous steelhead trout recovery.
- Establish a visitor serving "Gateway Corner" at the northwest corner of the intersection of PCH and TCB, consistent with the Topanga State Park General Plan goal of providing a coastal gateway to the Park.

1.3 Project Description and Alternatives

Under all Project Build Alternatives, the seasonally wetted and riparian habitat areas would be expanded from the existing less than 1 acre to 7 to 10 acres, while the more upland/transition areas would increase from the existing 21.4 acres of mixed non-native vegetation to between 23 and 24 acres of native restored habitats, depending on which alternative is selected (**Table 1**). This would require removing much of the historical fill on-site to create a more natural topography and expanded open space area. The existing wetted lagoon area and riparian habitats

[1] Sediment cells, also known as littoral cells, are reaches of shoreline that encompass the intertidal and nearshore movement of sediment. A sediment cell basically consists of zones of erosion, transport, and deposition.

would be protected with grading starting at the outer edge of existing riparian trees, preserving the current lagoon banks and the majority of the existing riparian willows and native hardwoods. Most native trees would be retained throughout the Project area, and the natural breaching pattern of the lagoon would be protected by grading outside the footprint of the existing wetted lagoon and working landward of the beach berm at its mouth. In addition to the restoration areas, weeding and targeted plantings may be implemented outside the newly graded areas within the overall project footprint including along TCB and the beach.

Under all Project Build Alternatives, the area of Topanga Beach for recreational users would increase with up to 50 ft of additional depth in Alternatives 2 and 3 on the east cove beach, and approximately 90 ft in Alternative 4. This adds approximately 1 acre of additional beach. The construction footprint includes the Topanga Beach Lagoon/ocean interface on the landward side of the bar-built sand berm and extends approximately 1,200 feet upstream into Topanga Creek with removal of fill on both the west and east sides. Under all Project Build Alternatives, the fill material would either be trucked off site for disposal or beneficially reused in a near-shore placement location, subject to approval by the United States Army Corps of Engineers (USACE).

Under all Project Build Alternatives, the length of the existing 79-foot-long Caltrans bridge would be expanded to accommodate a widened lagoon riparian area, which would lower flow velocities to improve adult steelhead migration opportunities and increase refugia areas for tidewater gobies and juvenile steelhead, as well as the quantity and quality of lagoon habitats. To provide for a wider lagoon and improve fish migration and refugia, the existing Caltrans bridge would be replaced with a longer bridge. The main span of the new bridge would increase to 200 feet, with secondary side spans of 120-140 feet on either side, increasing the total bridge span length to 460 feet. This expanded length provides space for the creek and lagoon to evolve in response to SLR and provides pedestrian access under the roadway on both sides of the lagoon, as only access on the east side is currently available. The existing alignment of the bridge and PCH roadway is maintained for two of the Project Build Alternatives but is relocated slightly to the north in the Alternative 4, as discussed below.

The new bridge would continue to accommodate two lanes in each direction with no expansion of roadway capacity. Traffic flows will also be protected during construction by way of a temporary roadway and bridge alignment. All utilities would be continued during construction, and eventually relocated underground or attached to the new bridge. All phases of construction and staging for the new bridge would be similar under each alternative.

Coastal access would be maintained during construction and improved under all Project Build Alternatives. This includes the creation of a trail system through the Project area and provision of pedestrian access under PCH on the east and west sides of the lagoon. Improved parking would be provided along the PCH and TCB corridors. An emergency route from PCH to the beach level would be constructed on the west side of the lagoon to allow lifeguard access to both limit vehicle usage along the lagoon berm and provide access to the western beach even during times when the lagoon mouth is open. Parking at the beach level on the east side would be similar to existing conditions, and would only be accessible to staff, emergency vehicles, and disabled visitor

parking spaces. The areas around the existing bus stops would be improved to be more welcoming to public transportation users.

Under all Project Build Alternatives, key DBH facilities on Topanga Beach would be relocated further from the ocean to protect structures from SLR. The existing lifeguard building, beach restroom, and helipad would be demolished and rebuilt closer to the realigned access road, and at a higher elevation. The new buildings would be of similar size and materials to the existing building. A small two-car garage for staff would be added to the improvements. The new helipad site would be re-located to the east side of the lagoon with a hydrant for improved access by the lifeguards, emergency responders and wildfire response. The size, setbacks and built elements of the new helipad would conform to all Federal Aviation Administration and Los Angeles County requirements. The permitted advanced onsite wastewater treatment system (AOWTS) that services the beach restroom would remain to support the new facility unless a sewer hookup becomes available. The existing parking lot would be modified depending on the alternative. American with Disabilities Act (ADA) and staff parking and access at the beach level is retained in all alternatives.

A plan for determining the future configuration of the historic Topanga Ranch Motel is included in Alternatives 3 and 4, as are potential locations for park facilities, concessions, and parking on CDPR property. Currently the Proposed Project area accommodates authorized and unauthorized parking opportunities. All Project Build Alternatives would modify the existing parking opportunities and visitor services. In general, additional coastal access parking spaces would be created, but their location and makeup would shift. Less free (and often non-conforming) parking along PCH would be available as parking is not permitted on the longer bridge deck but would be partially shifted to the TCB corridor. More parking would be available in CDPR and DBH lots, which include new areas on the west side of Topanga Creek and along TCB. Business lease parking would be reduced as only a single business would remain in the project area.

1.4 Estimating Habitat Gains

An assessment of habitat elevations was developed by ESA (2023a) and used by Moffatt & Nichol (M&N) to map projected habitats under each of the Build Alternatives for a 42-acre subset of the project area associated with the creek and lagoon corridor. The habitat elevation ranges of each habitat type estimated (see Table 1) were used to create maps of vegetation acreages under three SLR scenarios: no SLR, 1.6 feet of SLR, and 6.8 feet of SLR (see Appendix A). Developed areas and existing beach area were determined based on a jurisdictional delineation of Topanga Lagoon (see Appendix B). Shoreline position and sand beach acreages for each of the two scenarios containing SLR were mapped based on the U.S. Geological Survey's Coastal Storm Modeling System (CoSMoS) "hold the line" shoreline position for 1.6 feet and 6.6 feet of SLR, respectively. Habitat acreages mapped for all alternatives under each SLR scenario are provided in **Table 1** below.

Table 1 presents a summary of habitat gains for each alternative under two different SLR scenarios.

TABLE 1
SUMMARY OF ESTIMATED HABITAT GAINS FOR THE PROJECT BUILD ALTERNATIVES (IN ACRES)

	NO SLR Condition				1.6 ft SLR Condition				6.8 ft SLR Condition			
Habitat Type	**Alt 1**	**Alt 2**	**Alt 3**	**Alt 4**	**Alt 1**	**Alt 2**	**Alt 3**	**Alt 4**	**Alt 1**	**Alt 2**	**Alt 3**	**Alt 4**
Open Water	0.06	0.04	0.08	0.07	1.21	1.19	1.23	1.22	5.07	5.78	5.22	5.14
Seasonal Shallow Open Water	0.42	0.69	0.44	0.38	0.42	0.69	0.44	0.38	0.08	0.32	0.12	0.08
Seasonally Unvegetated Flat	0.16	1.51	0.28	0.27	0.38	1.69	0.28	0.51	0.99	3.87	2.77	2.53
Emergent Marsh	0.47	1.12	0.5	0.5	0.39	1.87	0.5	0.82	0.24	0.94	0.59	0.8
Saltgrass	0.07	N/A	N/A	N/A	0.07	N/A	N/A	N/A	0.01	N/A	N/A	N/A
Riparian	2.46	6.09	6.42	6.36	2.32	5.16	6.42	5.79	1.62	2.59	3.11	3.13
Wetted Area Below Riparian/Upland Transition	**3.6**	**9.5**	**7.7**	**7.6**	**4.8**	**10.6**	**8.9**	**8.7**	**8.0**	**13.5**	**11.8**	**11.7**
Riparian/Upland Transition	6.06	6.14	6.34	6.23	6.06	6.14	6.34	6.23	6.06	6.14	6.34	6.22
Coastal Sage Scrub	3.66	2.98	2.98	2.98	3.66	2.98	2.98	2.98	3.65	2.98	2.98	2.98
Upland	11.16	13.84	14.37	14.49	11.15	13.84	14.37	14.49	11.16	13.84	14.35	14.49
Disturbed Upland/Trails	0.49	N/A	N/A	N/A	0.49	N/A	N/A	N/A	0.49	N/A	N/A	N/A
Riparian/Upland Transition Habitats	**21.4**	**23.0**	**23.7**	**23.7**	**21.4**	**23.0**	**23.7**	**23.7**	**21.4**	**23.0**	**23.7**	**23.7**
Sand (Beach)	4.18	4.39	4.42	4.56	3.05	3.24	3.28	3.41	0.27	0.34	0.35	0.48
Total All Habitat	**29.2**	**36.8**	**35.8**	**35.8**	**29.2**	**36.8**	**35.8**	**35.8**	**29.6**	**36.8**	**35.8**	**35.9**
Roadways/Developed/Landscaped	12.43	4.84	5.78	5.78	12.43	4.84	5.78	5.78	11.99	4.84	5.78	5.78
TOTAL PROJECT AREA	**41.6**	**41.6**	**41.6**	**41.6**	**41.6**	**41.6**	**41.6**	**41.6**	**41.6**	**41.6**	**41.6**	**41.6**

Moffatt and Nichol habitat projections suggest the following trends. Alternative 2 tends to increase the extent of seasonal shallow open water, seasonal unvegetated flat, emergent marsh and decreased developed areas. Alternatives 3 and 4 are anticipated to result in somewhat more uplands habitats and Alternative 4 maximizes beach habitat gains. Alternatives 2–4 are projected under SLR to shift toward more open water and seasonally unvegetated flat habitats at the expense of decreased riparian presence.

1.4.1 Maximum Lagoon Habitat Alternative 2

Under Alternative 2, the maximum increase in lagoon, wetland, and riparian bank habitats would occur. The restoration area results in 9.5 wetted acres, 23 riparian/transitional upland acres restored and beach expansion to 4.39 acres in the area by the lagoon. Overall, the sandy beach area throughout the project will expand by at least 1 acre. All structures with the exception of a single business lease (current Reel Inn location) on the north side of PCH would be removed.

This lagoon alternative includes restoration of more natural side channels connected to the western side of the existing lagoon based on historic topography, expands the floodplain and potential channel areas on the east side, and would allow the lagoon system to evolve to accommodate changing sea level and storm surge conditions.

This Alternative is the most resilient to projected SLR for the lagoon and creek ecosystems, as it expands the area of the existing lagoon ecosystem footprint and accommodates the lagoon by letting it self-adjust and respond over time if habitat needs to migrates inland. Topanga Beach would also be expanded providing an opportunity for the inclusion of living shoreline elements (i.e., dunes) to be included.

This alternative would lengthen the Caltrans bridge from 79 to 460 feet but would not modify the alignment of PCH. With this alternative, CDPR contributes 0.05 acre to Caltrans and DBH contributes 0.22 acre due to changes in Right of Way to bring PCH up to current standards. Stormwater and surface runoff will be captured in appropriate BMPs such as bioswales or rain gardens within parking areas Parking areas will be permeable to the full extent feasible.

Within the Topanga Beach area, the existing lifeguard and public restroom building would be demolished and replaced. The new building would have the same footprint and will be built of similar materials, and it would be relocated directly upslope of its current location to provide additional protection from SLR. The helipad and new two-car garage would be relocated adjacent to it on the west. The existing Topanga Beach parking lot would be modified with existing spaces on the west end of the paved lot removed and relocated to a new lot on the west edge of the Project where there are no parking spaces currently. Parking areas would be permeable with surface runoff directed to bioswales to reduce pollution.

Under Alternative 2, all existing 25 structures of the Topanga Ranch Motel and all other buildings on CDPR property would be fully removed. The one exception is that a maximum 2,400 square foot (sf) concession could continue to exist at the current location of the Reel Inn restaurant just southeast of the historic motel. All new CDPR development would be located at the “Gateway Corner” (intersection of TCB and PCH).

Proposed re-development would be supported by an advanced onsite wastewater treatment system (OWTS) such as subsurface drip irrigation (SDI), seepage pits or connection to the Los Angeles County Sanitation sewer hub located at Coastline Drive.

1.4.2 Limited Lagoon Habitat Expansion Alternative 3

Under Alternative 3, the fill under the 20 structures retained in the Topanga Ranch Motel would limit the lagoon restoration to 7.7 wetted acres, with 23.7 riparian/transitional/upland acres restored and beach expansion to 4.42 acres in the area by the lagoon. Overall the sandy beach area throughout the project will expand by at least 1 acre. Only the western part of the main creek channel of the lagoon would be expanded for wetland, riparian, and transitional habitat creation. Habitat expansion would be restricted on the east side of the lagoon due to retaining the motel. Topanga Beach would be expanded slightly providing opportunity for use of living shoreline elements to be included primarily on the west side. This Alternative provides the least resilience to SLR as it retains much of the fill material on the east side of the creek thus reducing restoration footprint and restricting potential for lagoon habitat to respond.

This alternative would lengthen the Caltrans bridge from 79 to 460 feet but would not modify the alignment of PCH. With this alternative, CDPR contributes 0.05 acres to Caltrans and DBH contributes 0.22 acres due to changes in Right of Way to bring PCH up to current standards. Stormwater and surface runoff will be captured in appropriate BMPs such as bioswales or rain gardens within parking areas.

Within the Topanga Beach area, the existing lifeguard and public restroom building would be demolished and replaced. The new building would have the same footprint and will be built of similar materials, and it would be relocated directly upslope and to the east of the current location to provide additional protection from SLR. The helipad would be relocated to the western edge of the parking lot on level with PCH. The new two-car parking garage would be located under the helipad at the beach access road level. Retaining walls would be needed to support the helipad on top of the garage (92 feet of concrete masonry unit (CMU) wall, 8 to10-foot-tall underneath the south side, 72 feet on the north side of the helipad) and a 192-foot-long, 4 to 6-foot-tall wall to shore up the fill material supporting the remaining Topanga Ranch Motel units.

The east Topanga Beach parking lot would be modified to accommodate the helipad on the west end of the existing paved lot reducing spaces there, which would be replaced by a new parking lot added on the west edge of the project where there are no parking spaces currently. Parking areas would be permeable with surface runoff directed to bioswales to reduce pollution. Parking areas will be permeable to the full extent feasible.

1.4.3 Maximum Managed Retreat Alternative 4

Under Alternative 4, fill under 15 structures retained in the Topanga Ranch Motel would limit the lagoon restoration to 7.6 wetted acres, with 23.7 riparian/transitional upland acres restored and beach expansion to 4.56 acres in the area by the lagoon. Overall, the sandy beach area throughout the project will expand by at least 1 acre. Only the western part of the main creek channel of the lagoon would be expanded for wetland, riparian, and transitional habitat creation. Limited habitat

expansion would be restricted on the east side of the lagoon due to retaining a portion of the motel as well as a concession near the location of the existing Reel Inn. Potential impacts to sensitive Native American resources will need to be carefully monitored and potentially mitigated associated with the relocation of that facility and associated parking. Topanga Beach would expand slightly providing opportunity for use of living shoreline elements to be included. This Alternative maximizes the managed retreat, recreational beach area and living shoreline features such as dunes and provides the most SLR resiliency to the infrastructure and beach but does not provide as much opportunity for lagoon habitat to evolve as in Alternative 2.

The alignment of PCH would move north, expanding the maximum amount of beach area and managed retreat, and would also lengthen the Caltrans bridge from 79 to 460 feet. With this alternative, CDPR contributes 0.60 acres to Caltrans and Caltrans contributes 0.47 acres to DBH due to changes in Right of Way alignment

Stormwater and surface runoff will be captured in appropriate BMPs such as bioswales or rain gardens within parking areas. Parking areas will be permeable to the full extent feasible. Utilities would also require relocation underground which could potentially impact tribal cultural resources.

Additionally, approximately 500 feet of 4- to 12-foot-high retaining walls would be required along the northern shoulder of PCH to accommodate adjacent slopes. A 91-foot-long, 4 to 6-foot-tall CMU retaining wall would be needed on the south side of the bridge above the Waters of the United States to support the slopes on the east side. These retaining walls would be installed prior to excavation of the fill materials to avoid impacts to the wetted area.

Within the Topanga Beach area, the existing lifeguard and public restroom building would be demolished and replaced. The new building would have the same footprint and will be built of similar materials, and it would be relocated upslope of the current location, and north of the existing access road, to provide additional protection from SLR. The helipad and new parking garage would be relocated adjacent to it on the west. The Topanga Beach parking lot would be modified to reduce spaces in the existing paved lot on the west end, expand spaces on the east end and slightly shift the orientation of the lot shape to accommodate a new access road to the beach lifeguard headquarters building and garage, American with Disabilities Act (ADA) parking, and helipad. Additional design modification for these elements is anticipated if this alternative is selected in order to reduce potential impacts to tribal cultural resources. Additional spaces will be added in a new beach parking lot on the west edge of the Project area where there are no parking spaces currently. Parking areas would be permeable with surface runoff directed to bioswales to reduce pollution.

Programmatic Topanga State Park Visitor Services

Under Alternative 2, all 25 existing structures of the Topanga Ranch Motel and all other buildings on State Parks property would be fully removed. All new State Parks development would be located at the Gateway Corner (intersection of Topanga Canyon Boulevard and Pacific Coast Highway) within currently developed areas. The one exception is that a maximum 2,400-square-foot concession could remain at the current location of the Reel Inn restaurant just southeast of the historic motel. Under Project Alternatives 3 and 4, 15-20 structures associated with the historic Topanga Ranch Motel would be retained and restored. These structures would be used for

the development of future visitor services that could include a mix of overnight accommodations and Park facilities such as employee housing, a maintenance facility, park offices, and storage. This project component would remain within developed and landscaped areas and would not impact any sensitive biological resources. Development of visitor services at the Gateway Corner would be similar to that under Alternative 2.

1.5 Project Construction

Construction activities would be conducted in phases as summarized in **Table 2**. The initial phase would demolish existing structures and relocate utilities. To ensure that the Project would not constrain traffic during construction, a temporary bridge would be constructed on the coastal side of the existing bridge. Once this is completed, the existing bridge would be demolished, a new bridge erected, and the lagoon re-graded. For all Project Build Alternatives, the area would be graded to create the new lagoon. Mechanical removal using an excavator would start on the west side of the lagoon using haul routes under the new PCH bridge outer span, with at least a 20-foot buffer from the edge of the excavation area to retain native trees on the bank and to avoid potential impacts to the wetted areas. An excavator would remove soil and debris and groom the site contours.

TABLE 2
LAGOON RESTORATION CONSTRUCTION SEQUENCE

Sequence	Activity
1	Building Demo & Temporary Parking Provisions Municipal Bus stop and beach access stairs constructed. Gateway Corner Parking facilities constructed AOWTS construction could be initiated
2	Initiate relocation of some Utilities (includes work by Utility owners initiated at this time to facilitate bridge replacement and undergrounding)
3	Construct Temporary Road / Bridge (Stage 1) Install protection of wetted areas as required. Remove concrete embedded in east bank fill from 1920's bridge. Start construction of new parking on southwest DBH lot.
4	Demo NB half of Existing Bridge
5	Construct NB Road / Bridge (Stage 2)
6	Demo SB half of Existing Bridge
7	Construct SB Road / Bridge (Stage 3)
8	Demo Temporary Bridge Construct helipad and new DBH parking Grade for garage, roadway, lifeguard/restroom building. Create temporary access for trucks moving excavated fill for either beneficial reuse or to landfills
9	Lagoon Grading starts on west and moves east. Complete new parking on southwest DBH lot. Construct lifeguard/restroom building, then demo old building. OWTS construction
10	Restore Beach Area
Total Construction Duration: 60 months	
*NOTE: If sewer is selected, construction could begin during stage 9 and is anticipated to take an additional 12 months. During that time some lane closure between Coastline Drive and TCB is anticipated.	

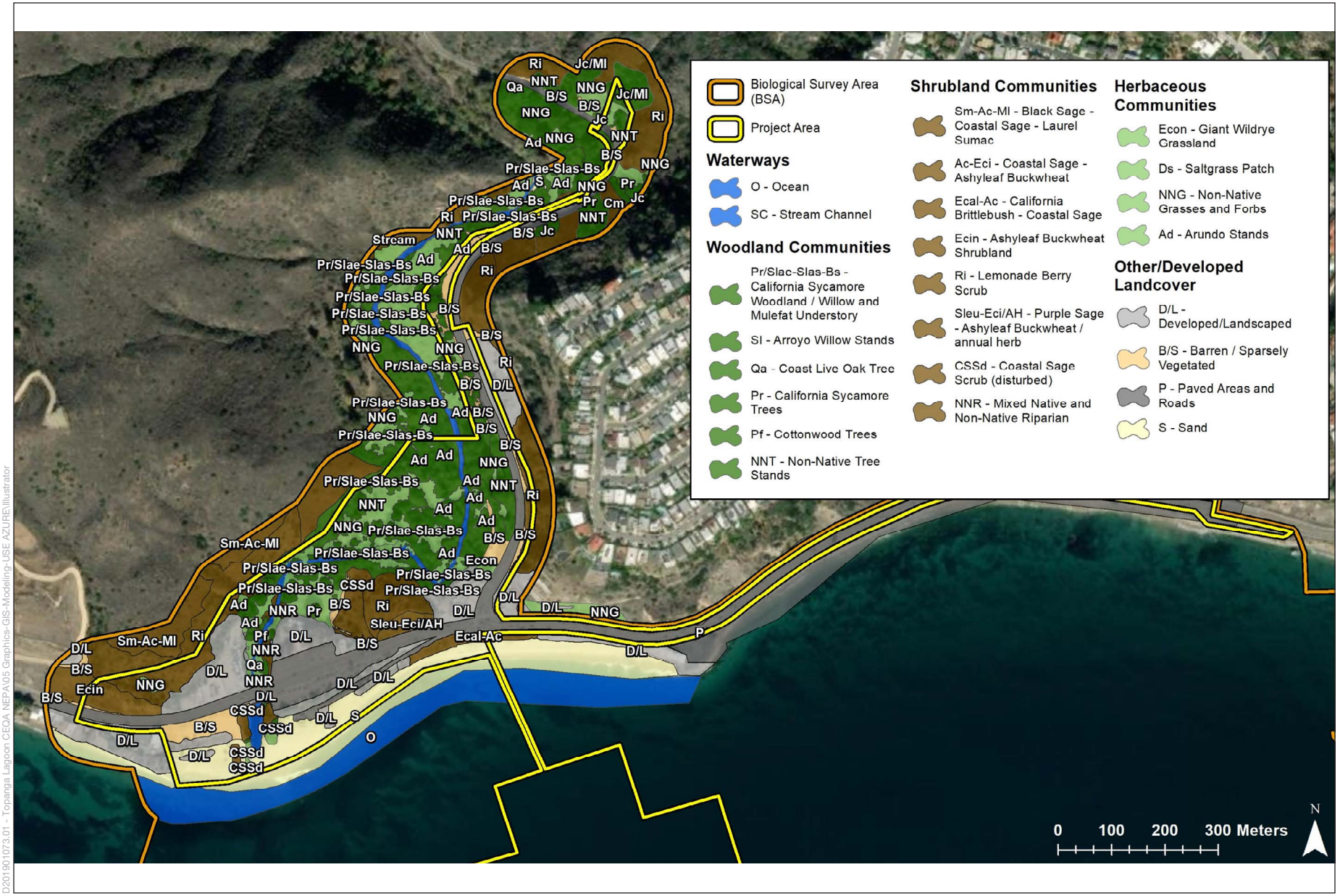
2.0 Topanga Creek and Lagoon Ecosystem Existing Conditions

Once over 30 acres, the Topanga Lagoon is currently less than 1 acre, and constrained by 30 feet of fill from construction of the PCH bridge on both the east and west sides. Construction of the 1933 bridge destroyed 93 percent of the original lagoon wetland habitat area. This loss of the lagoon wetland habitat area changed existing biogeochemical processes, and severely impacted its function. This reduction in acreage resulted in devastating loss of habitat, nearly eliminating biodiversity of wetland flora, compromised water quality, and constrained flows that limit natural hydrologic and sedimentation processes from occurring. Existing downstream creek, lagoon, and PCH Bridge conditions severely limit flood conveyance to the sea, impede fish passage, prevent natural geomorphic processes from occurring, and limit the lagoon to function as a flood control conveyance feature rather than the genuinely sensitive and rare habitat area that it once was. Expanding the lagoon and associated habitat areas will enable the system to revert to a more natural condition and closer to the historical condition.

Despite the existing use patterns and restrictions, Topanga Lagoon still hosts a robust population of the federally endangered tidewater goby and the only currently reproducing population of the federally endangered southern steelhead trout within the Santa Monica Mountains (CDPR and Resource Conservation District of the Santa Monica Mountains [RCDSMM] 2022). The lagoon habitat is significantly degraded due to the importation of fill material from adjacent hillslopes used to support the PCH bridge that impeded the natural hydrologic connection to the ocean. The current configuration is too constrained to support a healthy ecosystem. **Figure 1** depicts the existing habitat and vegetation types at the lagoon.

2.1 Hydrology

The Project area is located at the downstream terminus of the Topanga Creek Watershed, which is a part of the Santa Monica Bay Watershed and is the third largest drainage into the Santa Monica Bay (Los Angeles County DPW 2022; RCDSMM 2021). The hydrology of the project area is influenced by direct precipitation and surface runoff from adjacent slopes (WRA Inc.2020, ESA 2023). There is no point source imported water input. The main drainage feature, Topanga Creek, is fed by freshwater ground seeps as well as direct precipitation and flows to the Topanga Lagoon from the southern reach of the Project area. Topanga Creek, a perennial stream enters the Project area from the northeastern boundary and passes under the bridge, through Topanga Lagoon, and into the Pacific Ocean at Topanga Beach (WRA, Inc. 2020, ESA 2023). A sand berm forms on the beach creating Topanga Lagoon, which separates Topanga Creek from the beach and causes water to pond prior to discharging to the Pacific Ocean. Water for the Lagoon comes from the Creek making the lagoon a primarily freshwater system when the berm is closed which is the dominant condition. Winter storm flows from Topanga Creek flush out the sand bar deposited during summer, allowing some tidal influence during the rainy season and eventual closure during the summer and fall months. The Creek channel is constrained in the area immediately north of the PCH bridge due to fill materials and by the narrow opening of the bridge.



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SOURCE: Project Boundary (E PD, Moffat & Nichol, RCDSM M 9/20/2023), Biological Survey Area (CDPR, CRM 9/21/2023), Landcover Mapping; DPR September 2023; Service Layer Credits: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Topanga Lagoon Restoration Project

Figure 1
Vegetation Communities and Land Cover Map

ESA

2.2 Climate

The Santa Monica Bay Watershed is located in Southern California, which is known for its Mediterranean climate – hot, dry summers and cool winters with highly variable amounts of rain influenced by climatic events known as El Niño and La Niña (SWRCB 2014). Rainfall during the past 10 years averaged almost 18 inches but included severe drought years since 2012 (Los Angeles County Department of Public Works).

2.3 Stormwater

Stormwater is created when a precipitation event leads to collection of water in pools and rivulets on either pervious or impervious surfaces. When sufficient water collects, it flows over the land, creating stormwater runoff. In natural areas, stormwater runoff flows toward streams, rivers, lakes, or coastal waters and infiltrates through the soil into groundwater. In developed areas, stormwater is generally either retained on-site, infiltrated through pervious areas such as bioswales and gardens, or directed into stormwater drainage systems. Stormwater collection is more difficult in developed areas and runoff is exacerbated, as pavement and structures do not allow for stormwater infiltration into the soil. In undeveloped or pervious areas, runoff occurs when the soil approaches saturation and no longer absorbs the precipitation. Stormwater runoff often becomes polluted by sediment and toxic contaminants, particularly in developed areas, where it flows over streets and sidewalks. Urban runoff conveyed through municipal storm drain systems is one of the causes of poor water quality at discharge locations in urban areas.

Stormwater is conveyed and enters Topanga Creek in a variety of ways, including freshwater ground seeps as well as direct precipitation (WRA, Inc. 2020). Additionally, there are several culverts located along Topanga Canyon Boulevard that relieve drainage from the roadside and convey stormwater into Topanga Creek (Google Earth 2022). Another culvert located on the east bank of Topanga Lagoon conveys water from the DBH parking lot and PCH by the bridge.

As shown in Table 2 above, each of the Alternatives increases restoration areas and reduces developed areas.

2.4 Water Quality

More than a dozen different stormwater and wastewater pollutants, including metals, nutrients, indicator bacteria, organics, pesticides, trash, and other contaminants, are found in water bodies in the County in amounts significantly above established water quality standards. Sources of this pollution can be described in two categories: point sources and nonpoint sources. Topanga Creek is listed on the RWQCB 303(d) list for lead in the upper watershed and bacteria at Topanga Beach. No other pollutants of concern have been listed for the watershed (RCDSMM 2022). The Project area also includes water quality concerns related to bacterial exceedances, which have been chronic. Two sampling and monitoring studies in the Topanga Creek Watershed conducted in 2003-2004 and 2012-2014 found that total and fecal coliform bacterial exceedances were associated with storm events (Dagit et al.2015). The studies also found that dogs and birds were a significant source of fecal contamination to the Lagoon and ocean, and that both dog and gull sources are contributing to exceedances of *Enterococcus* and *E. coli* state water quality standards.

Ocean exceedances were therefore coming from sources at the beach or Lagoon and increased when there was a breach condition during storm events. The Los Angeles City Department of Sanitation Environmental Monitoring Division collects samples weekly as part of the requirements of their MS4 and those data are compiled and reported by Heal the Bay (Beach Report Card). Based on the Water Quality Report conducted in 2022, water samples analyzed for fecal indication bacteria are variable.

The Lagoon's water temperature is a focal concern that has been monitored for many years. The limited size of the open water area also exposes sensitive species, including the tidewater goby and southern steelhead trout, to significant temperature changes with few retreat areas to use during drought, heat waves, and other extreme weather events (RCDSMM 2014). It was found that water temperatures were higher in the summer/fall of 2020 (between 21 to 25 degrees Celsius), and substantially lower in 2021, although the Lagoon experienced lengthy time periods in both years that are on the upper end of thermal tolerance for both tidewater gobies and southern steelhead trout (Appendix A).

2.5 Geology

The Project area lies along the coastal front of the east-west trending Transverse Ranges. These mountains were rotated 110 degrees clockwise and uplifted as a consequence of the northern migration of the San Andreas Fault zone approximately 19 million years ago (summarized in Sylvester and O'Black Gans, 2016). Bedrock of the Western Transverse Ranges, locally, consists of tilted marine sediments of Cretaceous age with limited terrestrial sediments. As noted below in literature review, these Cretaceous shallow to deep marine sediments are given different names in southern California but, locally, are defined as the Trabuco and Tuna Canyon formations (Yerkes and Campbell, 1979; Shapiro et al., 2001). East of the project, the bedrock of the Santa Monica Mountains shifts to younger, Paleogene sediments that were deposited in a combination of marine and terrestrial settings (Dibblee and Ehrenspeck, 1992). The project itself lies at the mouth of Topanga Canyon, one of the major river systems draining the Transverse Ranges to the south. A combination of sea level changes and tectonic uplift has resulted in the valley being infilled with a variety of alluvial facies since the Pleistocene.

Regional mapping by Dibblee and Ehrenspeck (1992) provided limited information on the valley fill, noting that the majority is young Quaternary alluvium (Qa) with some regions of gravel (Qg) and landslides (Ql) along the steep valley walls. An older map by Yerkes and others (1964) at a higher resolution of 1:12,000 distinguishes regions of older alluvium (Qalp) as well as terraces (Qt), Coastal terrace deposits (Qtm), Tuna Canyon Formation (Cretaceous) (Kt) –and abundant artificial fill (af). Areas of imported local fill are primarily along the western edge of Topanga Canyon Boulevard, along PCH, and on either side of lower Topanga Creek.

2.6 Soils

Four native soil types occur within the Project area. In general, the floodplain of Topanga Creek is comprised of Elder fine sandy loam, coastal, having 0 to 2 percent slopes. The steep hillsides to the northwest of the floodplain are comprised of Chumash-Boades-Malibu association, with 30 to 75 percent slopes, and the remainder of the Project area to the south of the floodplain, including

the developed areas and beach, is primarily comprised of Abaft-Beaches complex with 0 to 5 percent slopes. A small area of Mipolomol-Topanga association, 30 to 75 percent slopes, is located along Topanga Canyon Boulevard.

2.7 Groundwater

When precipitation and surface water infiltrate naturally into the ground, they typically travel first through an unsaturated soil zone until they reach the water table, which is the layer where the soil is saturated. This layer of soil saturation is called a groundwater basin or aquifer. Aquifers can hold millions of acre-feet of water and extend for miles. Los Angeles County is underlain by numerous groundwater basins. Except during times of drought, groundwater extraction accounts for nearly one-third of the water usage in the unincorporated areas. In rural areas, many households depend solely on private wells that tap into local groundwater sources.

Topanga Lagoon, creek and watershed do not receive imported water and groundwater extraction is extremely limited in the upper watershed only (RCDSMM 2022). During field investigations in the Project area, groundwater surface was encountered in beach deposits ranging from depths of 3.5 feet mean sea level (MSL) to 33 feet MSL. However, the Project area is not located within a DWR-designated groundwater basin and is not within an adjudicated groundwater basin (DWR 2022).

2.8 Flood Hazards

2.8.1 Flood Zone

The Topanga County Beach portion of the Project area as well as a portion of the Topanga Lagoon are located within the Federal Emergency Management Agency (FEMA) flood hazard Zone VE (FEMA 2022). Additionally, the remaining portion of the Lagoon, Topanga Creek, and portions of the Project area surrounding the Creek are located within the FEMA flood hazard Zone AE. Zone VE is defined as coastal areas with a 1 percent or greater chance of flooding and an additional hazard associated with storm waves. Zone AE is defined as floodplain areas that have a 1-percent-annual-chance (or “100-year”) flood risk. Both VE and AE zones have flood elevations established by FEMA.

2.8.2 Coastal Flooding and Sea-Level Rise

During the winter months (November to February), offshore storms occurring over the Pacific Ocean, combined with high tides and strong winds, have the potential to cause coastal flooding as a result of wave run-up. The Base Flood Elevations mapped on FEMA’s Flood Insurance Rate Maps are based on the 100-year elevations (e.g., extreme high tide), as well as surge components (atmospheric pressure, wind setup, El Niño sea-level effects) and wave components (wave setup and swell from the Pacific Ocean). As discussed above, the Topanga Beach portion of the Project area as well as a portion of the Topanga Lagoon have been identified by FEMA as being located in flood hazard Zone VE, which has a 1 percent or greater chance of flooding and an additional hazard associated with storm waves.

Rising sea levels will increase the potential for coastal flooding, and the issue of SLR is important in land use planning and hazard analysis in coastal areas. California Executive Order S-13-08, signed by the governor on November 14, 2008, specifies that all state agencies planning construction projects in areas that are vulnerable to future sea-level rise must consider a range of scenarios for 2070 and 2100 to assess project vulnerability, and, to the extent feasible, must reduce expected risks and increase resiliency with respect to SLR.

The lifeguard building, beach, restrooms, and parking areas south of the PCH are managed by DBH and are currently experiencing significant impacts from coastal erosion and storm surges, which is projected to increase with SLR (Noble 2016).

2.9 Aquatic Resources

In August 2020, April 2022 and June 2023, a delineation was conducted within the Project area to identify wetlands and non-wetland waters potentially subject to jurisdiction by the USACE under Section 404 of the Clean Water Act (CWA) and/or Section 10 of the Rivers and Harbors Act (RHA) (WRA Inc. 2020, CDPR 2023, ESA 2023). **Table 3** and **Table 4** below summarize the aquatic resources mapped within the Project area.

TABLE 3
SUMMARY OF POTENTIAL CWA SECTION 404/401 JURISDICTIONAL AREAS WITHIN THE PROJECT AREA

		USACE/RWQCB	
Features	**Cowardin Class**	**Wetland (Acres)**	**Non-Wetland Water Acres (Linear Feet)**
Lagoon	Estuarine, subtidal, unconsolidated bottom (sub-tidal pond)	0.59	-
Open Waters	Marine, intertidal, unconsolidated bottom	-	2.79
Streams	Riverine, intermittent, unconsolidated bottom	-	2.25 (3,650)
Total		**0.59**	**5.04**

NOTE: The Cowardin Class is a commonly used classification system for wetlands (Cowardin et al, 1979) The Cowardin system is used by the U.S. Fish and Wildlife Service for the National Wetlands Inventory. In this system, wetlands are classified by landscape position, vegetation cover and hydrologic regime. The Cowardin system includes five major wetland types: marine, tidal, lacustrine, palustrine, and riverine.

SOURCE: WRA, Inc. 2020; Cowardin 1979

TABLE 4
SUMMARY OF POTENTIAL CDFW AND LOS ANGELES COUNTY SMM LCP JURISDICTIONAL AREAS WITHIN THE PROJECT AREA

Features	**Cowardin Class**	**CDFW Streambed (Acres)**	**CCC Wetland (Acres)**
Lagoon	Estuarine, subtidal, unconsolidated bottom (sub-tidal pond)	0.75	0.75
Riparian Vegetation	Riverine, intermittent, Forested wetland	18.51	18.51
Streams	Riverine, intermittent, unconsolidated bottom	5.84	5.84
Total		**25.10**	**25.10**

2.10 Vegetation Communities

Vegetation communities were mapped in 2020-2023 by CDPR and RCDSMM staff. The most common vegetation communities identified at the Topanga Lagoon project site include riparian woodlands near the creek, and upland sage scrub habitats in drier areas on adjacent slopes. Open water habitat is also present in the Lagoon. The project site also has stands of giant reed (*Arundo donax*) adjacent to the creek, non-native annual grasslands and developed areas including buildings and roads. Native trees are present and will be avoided to the extent possible when the site is graded, and the previously placed fill is removed. Although southern foredune community is not currently present at the site, depending on the Alternative selected, there may be an opportunity to restore an area of southern foredune community adjacent to the beach.

The existing lagoon contains a narrow band of emergent marsh and a pocket area of salt grass. Upstream of the lagoon, the site is riparian and upland dominant. The mapped locations of each habitat were compared to the project topography to estimate the elevation ranges for each habitat type. Under existing conditions downstream of the PCH Bridge, the upper end of the jurisdictional wetlands occurs around 9.6 feet North American Vertical Datum (NAVD), transitioning to upland habitat above this elevation. The salt grass (*Distichlis spicata*) on site occurs on the south side of the lagoon mouth, close to where the inlet begins, in the range of 6.2 to 8.7 feet NAVD according to the available topography.

The habitat ranges of each habitat type were used to create maps of existing vegetation acreages under three SLR scenarios: no SLR, 1.6 feet of SLR, and 6.8 feet of SLR (Table 1). Developed areas and existing beach area were determined based on a jurisdictional delineation of Topanga Lagoon completed by WRA, Inc and updated by ESA 2023. Shoreline position and sand beach acreages for each of the two scenarios containing SLR were mapped based on the U.S. Geological Survey's Coastal Storm Modeling System (CoSMoS) "hold the line" shoreline position for 1.6 feet and 6.6 feet of SLR, respectively. Habitat acreages mapped for all alternatives under each SLR scenario are provided in Table 1, above.

The habitat elevations represent an average of habitat elevations for low salinity with limited moderate salinity lagoon wetland habitats. These are based on ESA's modeling of the Topanga Lagoon Restoration mouth opening and closure and lagoon water level exceedance curves (i.e., inundation frequency distributions) and habitat zone inundation frequency criteria for low salinity (0 to 7 ppt) and infrequent moderate salinity (7 to 15 ppt) habitats. Actual elevations will vary based on a number of factors, with ecotone transitions between habitat zones. The emergent marsh zone includes the potential for salt marsh (e.g., near the mouth), tule marsh, and cattail marsh. The establishment and distribution of these marsh habitats is expected to depend on soil salinity and to vary over time in response to wet and dry years and other factors (ESA 2023a).

2.10.1 Riparian Woodland

The riparian woodland at Topanga creek is dominated by red willow (*Salix laevigata*) and arroyo willow (*S. lasiolepis*). Other native tree and large shrub species include sycamore (*Platanus racemosa*), coast live oak (*Quercus agrifolia*) California walnut (*Juglans californica*), toyon (*Heteromeles arbutifolia*) and blue elderberry (*Sambucus mexicana*), Non-native species also

occupy this habitat type and include giant reed. This habitat is considered to be a sensitive natural community type by the State of California (rank S3). Riparian woodlands can support sensitive bird species, such as least Bell's vireo (*Vireo bellii pusillus*), although no record of this species has been documented onsite.

2.10.2 Coastal Sage Scrub

The coastal sage scrub found at Topanga Creek and Lagoon is dominated by California sagebrush (*Artemisia californica*) and other species such as black sage (*Salvia mellifera*), ashyleaf buckwheat (*Eriogonum cinereum*), California brittlebush (*Encelia californica*), orange bush monkey flower (*Diplacus aurantiacus*), purple sage (*Salvia leucophylla*) and lemonade berry (*Rhus integrifoliaz*) This habitat is considered to be a sensitive natural community type by the State of California (rank S3). Coastal sage scrub can support sensitive bird species such as coastal California gnatcatcher (*Polioptila californica californica*) although no record of coastal California gnatcatchers exist for Topanga Lagoon.

2.10.3 Open Water/Lagoon

The open waters of the lagoon support tidewater goby and also allows for steelhead trout passage upstream when the lagoon mouth is open to the ocean. Bulrush (*Schoenoplectus californicus)* and cattails (*Typha* sp.) are found in the lagoon on the south side of the lagoon mouth near the bridge. These emergent marsh species are found in the elevation range of 5.2 to 6.2 feet NAVD according to the available topography (ESA 2023a).

2.11 Sensitive Animal Species

Two special-status wildlife species, tidewater goby and steelhead trout occupy Topanga Creek and Lagoon. Tidewater goby are listed as endangered by the U.S. Fish and Wildlife Service (USFWS) and steelhead trout by National Marine Fisheries Service (NMFS) and CDFW (pending 2023). CA Grunion runs at Topanga Beach are some of the most consistent in Santa Monica Bay. Martin 2020, 2021; CDPR 2023). The proposed restoration project is designed to enhance habitat for these species.

3.0 Project Team Roles and Responsibilities

3.1 Project Proponents

The project landowners (CDPR, DBH, Caltrans) and RCDSMM will be responsible for the Proposed Project and for retaining qualified biologists (including a Restoration Ecologist), engineers, and contractors and for funding implementation, maintenance, and monitoring of the project through its successful completion.

Contact information for the Project is:

Jamie King, Senior Conservation Biologist
Resource Conservation District of the Santa Monica Mountains
540 S. Topanga Canyon Blvd.
Topanga, CA 90290
jking@rcdsmm.org

3.2 Discretionary Approvals Required for the Project

Table 5 presents a preliminary list of the agencies and entities that have authority to issue specific permits and other discretionary approvals that may apply to the Proposed Project.

TABLE 5
PERMITS, APPROVALS, AND REGULATORY REQUIREMENTS*

Regulatory Agency	Permit	Reason for Permit or Approval
U.S. Army Corps of Engineers	CWA Section 404	• Impacts to Waters of the United States from project components within the lagoon
U.S. Army Corps of Engineers	Section 103 of the Marine Protection, Research and Sanctuaries Act	• Construction in marine environment including deposition of sediment in ocean
U.S. Fish and Wildlife Service	Endangered Species Act Section 7 Consultation	• Impacts to listed species and critical habitats
National Marine Fisheries Service	Endangered Species Act Section 7 Consultation	• Impacts to listed species and critical habitats
California Department of Fish and Wildlife	California Water Code 1602 – Streambed or Lake Alteration Agreement	• Impacts to jurisdictional features such as bed and bank of streams, rivers, lakes and features subject to Fish and Game Code Section 1602 from project components
	California Endangered Species Act 2081 or 2080.1 consistency determination	• Impacts to listed and fully protected species, as well as species of special concern
California Coastal Commission	Coastal Development Permit (CDP)	• Development within coastal zone
California Department of Transportation	Encroachment Permit	• Bridge Replacement
California State Lands Commission	Lease	• Lease for use of state lands
Los Angeles Regional Water Quality Control Board	CWA 401 Water Quality Certification	• Consistency determination with US Army Corps of Engineers (USACE) 404 Permit for impacts to waters of the US that are also waters of the State
	NPDES/Waste Discharge Requirement	• Deposition of sediment in waters of the US
	State-wide Stormwater NPDES for construction	• For runoff from construction activities
Los Angeles County	Encroachment Permits	• Access to public rights-of-way

3.3 Responsibilities and Qualifications of Project Engineer, Restoration Ecologist, and Contractors

Project Restoration Coordinator/Manager: The project restoration coordinator will be responsible for coordinating all restoration associated consultants and contractors to ensure permit compliance and ensure proper reporting.

Project Engineer: The project engineer will develop the construction design drawings and provide supervision of the grading of the project during implementation and ensure compliance with all

permits. The project engineer will be hired by the project landowners and/or RCDSMM and will be a licensed civil engineer, specializing in coastal wetland restoration. The engineer will coordinate with the Restoration Ecologist and implementation contractor during construction of the project.

Restoration Ecologist: Supervision of the plant installation, maintenance, and monitoring of this restoration project will be the responsibility of a Restoration Ecologist experienced with wetland/riparian restoration, hired by the project landowners and/or RCDSMM. Plant installation and the maintenance monitoring period are described further in Sections 4.0-6.0. The Restoration Ecologist will oversee the efforts of the installation and maintenance contractor(s) during the 1-Year plant establishment period (PEP) and subsequent five-year maintenance and monitoring period and coordinate with the contractor(s) to avoid impacts (outside the project footprint) to sensitive habitat, in addition to avoiding impacts to sensitive wildlife species. The Restoration Ecologist will be an individual or team of individuals with a degree in botany, ecology, or related field, a minimum of five years of experience with restoration of native wetland habitats in southern California and be able to demonstrate successful experience on at least three similar restoration projects. The Restoration Ecologist will have overall responsibility for data collection, report preparation and coordination with the project landowners and/or RCDSMM to ensure that all metrics and requirements are met as applicable for the project's regulatory permits.

Installation and Maintenance Contractor: The implementation contractor will be responsible for site preparation, implementation of required erosion, discharge and stormwater pollution prevention protocols, pre-planting non-native plant species (weed) control, installation of a temporary irrigation system (i.e., automated or alternative), and installation of native plants (container stock and cuttings) and seed mixes in accordance with restoration construction plan specifications. The Maintenance Contractor will be responsible for maintenance of the restoration areas for five years and/or until performance goals are attained with concurrence from the project landowners and/or RCDSMM, and permitting agencies. Maintenance Contractor responsibilities will include non-native, invasive species (weed) control, erosion control, care of native plantings, maintenance and operation of the temporary irrigation system, re-planting and/or re-seeding as needed, trash removal, and site protection. All activities conducted will be seasonally appropriate and approved by the Restoration Ecologist. The Maintenance Contractor will meet the Restoration Ecologist at the site when requested and will perform all checklist items in a timely manner as directed. The installation and maintenance contractor(s) will hold a contractor's license (C-27), Qualified Applicator Licenses (QALs) to apply herbicides, and must have a minimum of five years of experience installing and maintaining native wetland/riparian habitats in southern California and be able to demonstrate successful completion of three similar projects. The installation and Maintenance Contractor may be the same firm or separate firms. Using the same contractor for installation and maintenance or changing maintenance contractors is at the discretion of the project landowners and/or RCDSMM.

3.4 Nursery (Seed/Plant Procurement)

Native plant material will be provided from qualified nurseries and seed suppliers who possess a valid California Nursery License and can provide propagules of appropriate genetic stock from locally sourced plant material. The implementation contractor will obtain container plants from a

nursery that adheres to best management practices (BMPs) to prevent the establishment and spread of *Phytophthora* root rot. Seed shall have been tested for purity and germination not more than one year prior to application of seed. Multiple suppliers may be needed to obtain appropriate seed and plant material sourced within the project vicinity. As part of pre-construction activities, the implementation contractor shall submit a list of the suppliers and seed/plant materials to the project landowners and/or RCDSMM and Restoration Ecologist for review. The seed procurement effort should begin at least two years prior to the start of restoration construction activities.

3.5 Pre-Construction Meeting

Implementation of this habitat restoration plan will begin with Project approval. Prior to the initiation of restoration activities, an on-site meeting will be held with the project landowners and/or RCDSMM, restoration project manager, implementation contractor, Restoration Ecologist, and project engineer. Topics that will be addressed at this meeting include but are not limited to: (1) mobilization and protection of infrastructure; (2) contractor environmental training; (3) demarcation of sensitive areas and avoidance measures; (4) delineation of access routes and staging areas; (5) schedule of activities and milestones; (6) overall project goals and benefits, and (7) review of permit compliance for all project stages.

A summary of all major tasks related to the project, starting with the pre-construction phase, and ending with a five-year maintenance and monitoring establishment period, is provided in **Table 6**.

4.0 Implementation Plan

4.1 Installation Schedule and Protection of Species

The implementation schedule is included in Table 6. If implementation of the restoration plan would begin during the bird nesting season (February 1–August 1), a qualified avian biologist would be needed to conduct pre-construction surveys within one week prior to the start of work. The survey would document breeding activity of nesting and migratory birds and raptors within or immediately adjacent to the proposed work areas. If an active bird nest is found, the nest will be flagged and mapped on the project plans along with an appropriate buffer, which will be determined by the biologist based on the biology of the species. The buffer will be delineated by temporary fencing and will remain in effect as long as construction occurs or until the nest is vacated and the juveniles have fledged. The nest area will be demarcated in the field with flagging and stakes or construction fencing. The project site has the potential to support additional sensitive species, including tidewater goby and steelhead trout, San Diego woodrat, sensitive herpetofauna, birds and bats. Mitigation measures for San Diego woodrat will include pre-construction surveys for woodrat middens, midden avoidance and midden and animal relocation.

To avoid potential significant impacts to special-status reptile species, minimization measures will include pre-construction surveys and development of a relocation plan for translocation of any individual animals to suitable habitats outside of the construction area.

TABLE 6
TOPANGA LAGOON RESTORATION PLAN CHECKLIST

		Applicable Parties					
Construction Phase	**Restoration Task**	**Project Proponent[1]**	**Engineer**	**Implementation Contractor**	**Maintenance Contractor**	**Restoration Ecologist/ Project Manager**	**Resource Agencies[2]**
Pre-Construction	Order container plantings and seed (2–3-year lead time)[3]	X*		X		X*	
	Attend pre-construction meeting	X	X	X		X	
	Pre-construction biological surveys	X				X	
	10-day notification to resource agencies	X				X	
	Install perimeter fencing (as needed)			X		X*	
	Document pre-installation site conditions	X*				X	
Site Preparation	Install erosion control (as needed)			X		X*	
	Non-native plant removal	X*		X		X*	
Grading	Grade site	X*	X*	X		X*	
Installation	Install container plantings, cuttings, and seed (anticipated to be approximately 4 months)			X		X*	
	Submit as-built mark-ups and site implementation monitoring data		X*	X		X*	
	Document as-built conditions, including plant installation and 120-day establishment period, and prepare/submit as-built letter report	X*		X		X	
1-Year Plant Establishment Period (PEP)	Maintain site for 1-Year, or until sign off by the project landowners and/or RCDSMM and Restoration Ecologist	X*		X		X*	X*
	Replace dead container plantings			X		X*	
Five-Year Maintenance & Monitoring Period	After 1-Year Plant Establishment Period is completed maintain site for a minimum of five additional years until signed off by the project landowners and/or RCDSMM, Engineer, and resource agencies. The maintenance period may be longer than five years if success criteria are not met due to drought conditions	X*	X*		X	X*	X*

1 This includes the project landowners (California Department of Parks and Recreation (CDPR), County of Los Angeles Department of Beaches and Harbors (DBH), and Caltrans) and/or Resource Conservation District of the Santa Monica Mountains (RCDSMM)

2 USACE, CDFW, RWQCB, CCC, DBH, Caltrans and CDPR

3 Must provide all source locations and receive authorization from the project landowners and/or RCDSMM of final seed and plant lists prior to ordering.

* Inspection of work related to this task.

Sensitive bird species including Cooper's hawk, yellow warbler and other nesting birds, avoidance and minimization measures will include pre-construction surveys for nesting birds and avoidance and minimization measures in the event that nesting activity could be disturbed by project activities.

Sensitive bat species avoidance and minimization measures include, but are not limited to, scheduling potential disturbance to bat roosts during times when there is less potential for impact. Other measures, including pre-construction surveys and having a qualified biologist present during tree cutting activities.

Therefore, additional surveys or habitat assessments may be required to quantify potential impacts to these species to comply with permitting requirements prior to the start of work. If tidewater goby is detected during the survey, additional measures shall be implemented as determined through the subsequent Endangered Species Act consultation conducted by the USACE with the USFWS as part of obtaining the CWA Section 404 authorization for the project.

The Draft EIR (ESA 2023b) outlines several mitigation measures to ensure sensitive fish species are protected during construction (Mitigation Measures 3.3-1 through 3.3-4. These measures include Fish Protection Measures During Work in Wetted Areas (BIO 3.3-4), Fish Relocation Measures (MM 3.3-5, Fish Hydroacoustic Buffering Measures (MM 3.3-6) and General BMPs for Biological Resources (MM 3.3-7).

To avoid any potential sediment movement or siltation during planting of container plants (of one-gallon size or smaller), temporarily excavated soil (from a planting hole) would be separately contained (e.g., via a fiber roll or other) and in the same workday would be backfilled and repacked around the base of the plants to stabilize soil in place and to provide a water basin around the plants. A CDPR Archaeologist or Native American Cultural Monitor may need to oversee any soil disturbance in sensitive areas. Planting, installation of cuttings, and seeding would be targeted between November and February, and ideally after the first wetting rains. The maintenance and monitoring program will begin following sign-off of the one -year establishment period and extend for a five-year period following completion of the installation. As a guideline, maintenance will be conducted monthly during the first year, eight times per year during the second and third year, and four times thereafter (see Section 5). Regular monitoring visits will be conducted to coincide with maintenance visits (refer to Section 5.1). Annual monitoring will occur in May or June to coincide with the peak growing season of wetland plant species, with an annual report distributed by the end of each monitoring year.

In discussion with the RCDSMM and CDPR, we are proposing a one-year establishment period due to the complexity of this project. This is longer than the typical 120-day establishment period and will provide greater assurance that all the plant diversity and cover goals are met. After the one-year establishment period is completed, five additional maintenance and monitoring years will be implemented for a total of six years.

4.2 Site Preparation

4.2.1 Site Access and Staging

Potential construction access and staging locations will be identified prior to implementation in the construction plans. At the completion of the project, the access and staging areas will need to be restored to existing conditions, or those identified by the project landowners and/or RCDSMM as part of the project design.

4.2.2 Delineating Limits of Work and Temporary Signage

Prior to restoration activities, work areas will be staked, roped off, temporarily fenced, or otherwise demarcated to conspicuously mark the limits. This is to avoid impacts to native habitats and preserve protected tree zones outside the construction footprint, as well as to ensure that construction personnel and equipment remain within approved work, access, and staging areas and do not inadvertently affect native habitats or sensitive plant species by undertaking activities outside the authorized areas. Project boundary points will be marked in the field by the Restoration Ecologist based on the construction plans, and delineation materials (e.g., fenced and roped) will be installed by the implementation contractor.

Temporary signs will provide an explanation of the project and a contact number for public inquiries. Signs will be installed at all entrances to the project site. Sign language and location will be approved by the project landowners and/or RCDSMM.

4.2.3 Erosion Control

Prior to planting and seeding, the implementation contractor will install BMPs for erosion control as specified in the construction plans and also as determined necessary by the contractor, Restoration Ecologist, and project landowners and/or RCDSMM. Best Management Practices (BMPs) will be installed per the approved Stormwater Pollution Prevention Plan (SWPPP) and Erosion Control Plan to comply with the Construction General Permit and Grading Permit, respectively. Erosion control materials could include, but are not limited to, biodegradable fiber rolls (wattles), natural fiber matting, and/or organic mulch. Only natural threads and nettings are permissible (no products with plastic mesh) and must be certified weed free. It is assumed erosion control materials implemented during the installation phase will be repaired/replaced during the maintenance phase, then removed or left to decompose after sufficient vegetation has been established to control erosion.

4.2.4 Non-Native Removal

Non-native (weed) plant species can be divided between aggressive, invasive exotics (that can outcompete desirable native species if they are not controlled) and more benign species (that tend to diminish as native species become established). For the purposes of this plan, guidance for determining problematic invasive (exotics) is provided by species listed as “moderate” or “high” threats to California wildlands by the California Invasive Plant Council (Cal-IPC) (2020) and site observations. For the restoration project, non-native plant treatment and control will occur during implementation in the graded areas (i.e., after grading and before planting/seeding as needed) where planting/seeding will occur and in existing habitat as part of restoration activities. Graded

areas will be initially clear of vegetation but volunteer plants including non-native species could germinate or re-sprout prior to native planting and seeding.

A combination of hand-removal, mechanical removal (e.g., chainsaw, etc.), solarization, and appropriate herbicide (i.e., wetland-approved herbicides) treatments will be used based on the species, and its location and size. Solarization can be effectively implemented during the hottest time of the year, typically July-August. Solarizing smaller areas can be effective and more easily managed than large areas. Solarization is not always 100 percent effective and may require follow up weed treatment.

Herbicide is a tool in the IPC toolkit where all other practical manual measures (e.g., mulching, solarization, manual removal) are considered and implemented as appropriate. When herbicide is required and determined to be the only viable option, its use will comply with CA Department of Parks and Recreation (State Parks) Section 32000 Native Plant Landscaping Regulations, Angeles District guidance, the requirements of the CA Department of Pesticide Regulation, (CDPR) and Los Angeles County Agricultural Commissioner's Office (LACAC). This includes using approved, low toxicity herbicides per the requirements of the label, and as approved by the State Park's Pest Control Advisor (PCA) and QAC. All applicators will be trained and approved by State Parks. State Parks staff will be responsible for the submission of monthly reports summarizing all herbicide applications to the LACAC, and DPR, DBH and RCDSMM will be copied on these communications. The PCA will also ensure that the use of any herbicides or other vegetation removal methods is consistent with the permit conditions for the project. The implementation contractor's PCA will help determine appropriate treatment methods in compliance with CDPR and LA County requirements. It is the intent of this Plan that herbicides be used judiciously and only as needed (i.e., treatment of perennial species that re-sprout). Any herbicide use will be approved by the State and County as described in Section 5.2 below. Larger woody invasive tree species in existing habitat (i.e., restoration areas) will be cut to ground level with all above-ground portions removed from the site. All non-native plant biomass will be disposed of at an approved local green-waste facility, unless the Restoration Ecologist approves use of some non-native debris (without live vegetative material, flowers, or seed heads) as on-site mulch.

The primary invasive species detected on-site, or which have potential to occur, include but are not limited to:

Cal-IPC Rating High

- *Arundo donax* (giant reed)
- *Bromus madritensis* ssp. *rubens* (red brome)
- *Carprobrotis edulis* (iceplant)
- *Cortaderia jubata* (jubata grass)
- *Delairea odorata* (Cape ivy)
- *Foeniculum vulgare* (sweet fennel)
- *Hedera helix* (English ivy)
- *Tamarix ramosissima* (tamarisk)

Cal-IPC Rating Moderate

- *Acacia dealbata* (silver wattle)
- *Ailanthus altissima* (tree-of-heaven)
- *Asphodelis fistulosus* (onion weed)
- *Avena* spp. (wild oat)
- *Brassica nigra* (black mustard)
- *Bromus diandrus* (ripgut brome)
- *Carduus pycnocephalus* (Italian thistle)
- *Centauria melitensis* (tocalote)
- *Circium vulgare* (bull thistle)
- *Conium maculatum* (poison hemlock)
- *Cynodon dactylon* (Bermuda grass)
- *Hirschefeldia incana* (short pod mustard)
- *Mesembryanthemum crstalinum* (crystalline iceplant)
- *Myoporum laetum* (ngaio tree)
- *Nicotiana glauca* (tree tobacco
- *Pennisetum setaceum* (fountain grass)
- *Schinus terebinthifolius* (Brazilian pepper)
- *Vinca major* (periwinkle)
- *Washingtonia robusta* (Mexican fan palm)

Cal-IPC Rating Limited

- *Acacia melanoxylon* (blackwood acacia)
- *Asparagus* sp. (asparagus fern)
- *Bromus hordaceus* (soft chess)
- *Cakile maritima* (european sea rocket)
- *Echium candicans* (pride of Madeira)
- *Erodium cicutarium* (redstem filaree)
- *Eucalyptus cmaldulensis* (red gum)
- *Eucalyptus globulus* (blue gum)
- *Euphorbia terracina* (carnation spurge)
- *Hypochaeris glabra* (smooth cat's ear)
- *Ipomea* sp. (morning glory)
- *Lantana camara* (lantana)

- *Marrubium vulgare* (horehound)
- *Olea europea* (olive)
- *Phoenix canariensis* (Canary Island date palm)
- *Pittosporum* sp. (pittosporum)
- *Raphanus sativus* (wild radish)
- *Ricinus communis* (castor bean)
- *Rumex crispus* (curly dock)
- *Salsola tragus* (Russian thistle)
- *Schinus molle* (Peruvian pepper)
- *Silybum, marianum* (milk thistle)
- *Stipa miliacea* var. *miliacea* (Smilo grass)

In addition to problematic invasive species in the high and moderate Cal-IPC ranking, there are additional non-native (weeds) second-priority, limited Cal-IPC species rank that need to be controlled when they proliferate beyond acceptable levels and are inhibiting the establishment of native plants.

Prior to planting and seeding, invasive species and second-priority species will be effectively controlled (i.e., <1.0% cover). In addition, invasive species and second-priority species will be effectively controlled (i.e., <1.0% cover) in restoration areas (existing habitat) prior to the completion of the installation phase. To reach invasive species cover goals, multiple treatments are typically required. Temporary irrigation should be installed in water treatment areas sufficiently to cause invasives to germinate. Implementing a minimum of three treatments, approximately one month apart, will be needed to successfully control invasive species. Non-native plant control during the post-installation maintenance period is discussed in Section 5.

4.3 Project Grading

Prior to planting, grading and excavation of the existing fill west (and east depending on the Alternative chosen) of Topanga creek is proposed to reach design grades compatible with riparian, transitional and upland habitat. The current grading plans for the Alternatives were developed to provide the appropriate elevations for restoring target habitats. The grading design for the preferred alternative will be detailed during the subsequent design phase of the project. The detailed grading will consider measures to benefit vector control, including grading slopes that drain when the lagoon is open and avoiding flat vegetated areas that pond shallow water as well as channels that enhance drainage when the lagoon is open and allow for access for vector control maintenance activities as needed.

4.4 Planting Plan and Specifications

Subject to the approval of the USACE, RWQCB, CDFW, and CCC, the overall planting approach is to provide a diversity of native species adapted to site conditions (i.e., species documented on-

site or in the project vicinity) in conjunction with natural recruitment to vegetate habitats that will be created or temporarily impacted as part of the project restoration. The primary goals are to establish high functioning, self-sustaining vegetation communities that provide wildlife habitat, improve water quality, and provide aesthetic and educational public values. Vector control will also be considered. All seed and other plant propagules will be collected within the Santa Monica Mountains area or as close to the Topanga Project site as possible.

The graded areas (~ 15 acres) will be the focus of container planting and seeding efforts, but enhancement of the entire project area outside of the grading footprint (~30 acres) will also be included in the implementation as funding permits. Enhancement activities will include weed control at a minimum, but areas currently dominated by non-natives may also require planting and seeding as well. Actual acreages of restoration and enhancement areas will be further refined once a preferred alternative is selected and further design past a conceptual level occurs.

As a contingency, funds should be set aside to purchase additional container plants and native seeds after weed control efforts open additional available habitat. The acreage outside of the grading footprint that may require planting and seeding is currently unknown and will be based on available funding. After weeds have been removed and the weeded areas are observed for native growth, the Restoration Ecologist, in consultation with the client and agencies, will determine which areas will benefit from additional planting and seeding.

The planting strategy in the graded area is primarily based on hydrology and elevations, soil and water salinity, and the degree of anticipated natural plant recruitment. Species such as southern cattail (*Typha* sp.) and California bulrush (*Schoenoplectus californicus*), will be collected in clumps from existing populations at the site or at local similar habitats within the Santa Monica Bay and then planted in appropriate emergent wetland habitat settings. These species are clonal in growth pattern and are expected to spread from the initial planting locations into surrounding areas with the appropriate hydrology to help establish the intended emergent wetland habitat. The proposed planting approach for the emergent marsh habitat includes installing scattered groupings (i.e., nodes), rather than in a grid, to allow the different native species more space to establish and respond to hydrologic and soil conditions. Based on monitoring studies (Dagit et al. 2018) the salinity of the water in the Lagoon is low and brackish conditions were rarely noted.

A riparian woodland plant palette and seed mix have been prepared for areas near the creek. Riparian woodland and other habitat types will be planted at an appropriate elevation above the Lagoon and Creek. The planting elevations will be based on the proposed habitat elevations in **Table 7** adapted from the Topanga Lagoon Restoration Ecohydrology Report: Fish Passage, Fish Habitat Suitability, and Habitat Zone Elevations (ESA 2023a).

TABLE 7
CURRENT AND FUTURE CONDITIONS HABITAT ELEVATIONS (FEET NAVD)

	No Sea Level Rise		1.6 ft Sea Level Rise		3.3 ft Sea Level Rise		6.8 ft Sea Level Rise	
Habitat Type	**Bottom Elevation**	**Top Elevation**	**Bottom Elevation**	**Top Elevation**	**Bottom Elevation**	**Top Elevation**	**Bottom Elevation**	**Top Elevation**
Upland/Coastal Sage Scrub	10-year WL, 17.2 min**	>10-year WL, 17.2 min**	10-year WL, 17.2 min**	>10-year WL, 17.2 min**	10-year WL, 17.2 min**	>10-year WL, 17.2 min**	10-year WL, 17.2 min**	>10-year WL, 17.2 min**
Riparian/Upland Transition	16.2 or thalweg +7*	10-year WL, 17.2 min**	16.2 or thalweg +7*	10-year WL, 17.2 min**	16.2 or thalweg +7*	10-year WL, 17.2 min**	*16.2 or thalweg +7	10-year WL, 17.2 min**
Riparian	9.6	16.2 or thalweg +7*	10.4	16.2 or thalweg +7*	11.5	16.2 or thalweg +7*	13.8	16.2 or thalweg +7*
Emergent Marsh	6.1	9.6	8	10.4	10.1	11.5	12.5	13.8
Seasonally Exposed Unvegetated Flat	4.9	6.1	4.9	8	5.3	10.1	6.9	12.5
Southern Foredune***	Need potential elevations for this habitat							
Salt Marsh	3.9	4.9	3.9	4.9	4.3	5.3	5.9	6.9
Seasonally Shallow Open Water	3.9	4.9	3.9	4.9	4.3	5.3	5.9	6.9
Open Water	Channel thalweg	3.9	Channel thalweg	3.9	Channel thalweg	4.3	Channel thalweg	5.9

NOTES:

* Riparian top elevation and Riparian/Upland Transition bottom elevation is 16.2 at the downstream end of the lagoon up to the point where the thalweg elevation is above 9.2. Upstream of where the thalweg elevation is 9.2, the riparian zone top elevation transitions to a zone that slopes upstream with the thalweg profile and is 7 ft above the thalweg.

** Top elevation of Riparian/Upland Transition is 17.2 or the 10-year water level, whichever is higher, i.e., 17.2 at the downstream end of the lagoon, transitioning upstream to a Riparian/Upland Transition zone that slopes upstream with the 10-year water surface profile.

*** Southern foredune habitat will be located at the upper elevation of the beach. Additional beach sand should be added to raise the elevation and depth of the sand to support coastal dune species.

Table 8 lists common species to be planted, by their relative position in each habitat type to be restored. Selected species in Table 8 will be planted in transition areas between habitat types so therefore selected species may be listed/planted in more than one habitat type.

TABLE 8*
CONCEPTUAL PLANTING ARRANGEMENT BASED ON RELATIVE HABITAT ELEVATION

Habitat Zones	Species
Upland/Coastal Sage Scrub = *Above Riparian/Upland Transition	CSS species Sagebrush, Buckwheat Oak
Riparian/Upland Transition	Oak Walnut Sycamore Mulefat
Riparian	Sycamore Cottonwood Mulefat Willow
Emergent Marsh = *Wetted Area Below Riparian/Upland Transition Lagoon edge above salt marsh	Cattails Bulrush Carex spp. Juncus spp.
Salt Marsh = *Wetted Area Below Riparian/Upland Transition nearest Lagoon mouth	Salt grass Marsh Jaumea Spiny rush Pickleweed Sea blite
Seasonally Exposed Unvegetated Flat	Salt Grass
Seasonally Shallow Open Water	No planting
Open Water	No planting
Southern foredune = sand (in part)	Red and pink sand verbena, Beach bur Beach evening primrose

* Habitat equivalency between CHRAMP Table 1 (Moffett and Nichol) and Table 8.

It should also be noted that specific native plant species important to the special-status species known or anticipated to be present onsite will be incorporated into plant palettes in further design stages with the input of species specialists and the regulatory agencies. This will include plant resources for monarch butterfly (*Danaus plexippus*, roosting and nectary plants, see Xerces 2019), Crotch's bumble bee (*Bombus crotchii*, food plant families: Apocynaceae, Asteraceae, Lamiaceae, Hydrophyllacae, Asclepiadaceae and Boraginaceae per Thorp et al. 1983; Richardson 2017), San Diego desert woodrat (*Neotoma lepida intermedia,* food plants such as oak, buckwheat, prickly pear), and others.

Consultation with the Gabrielino/Tongva will also occur during further design stages to ensure that native plant species important to Native American cultural heritage are incorporated into the plant palettes.

The habitat zones listed below in Table 8 are correlated with the habitat types listed in Table 1 of this document (provided in the Moffatt and Nichols Alternatives Analysis Report, 2022). The equivalency of habitats listed in Table 1 (Moffett and Nichols) of this CHRAMP are included in Table 8.

Coastal sage scrub

Upland sage scrub plant palette and seed mix have been prepared, which will help establish diverse upland habitat that will serve as aquatic resource (wetland habitat) buffer area (Table 9). For the coastal sage scrub habitat, higher density planting and seeding is proposed for erosion control and because limited natural plant recruitment is expected to occur. During a site visit to the Topanga Lagoon, in August 2022, the Restoration Biologist observed that some prickly pear cactus near the Lagoon appeared to be of hybrid origin. The plants are hybrids between coast prickly pear (*Opuntia littoralis*) and mission cactus (*Opuntia ficus-indica*). The mission prickly pear can be distinguished from coast prickly pear by the relative lack of large spines on the pads. During restoration implementation we recommend that hybrid prickly pear cactus be removed from the site. Coast prickly pear cactus that do not appear to be of hybrid origin occur on the coastal sage scrub dominated slopes to the east of the Lagoon. These unhybridized cacti on the slopes, can serve as a source for cuttings, that can be planted in restored coastal sage scrub areas closer to the Lagoon in appropriate habitat.

Riparian/Upland Transition

Near the water's edge, riparian habitat including willow (*Salix* spp.), cottonwood (*Populus* sp.) and mulefat (*Baccharis salicifolia*) will be planted, as these species are adapted to higher moisture conditions. Drier adapted species, such as black walnut (*Juglans californica*), sycamore (*Platanus racemose*), coast live oak (*Quercus agrifolia*) and elderberry (*Sambucus nigra*) should be planted starting at higher elevations above than willows and cottonwoods (Table 10). At elevations above the edge of the riparian planting, the habitat will transition to coastal sage scrub vegetation. The transition plantings between riparian and coastal sage scrub will include mulefat between the upper edge of riparian woodland and the coastal sage scrub (i.e., ecotonal transition area). Mulefat can tolerate wet as well as drier conditions once it is established. At the highest elevations on the project site all vegetation will consist of coastal sage scrub.

Riparian

As described above, riparian plantings will consist of willows, mulefat, cottonwood and additional species adapted to moist soil conditions (Table 11). As the habitat and soils become drier with increasing elevation and distance from the water's edge, additional tree, and shrub species such as sycamore, white alder, California bay laurel, elderberry, coast live oak, black walnut and mulefat will be planted. Because of their specific habitat requirements, black walnut, white alder and California bay laurel should only be planted along the upper reaches of Topanga Creek, as they do not typically occur near the immediate coastline. In addition to container

plants, cuttings of willows (*Salix gooddingii*, and *S. lasiolepis*), mulefat and arrow weed (*Pluchea sericea*) can also be installed to supplement vegetation establishment in riparian woodland habitat and areas with freshwater.

Emergent Marsh (freshwater species)

Species typical of emergent marsh (freshwater) will be planted adjacent to open water in the upper part (north portion) of the lagoon in areas that have freshwater (Table 12). These emergent marsh species will include cattails (*Typha latifolia*) and bulrush (*Schoenoplectus californicus)*

Salt Marsh (salt tolerant species)

Although current salinity of the Lagoon is low, it is anticipated that with restoration grading and the potential for increased tidal influence, the lower portions of the Lagoon closer to the beach may have the necessary salinity to support the establishment of some salt marsh species. Since there is some uncertainty regarding the future salinity of the lower lagoon post-grading, salt marsh plant species will be introduced at a level that is intended to inoculate the area with salt marsh species so that if salinity conditions become suitable, propagules of these species will be able to expand their distribution over time. Species typical of salt marsh habitat are included in Table 13.

Seasonally Exposed Unvegetated Flats

Based on discussions with Rosi Dagit of RCDSMM during an August 2022 site visit, areas previously intended to be seasonally unvegetated flats should be planted with salt grass (*Distichilis spicata*) at a minimum, so that the space is occupied by native species. By planting native species in these areas, it will discourage non-native species from occupying these areas over the long-term. If conditions are determined to be appropriate by the Restoration Ecologist, lower statured emergent marsh species such as sedges (*Carex* spp.) and rushes (*Juncus* spp.) listed in Table 12 can also be introduced, in addition to saltgrass, in the areas proposed to be seasonally exposed unvegetated flats.

If conditions are suitable for salt marsh species adjacent to the lower portions of the lagoon nearest the beach (higher salinity than current conditions) then additional species listed in Table 13 can be planted. In upper portions of the lagoon where salinity is anticipated to be lower, species from the emergent marsh plant list (see Table 12) can be used.

Southern Foredune

A small area of southern foredune dune habitat may also be restored as part of the restoration project, depending on the Alternative selected. Southern foredune habitat could be restored using a combination of seeding and planting of container stock. Restored southern foredune habitat, if the patch is large enough, has the potential to support sensitive species such as western snowy plover, legless lizard (*Anniella* sp.) and invertebrates such as globose dune beetle. We recommend that additional beach sand be placed in the area intended for foredune restoration so that the habitat is suitable for dune species. The addition of beach sand favors the establishment of typical foredune plants instead of coastal sage scrub species. Proposed seed mixes and plant palettes for restoration of the riparian, upland sage scrub, riparian upland transition, emergent

marsh, salt marsh, (un)vegetated flats and southern foredune vegetation communities are presented in **Table 9** through **Table 15**, respectively.

TABLE 9
UPLAND SAGE SCRUB SEED MIX AND PLANT PALETTE

Seed Mix[1]

Scientific Name	Common Name	Life Form	Min. % Purity/ Germination	Lbs./Acre
Acmispon glaber var. *glaber*	deerweed	perennial herb	95/80	1
Artemisia californica	California sagebrush	shrub	30/60	3
Asclepias fascicularis	narrow leaf milkweed	perennial herb	90/65	1
Deinandra fasiculata	fascicled tarplant	annual herb	25/65	1
Encelia californica	coast sunflower	shrub	30/45	2
Eriogonum fasciculatum ssp. *foliolosum*	California buckwheat	shrub	55/16	1
Hazardia squarrosa	saw-toothed goldenbush	shrub	10/20	2
Lupinus succulentus	arroyo lupine	annual herb	98/85	1
Malacothamnus fasciculatus	bush mallow	shrub	20/60	1
Stipa lepida	foothill needlegrass	Perennial grass	90/71	2
Stipa pulchra	purple needlegrass	perennial grass	90/75	4
Scrophularia californica	California bee plant	perennial herb	70/75	1
Verbena lasiostachys	western vervain	perennial herb	90/55	0.5
			TOTAL	**20.5**

Container Stock

Scientific Name	Common Name	Life Form	Container Size	Number Per Acre[2/3]
Artemisia californica	California sagebrush	shrub	1-gallon	300
Elymus condensatus	giant wildrye	perennial grass	1-gallon	200
Eriogonum fasciculatum ssp. *foliolosum*	California buckwheat	shrub	1-gallon	50
Eriogonum cinereum	ashyleaf buckwheat	shrub	1-gallon	250
Heteromeles arbutifolia	toyon	shrub	1-gallon	20
Isocoma menziesii var. *vernonioides*	coastal goldenbush	shrub	1-gallon	50
Keckiella cordifolia	heart-leaved keckiella	shrub	1-gallon	30
Malosma laurina	laurel sumac	shrub	1-gallon	20
Rhus integrifolia	lemonade berry	shrub	1-gallon	5
			TOTAL	**925**

1 Seed to be applied by hydroseed method with hydromulch and tackifier (binder).

2 925 plants per acre equals planting on average 7-feet on-center. The project Restoration Ecologist will have discretion to direct layout of plants in ecologically appropriate locations in natural groupings prior to installation.

3 To discourage unauthorized access, cacti species such as *Opuntia littoralis* (coast prickly-pear) could also be installed as a supplement.

TABLE 10
RIPARIAN UPLAND TRANSITION-SEED MIX AND PLANT PALETTE

Seed Mix[1]

Scientific Name	Common Name	Life Form	Min. % Purity/ Germination	Lbs./Acre
Ambrosia psilostachya	western ragweed	perennial herb	45/45	2
Distichlis spicata	saltgrass	perennial grass	90/75	2
Artemisia californica	California sagebrush	shrub	30/60	2
Elymus condensatus	giant wildrye	perennial grass	70/76	2
			TOTAL	**8**

Container Stock

Scientific Name	Common Name	Life Form	Container Size	Number Per Acre[2]
Understory and Shrubs				
Artemisia calfornica	California sagebrush	shrub	1-gallon	150
Baccharis salicifolia	mule fat	shrub	1-gallon	100
Elymus triticoides	beardless wildrye	perennial grass	1-gallon	100
Encelia californica	California brittlebush	shrub	1-gallon	100
Heteromeles arbutifolia	toyon	shrub	1-gallon	75
Ribes speciosum	fuschia-flowered gooseberry	shrub	1-gallon	50
Rosa californica	California wild rose	Shrub	1-gallon	25
			TOTAL	**600**

1 Seed to be applied by hand and raked into the top ¼ inch of soil, or hydroseed method with hydromulch and tackifier (binder).

2 600 plants per acre equals planting on average 8.5-feet on-center. The project Restoration Ecologist will have discretion to direct layout of plants in ecologically appropriate locations in natural groupings prior to installation.

TABLE 11
RIPARIAN WOODLAND SEED MIX AND PLANT PALETTE

Seed Mix[1]

Scientific Name	Common Name	Life Form	Min. % Purity/ Germination	Lbs./Acre
Ambrosia psilostachya	western ragweed	perennial herb	45/45	2
Distichlis spicata	saltgrass	perennial grass	90/75	2
Malvella leprosa	alkali mallow	perennial herb	10/50	1
Heliotropium curassavicum	salt heliotrope	perennial herb	15/50	2
			TOTAL	**7**

Container Stock

Scientific Name	Common Name	Life Form	Container Size	Number Per Acre//spacing[2]
Understory and Shrubs				
Artemisia douglasiana	California mugwort	shrub	1-gallon	100
Baccharis salicifolia	Mule fat	shrub	1-gallon	200
Elymus triticoides	beardless wildrye	perennial grass	rose pots or 1-gallon	150
Isocoma menziesii var. *vernonioides*	coastal goldenbush	shrub	1-gallon	50
Pluchea sericea	arrow weed	shrub	1-gallon	25
Rosa californica	California wild rose	shrub	1-gallon	25
Trees				
Alnus rhombifolia	white alder	tree	Tall Tree pots	25
Juglans californica	black walnut	tree	Tall Tree pots	25
Platanus racemosa	western sycamore	tree	Tall Tree pots	25
Populus fremontii	Fremont cottonwood	tree	Tall Tree pots	25
Quercus agrifolia	coast live oak	tree	Tall Tree pots	50
Salix laevigata[4]	red willow	tree	Tall Tree pots	200
Salix lasiolepis[4]	arroyo willow	tree	Tall Tree pots	300
Sambucus nigra	elderberry	tree	Tall Tree pots	50
Umbellaria californica	California bay	tree	Tall Tree pots	25
			TOTAL	**1,275**

1 Seed to be applied by hand and raked into the top ¼ inch of soil, or hydroseed method with hydromulch and tackifier (binder).

2 1,250 plants per acre equals planting on average 6-foot on-center. The project Restoration Ecologist will have discretion to direct layout of plants in ecologically appropriate locations in natural groupings prior to installation.

3 As a supplement to 1-gallon container size *Salix* spp. (willow) container plants, cuttings collected from the project area may also be installed.

TABLE 12
EMERGENT MARSH -SEED MIX AND PLANT PALETTE

Scientific Name	Common Name	Life Form	Min. % Purity/ Germination	Lbs./Acre
Anemopsis californica	yerba mansa	**perennial herb**	**55/80**	**1**
Carex praegracilis	field sedge	perennial herb	95/80	2
Carex spissa	San Diego sedge	perennial herb	95/65	2
Distichlis spicata	salt grass	perennial grass	90/75	2
Juncus balticus	Baltic rush	perennial herb	95/80	2
Juncus dubious	Mariposa rush	perennial herb	95/50	2
Pluchea sericea	arrow weed	shrub	7/20	2
			TOTAL	**13**

Container Stock/Salvaged Clumps*

Scientific Name	Common Name	Life Form	Container Size	Number Per Acre [2]
Equisetum hyemale	scouringrush horsetail	perennial herb	salvaged clumps	5 clumps
Schoenoplectus acutus	hardstem bulrush	perennial herb	salvaged clumps	10 clumps-
Schoenoplectus californicus	bulrush	perennial herb	salvaged clumps	10 clumps-
Typha latiflia	broadleaf cattail	perennial herb	salvaged clumps	5 clumps
			TOTAL	**30 clumps**

[1] Seed to be applied by hand and raked into the top ¼ inch of soil, or hydroseed method with hydromulch and tackifier (binder).

[2] Clumps should be planted at a spacing between 30-40 feet apart.

TABLE 13
SALT MARSH PLANT PALETTE

Seed Mix[1]

Scientific Name	Common Name	Life Form	Min. % Purity/ Germination	Lbs./Acre
Cressa truxillensis	alkali weed	perennial herb	10/60	1
Distichlis spicata	saltgrass	perennial grass	90/75	2
Frankenia salina	alkali heath	perennial herb/ shrub	40/78	1
Salicornia pacifica	pickleweed	perennial herb	8/72	2
Suaeda taxifolia	wooly seablite	shrub	34/24	2
			TOTAL	**8**

Container Stock[1]

Scientific Name[1]	Common Name	Life Form	Container Size	Number Per Acre[3]
Arthrocnemum (Salicornia) subterminale	Parish's glasswort	perennial herb	1-gallon	75
Batis maritima	saltwort	shrub	1-gallon	75
Distichilis (Monanthochloe) littaoralis	shoregrass	grass	1-gallon	50
Jaumea carnosa	marsh jaumea	perennial herb	1-gallon	75
Juncus acutus	spiny rush	perennial herb	1-gallon	25
Limonium californicum	California sea lavender	perennial herb	1-gallon	25
Suaeda esteroa	estuary seablite	perennial herb	1-gallon	50
			TOTAL	**375**

1 Seed to be applied by hand and raked into the top ¼ inch of soil

2 375 plants per acre equals planting on average 10.75-foot on-center. The project Restoration Ecologist will have discretion to direct layout of plants in ecologically appropriate locations in natural groupings prior to installation.

TABLE 14
(UN)VEGETATED FLAT PLANT PALETTE

Container Stock[1,2]

Scientific Name	Common Name	Life Form	Container size	Number Per Acre[1]
Distichlis spicata	saltgrass	perennial grass	1-gallon	300

1 300 plants per acre equals planting on average 12-feet on-center. The project Restoration Ecologist will have discretion to direct layout of plants in ecologically appropriate locations in natural groupings prior to installation.

2 Additional species low statured species from either Table 12 or Table 13 can also be planted depending on the level of salinity observed after the restoration grading has been completed.

TABLE 15
SOUTHERN FOREDUNE SEED MIX AND PLANT PALETTE

Seed Mix[1]

Scientific Name	Common Name	Life Form	Min. % Purity/ Germination	Lbs./Acre
Abronia maritima	red sand verbena	perennial herb	85/15	6
Abronia umbellata	beach sand verbena	perennial herb	75/20	2
Ambrosia chamissonis	beach bur	perennial herb	90/55	1
Atriplex leucophylla	beach salt bush	perennial herb	80/40	1
Camisoniopsis cheranthifolia	beach evening primrose	perennial herb	95/90	2
			TOTAL	**12**

Container Stock[1]

Scientific Name[1]	Common Name	Life Form	Container Size	Number Per Acre[3]
Abronia maritima	red sand verbena	perennial herb	1-gallon	50
Abronia umbellata	beach sand verbena	perennial herb	1-gallon	50
Ambrosia chamissonis	beach bur	perennial herb	1-gallon	50
Atriplex leucophylla	beach salt bush	perennial herb	1-gallon	25
Calystegia soldanella	Beach morning glory	perennial herb	1-gallon	25
Camisoniopsis cheranthifolia	beach evening primrose	perennial herb	1-gallon	75
Croton califonicus	California croton	perennial herb	1-gallon	75
Distichlis spicata	Salt grass	perennial grass	1-gallon	50
Nemacaulis denudata	Woolly heads	perennial herb	1-gallon	50
			TOTAL	**450**

1 Seed to be applied by hand and raked into the top ¼ inch of soil

2 450 plants per acre equals planting on average 9.8-feet on-center. The project Restoration Ecologist will have discretion to direct layout of plants in ecologically appropriate locations in natural groupings prior to installation.

4.4.1 Temporary Irrigation

After grading and preliminary invasive vegetation removal, implementation of erosion control BMPs and prior to planting, temporary irrigation will be installed in the upland and transition zone and upper edge of riparian habitat to support and expedite native plant establishment. Temporary irrigation for the riparian plantings immediately adjacent to the creek areas will include drip irrigation.

Temporary irrigation using overspray is planned for up to three years of the five-year maintenance and monitoring period, with irrigation being reduced over time, except for any oaks in upland areas where drip system per tree is needed Upon successful establishment of plants, the irrigation system will be removed. Irrigation pipe and components will be installed above grade for ease of removal. Temporary irrigation will utilize on-site potable water. An automated system would be installed with a point of connection (POC), meter, and mainline to supply water.

Potable/chlorinated water should not be directly sprayed or runoff directly into the lagoon to minimize impacts to native fish. The plantings should be watered so that the potable water infiltrates into the soil to prevent direct runoff into the lagoon.

Prior to completion of the installation phase, the will coordinate with the implementation contractor to confirm complete irrigation coverage of planting/seeding areas. The implementation contractor will be responsible for initial survival of container plants and germination of seed, and oversight and application of irrigation, but the and contractor should coordinate to agree on preferred irrigation frequency and quantity to support healthy plants and successful habitat establishment. Maintenance, operation, and removal of the irrigation system components during the post-installation maintenance period is discussed in Section 5.

4.4.2 Soil Testing and Preparation

After grading and prior to planting and seeding, composite soil samples will be collected from at least eight representative locations (i.e., six in wetland/riparian areas and two in upland areas) to conduct agricultural suitability and soil composition testing. The testing results will be used to confirm post-grading soil conditions and whether soil treatments to reduce compaction or amendments are needed. Based on the test results, it is possible some organic amendments for container plant backfill could be beneficial but larger scale soil amendment applications are not anticipated to be needed.

Soil shall be stabilized but not overly compacted (i.e., less than 80% is what is used for trees percent compaction, except where 90% compaction may be needed on slopes) and the soil surface will have minor, natural undulations/variation and be roughened to improve seed germination and growth. Soil ripping may be considered to aid in plant establishment. Soil treatments will need to be considered further during the detailed design phase of the project. A CDPR Archaeologist and/or Native American Monitor will supervise any soil disturbance in sensitive cultural areas.

4.4.3 Plant Installation

Plant/Seed Orders

The source for seeds, containerized plants and cuttings should be as close to the project site as possible and within the same climate zone (i.e., within the same watershed or adjacent watersheds, and at a similar latitude). This may include similar lagoon systems in Santa Monica Bay. Prior to installation, the implementation contractor shall submit a list of the suppliers and plant/seed materials (per the Plan palettes and seed mixes) to the CDPR, DBH and/or RCDSMM and for review. The submittal will include species, quantities, container sizes, original source/collection locations, and seed purity and germination rates. Material sourced/collected outside the coastal zone between Ventura County and western Los Angeles County may be rejected. If particular plant/seed material is not available, either the implementation contractor will contract with a nursery to conduct seed collection and/or plant propagation or potential substitutions will be agreed upon by project landowners and/or RCDSMM, , and implementation contractor. If a contracted seed collection effort and/or nursery contract grow agreement are determined to be necessary, they should be established approximately two-three years in advance of restoration project implementation in order to ensure appropriate plant material is available. An

excess of propagules of rarer or harder to grow species shall be ordered to provide a contingency buffer in the event of their failure to germinate or thrive.

Note that it is recommended to plant 50% more native trees for each species than required for mitigation so that any failure to establish is addressed at the start of the project and does not change the overall monitoring time frame. If the number of mitigation trees falls below the requirement, then the monitoring period is extended for those new plantings.

Container Plants and Cuttings

Prior to installation, container stock will be inspected by the for signs of pests, disease, root condition, and general health. Container plants will be checked for pests (e.g., polyphagous shot hole borer [*Euwallacea sp*.; ISHB]), coqui frog [*Eleutherodactylus coqui*], Argentine ant [*Linepithema humile*], disease (e.g., *Phytophthora* root rot), root condition, and general health. Any infected or substandard plant material will be rejected and replaced at no additional cost. Container stock will be installed as rose-pot size or one-gallon specimens. All plants should be installed in a way that mimics natural plant distribution. The will coordinate with the implementation contractor on the plant layout to ensure species are placed in ecologically appropriate locations in accordance with the Plan. Archaeological or Native American monitoring may be required in planting areas that were not previously graded as part of the restoration.

Container stock should be installed in holes/basins that are slightly wider than the root ball of the plant, identified with a unique numerical metal tag, and GPS coordinates collected. Holes may be dug with mechanical augers or by hand, at the discretion of the implementation contractor. Each hole shall be filled with water twice and allowed to drain before installing the plant, unless sufficient soil saturation is present, in which case, less or no pre-watering will be necessary. A basin will be constructed around each plant with a minimum inner diameter of approximately 2 feet. This well will be filled with water and allowed to drain following installation. Ideally, planting will occur during the rainy season between November and February (or spring depending on the timing of project implementation) to maximize survival of container stock. Plant protectors such as wire mesh cages or tree protection tubes may be used to minimize herbivory and maintain plant survival, as needed.

Mulch is typically used as a weed barrier for hydroseeding, small container, and tree installation and also retains moisture reducing irrigation needs. Mulch is usually composted, between 1-3 inches, and meets requirements for being disease and pest free.

Hydroseeding typically consists of the application of wood fiber, seed, and stabilizing emulsion (binder) with hydro-mulch equipment, which temporarily protects exposed soils from erosion until the seeds germinate, grow, and become established. Should hydroseeding be employed during any stage of this project, the following are recommended: 1. The seed shall be mixed uniformly in slurry composed of water, certified weed free wood fiber or cellulose mulch, and stabilizing emulsion or other suitable mix as recommended by the Restoration Ecologist. 2. The hydroseed mix shall be applied using hydro-mulching equipment or other method as recommended by the Restoration Ecologist.

For small seedlings and container plants/trees, the basin and surrounding area approximately 3 feet by 3 feet in size, will be covered with a 2–4-inch layer of natural mulch or locally sourced leaf litter. Mulch will be augmented as needed over the establishment period. No fertilizer should be used with the mulch application to prevent water quality issues.

Cuttings/Stakes

Cuttings of willows (*Salix laevigata and S. lasiolepis*), mule fat (*Baccharis salicifolia*) and arrow weed (*Pluchea sericea*) can also be installed to supplement vegetation establishment in riparian willow scrub habitat and areas with freshwater. Mule fat, which is adapted to grow in drier areas once it is established, will also be planted in the transition between the riparian and upland areas. Cuttings will be sourced from live cuttings from healthy plants within the vicinity of Topanga Creek to maintain the genetic stock on-site. Source material will be mature shrubs and trees. Specific cutting procedures would include taking cuttings that are straight or so and at least 20 inches long and 0.5 to 1 inch in diameter. However, cuttings placed in or near the groundwater table should be sufficiently long enough to reach the capillary fringe (saturated zone) above the water table. To help ensure genetic diversity within the restoration project and limit damage to existing vegetation, no more than 5 cuttings will be collected per individual tree or shrub. The stems will be cut so that the bottom end is at an angle, to identify which end to install in the ground. All cuttings will be stripped of leaves to allow roots to develop prior to above-ground vegetation and keep the cutting from drying out, while tops will be cut flat to distinguish the top from the bottom end. Cuttings should be dipped in a liquid solution of mycorrhizal inoculum (vesicular-arbuscular mycorrhiza [VAM] fungi) immediately prior to planting. VAM inoculums are commercially available and shall include two or more such species: *Glomus intraradices*, *Glomus etunicatum*, or *Glomulus mosseae*. It is also recommended a liquid solution of mycorrhizal inoculum be applied to container plants if they have not already been inoculated at the supplier's nursery.

Cuttings will be installed so that 50 to 60 percent of their total length is below grade. The ground should be saturated prior to installation, and cuttings should be installed immediately or stored properly to avoid desiccation. Installation of cuttings should occur during the same timeframe referenced above for container plants.

Seeding

Seed application should take place during the rainy season after installation of container plants and cuttings. When hydroseeding after planting, experienced hydroseed staff can spray the seed slurry around the container plants so the plants are not covered. The seed will be protected by the slurry mix (e.g., mulch) and/or by raking it into the top ¼ inch of soil if hand seeded. The contractor will obtain seed from a qualified supplier. The seed will be ordered and delivered in separate, original containers by species and inspected by the Restoration Ecologist. Seed must be labeled with the species, collection/source location, purity and germination percentage rates, and quantity of seed in pounds. If the delivered seed differs from specified purity and germination rates, then the application rates will be adjusted accordingly to achieve the equivalent amount of pure live seed (PLS). The Restoration Ecologist will inspect the seed prior to mixing with other species in the seed mix and application on-site and will reject seed lacking certified tags or not conforming to the specifications.

The riparian seed mix can be applied by hand and raked into the top two inches of soil or applied via hydroseeding with mulch and tackifier. The upland scrub seed mix (for upland and riparian-upland transition scrub habitats) will be applied via hydroseeding with mulch and tackifier for stabilization and to improve germination results.

Seed applied by hydroseed include the following application steps:

- Hydroseed equipment shall have a built-in agitation system and operating capacity sufficient to agitate, suspend and homogeneously mix a slurry of seed, organic mulching amendments.
- Virgin wood fiber mulch: apply at a minimum rate of 2,000 lbs./acre.
- No fertilizer will be applied at the restoration site due to water quality concerns.
- Organic tackifier: Gura Tack or approved equal applied at a rate of 100 lbs./acre.
- Spray areas with a uniform visible coat, using the dark color of the wood fiber mulch as a visual guide. The slurry shall be applied in a downward drilling motion via a fan stream nozzle to form a blotter-like ground cover impregnated uniformly with seeds and which, after application, will allow absorption of moisture and rainfall to percolate to underlying soil.

The Restoration Ecologist will determine when the planting and seeding phase is successfully completed at the site. The installation phase of the project (site preparation and planting) is anticipated to be approximately 4 months but could be longer. Completion of this phase will mark the beginning of the 1-Year plant establishment period (PEP) within post-installation Year 1.

4.4.4 One-Year Establishment Period

Following installation completion (installation is anticipated to be approximately 4 months long), the 1-Year plant establishment period (PEP) will start. The 1-Year PEP (i.e., first year post-installation) is intended to provide an observation and guarantee period to ensure that most plant material installed is becoming established. The Restoration Ecologist will conduct weekly to monthly monitoring visits during this period and develop a list of action items to be addressed in a timely manner, as needed. Action items may include maintenance for weed control, erosion control, irrigation, vandalism, replacement of container stock, removal of trash or debris, pest management, and site protection or signage. The implementation contractor is responsible for performing remedial measures to fix any observed problems identified by the Restoration Ecologist. Success at the end of the 1-year establishment period will be met if invasive plant cover is <1.0 percent, other non-native cover is <10 percent, there is 95 percent survivorship of container stock within planting areas, installed seed has begun to germinate, and there are no erosion-related issues. If natural rainfall is not sufficient to cause germination, then irrigation can be used to stimulate germination of seeds. Some replacement planting may be needed during this period. The successful completion of this period will set the restoration areas up with a higher probability of long-term success during the remaining eight months of Year 1 and the subsequent five-year maintenance and monitoring period.

4.4.5 Planting As-Built Conditions

Based on as-built information provided by the installation contractor and site implementation monitoring data, the Restoration Ecologist shall submit an as-built letter report to the project

landowners and/or RCDSMM within 30 days of completion of plant installation activities and the 1-year plant establishment period. A map will be created including, but not limited to, showing GPS locations of all remaining and installed trees, and polygons delimiting the extent of planting for each vegetation community including GPS locations of container stock installed and track lines showing irrigation lines with notes on service locations. This letter will describe site preparation, plant installation methods, activities conducted during the 1-year plant establishment period, and the as-built status of the plants. To document baseline site conditions and implementation of this Plan, the letter will include an as-built graphic on an aerial photo base as well as photos taken from designated photo stations before and after installation. As required by the Los Angeles County Local Coastal Plan, a *Native Tree Replacement Planting Mitigation, Maintenance and Monitoring Plan* describing mitigation, monitoring, and reporting will be prepared to guide future restoration planting and direct fuel modification protocols according to Coastal Development Permit (CDP), and other regulatory approvals, for each proposed alternative.

5.0 Maintenance Program

5.1 Maintenance Activities and Schedule

After the initial 1-year plant establishment period, the Maintenance Contractor (which may be the same firm as the implementation contractor or a separate firm) will take over responsibility for the remainder of post-installation Year 1 and the scheduled five-year maintenance period (Years 1-5). The contractor will perform maintenance visits and activities in accordance with the restoration goals presented in this Plan.

The intensity of maintenance over the five-year period is expected to lessen each year as invasive and other non-native plant species are removed and controlled, and native plants (from planting, seeding and volunteers) become established. As a guideline, the contractor is expected to perform maintenance once a month for the 1-year plant establishment period, and then for Maintenance Years 1 and 2. The contractor is also expected to perform maintenance every 2 months during Maintenance Year 3, and quarterly during Maintenance Years 4 and 5. The general framework maintenance schedule is provided in Table 16, but actual maintenance responsibilities may vary based on site conditions and progress relative to meeting performance goals on schedule. Maintenance may be needed more frequently, for example, to perform remedial measures (e.g., re-planting). Based on weather conditions and the degree of non-native species, additional maintenance visits may be necessary during particular seasons and periods of the restoration project (see **Table 16**).

TABLE 16
MAINTENANCE SCHEDULE

Maintenance Task to Be Completed	Interval
Site maintenance during the 1-year plant establishment period	Monthly
Year 1 – Site maintenance	Monthly
Year 2 – Site maintenance	Monthly
Year 3 – Site maintenance	Every two months
Years 4–5 – Site maintenance	Quarterly
Remedial measures (including, but not limited to, re-planting, reseeding, and erosion control)	As needed

These maintenance guidelines are specifically tailored for native plant establishment. The maintenance program will include weed control, temporary watering/irrigation, erosion control, removal of trash, and any remedial measures deemed necessary for the success of the project (e.g., re-planting and re-seeding). Maintenance activities will be directed by the Restoration Ecologist. Potential damage to plants and other facilities occurring because of unusual weather or vandalism will be discussed by the project landowners and/or RCDSMM, contractor, and Restoration Ecologist to determine appropriate responses and measures.

The contractor will coordinate with the Restoration Ecologist on a regular basis to determine priority maintenance activities during different periods of the project. The primary maintenance obligations are reviewed in the following sections.

5.2 Non-Native Plant Control

Invasive species and other non-native species (second priority) are reviewed in Section 4.2.4. It is intended that invasive species (listed in Section 4.2.4 and as identified by the Restoration Ecologist and Maintenance Contractor) will be treated and removed wherever they occur within the restoration areas and account for less than 1.0 percent cover during the last two years of the five-year maintenance period. During the maintenance phase, the Restoration Ecologist will create and maintain a list of invasive species that have re-sprouted or volunteered that need to be removed and controlled. The Restoration Ecologist will periodically update this "living" list in coordination with the Maintenance Contractor to track invasive species that have been eradicated and potentially newly identified invasive species that need to be controlled. Other non-native species (less problematic) will be treated and removed within the restoration areas and account for less than 5.0 percent cover during the last two years of the five-year maintenance period. The species will also be listed and tracked by the Restoration Ecologist and Maintenance Contractor and an adaptive management approach will be applied to determine maintenance needs during different periods of the maintenance period.

In general, non-native plants should be removed before they become 12 inches high or set seed. If root systems of particular non-native plants that are in a young/small stage cannot be feasibly removed with hand-pulling, approved herbicides may be applied under the supervision of a licensed Pest Control Advisor and will be conducted by trained staff overseen by a supervisor with a Qualified Applicator License or Certification from the Department of Pesticide Regulation

Working in coordination with the Restoration Ecologist, the contractor and their Pest Control Advisor retain discretion to select their preferred non-native plant treatment and removal methods as long as the work is conducted in a safe and professional manner and in accordance with the goals of this plan and all applicable local, state, and federal laws and requirements. According to the Department of Parks and Recreation (Section 32000 Native Plant Landscaping Regulations), the Pest Control Advisor shall submit the written herbicide recommendations to the State for approval, no less than 15 days prior to the use of any herbicides. Project landowners RCDSMM will also be copied on these communications. The Pest Control Advisor will also ensure that the use of any herbicides or other vegetation removal methods is consistent with the County's abatement policy at that time. Weed debris will be properly disposed of off-site, unless the Restoration Ecologist determines some weed debris can be left in-place or cut and distributed as mulch on-site.

5.3 Temporary Irrigation

Implementation and initial application of temporary irrigation for riparian, transition, and upland scrub habitats is discussed in Section 4.4.1. Depending on the method selected, the Maintenance Contractor will be responsible for maintaining system components (e.g., pipe, sprinkler heads, water tanks, etc.) to ensure sufficient water is provided to establish native container plants and seed and meet project performance standards.

The Maintenance Contractor and Restoration Ecologist will communicate and coordinate regarding preferred irrigation timing (cycles) and quantities during different points of the maintenance period. The Contractor will keep a record of irrigation frequency and gallons applied monthly and annually. In general, irrigation will be applied to supplement and 'extend' the rainy season along with providing water as needed during the summer; and less frequent deeper watering (mimicking natural wetting and drying cycles) is preferred over more frequent surface watering. It is intended as native plantings become established, temporary irrigation use will be progressively reduced and then phased out completely before the end of Maintenance Year 3 if plants are fully established. Once concurrence is provided that temporary irrigation is no longer needed, the Maintenance Contractor will remove all irrigation-related materials and debris from the site. If drought conditions are anticipated irrigation systems may be left in place for five years.

5.4 Trash Removal

All trash will be removed by the Maintenance Contractor from the project site during each maintenance visit throughout the maintenance period. Care will be taken that trash removal activities minimize or avoid impacts to native plants in the project site. All trash and weed debris will be removed from the project site and disposed of at an off-site licensed waste-disposal facility.

5.5 Erosion Control

Erosion control measures in the planted areas will be replaced, or additional measures will be installed as needed and as directed by the CDPR, DBH, and/or RCDSMM or Restoration Ecologist. Within the project site, temporary erosion control will be needed on the upland slopes

until these areas are sufficiently stabilized and revegetated. Erosion control materials could include, but are not limited to, biodegradable fiber rolls (wattles), natural fiber matting, and/or organic mulch. Only natural threads and nettings are permissible (no products with plastic mesh).

Any non-biodegradable erosion control materials will be removed from the project site by the Maintenance Contractor once the Restoration Ecologist determines that sufficient native plant cover is established.

5.6 Sediment Erosion and Deposition

A technical report that investigated hydraulics, sediment transport and sea level rise analysis was prepared by Moffat and Nichol (2022). The analysis showed that the upper reaches of Topanga Creek are erosional due to steeper slopes while the area at the Lagoon is depositional due to mild slopes. The results suggest that in many locations vegetation is sufficient to stabilize the channel banks and overbanks, and riprap would not be needed along the Lagoon edge.

In areas where the channel shear stresses are greater and could result in erosion, a combination of soil bioengineering will provide an effective means of treating sites where steep slopes and instability are resulting in revegetation problems. Soil bioengineering is the use of living plant. materials to perform engineering functions, from simple erosion control with grass and other seeding or more complex slope stabilization with willows and other plants (Schiechtl, 1980). and vegetated channel banks may be used to provide both channel stability and improved habitat. Based on the analysis results, substantial erosion or deposition is not expected. Initially, the creek channels and slough banks may adjust due to natural processes, especially before the banks are fully vegetated, but this is expected in a natural system. Sediment management is not expected to be necessary except for after major storm events if monitoring shows substantial erosion or deposition at the site. The need and design for any bioengineering erosion control measures will be assessed and developed in subsequent phases of the project by the project engineer.

5.7 Replacement Planting and Seeding

If performance goals outlined in Section 8.0 below, are not being met, additional measures, such as installation of replacement container plants, cuttings, and/or seed may be implemented. Depending on performance of plantings and seed (e.g., which species are establishing best) and availability of appropriate material, the landowners, RCDSMM, Restoration Ecologist, and/or Maintenance Contractor will acquire species for potential re-planting and/or re-seeding.

5.8 Vandalism and Site Protection

Vandalism could occur within the project site via tagging of signage, damage, or removal of fencing to allow “shortcuts” and plant trampling or removal. If vandalism or unauthorized access does occur, site protection measures will be evaluated in coordination with the the project landowners and/or RCDSMM to determine the best approach to protect the restoration areas. Site protection measures will include additional signage to indicate habitat restoration is in progress and unauthorized access is not permitted and notification to CDPR ranger staff. If this is not

sufficient, temporary fencing or other measures would be considered and implemented as appropriate.

5.9 Sensitive Species Issues

The Restoration Ecologist will note the presence of any plants or wildlife species during regular site visits, including specific locations for sensitive species, and will inform the project landowners and/or RCDSMM and Maintenance Contractor of any sensitive species detected. In addition, the Restoration Ecologist on behalf of the project will inform CDFW and USFWS of any threatened or endangered species detected nesting or utilizing the site (in addition to tidewater goby and steelhead trout). Measures (e.g., temporary buffer and/or seasonal work restrictions) will be implemented as appropriate, and as required by permits to protect sensitive species.

6.0 Monitoring and Reporting Program

6.1 Monitoring and Reporting Schedules

Monitoring and annual assessments will be carried out under the direction of the Restoration Ecologist. This monitoring program will begin with project site preparation and installation phase and continue during the 1-Year PEP and for the planned additional five-year project maintenance and monitoring period (**Table 17**). The actual installation phase is anticipated to take approximately 3-4 months, but is ultimately dictated by propagule availability, and installation schedules and methods approved for the project contractors based on current site and weather conditions.

TABLE 17
MONITORING SCHEDULE[1]

Phase	Schedule
Implementation Monitoring	
Project site preparation and installation	At least weekly
1-Year plant establishment period (PEP)	At least monthly
Maintenance Monitoring	
Year 2	Monthly (12 visits)
Years 3 and 4	8 visits per year
February to July	Monthly (6 visits per year)
August to January	2 visits per year
Years 5 and 6	Quarterly (4 visits per year)
Annual Monitoring	
Years 1 through 6	May or June (1 visit per year)

[1] This schedule is only a guideline; monitoring will be performed as necessary, as required by project permits, and as determined by the Restoration Ecologist. The site preparation and installation is anticipated to take approximately 4 months.

Monitoring will be conducted at least weekly during project site preparation and installation, and at least monthly during the 1-Year PEP. A post-installation and as-built report will be prepared

within 30 days following the successful completion of the approximately 120 installation period. Monitoring and maintenance will continue for the remainder of the 1-Year PEP and will be conducted at least monthly. At the end of the 1-Year PEP, the first annual report will be prepared. Maintenance monitoring will be conducted monthly during Year 2 of the subsequent five-year maintenance and monitoring period. In Years 3 and 4, monitoring will be conducted monthly from February through July (to cover the peak establishment period of both spring and summer germinating species) and twice in the remainder of the year. During Years 5 and 6, monitoring will be conducted four times per year. For all native tree retained and mitigation trees, the monitoring report will follow the requirements of CDP other approvals, which will be detailed in the Native Tree Restoration Plan and incorporate any additional permitting requirements. Revisions of the as-built map shall be provided reflecting any changes to the perimeters of each vegetation community as well as irrigation changes, if any. Brief maintenance monitoring memos will be prepared following each visit to document observations, progress toward meeting restoration and goals, and any recommendations. Annual monitoring will be conducted in May or June of each year to coincide with the peak growing season for wetland habitats. The exact timing of the visits will depend on project site and weather conditions. An annual report will be prepared following each annual assessment and will be submitted to the project landowners and/or RCDSMM for review before the end of each monitoring year.

6.2 Implementation Monitoring

The Restoration Ecologist will be on-site at least weekly, or as needed, during plant installation to ensure that activities are being conducted per the Plan. The Restoration Ecologist will monitor all phases of the plant installation process, including non-native plant treatment and removal and the installation of plants and seed. The Project Engineer will be on-site as needed to monitor the implementation of grading and erosion control features. The Restoration Ecologist and/or Project Engineer and project landowners and/or RCDSMM must inspect and authorize each phase of work before the next phase may begin. Pre-installation photos will be taken of existing habitats in the project site from designated photo documentation stations. This information will be used later to track positive changes in habitat restoration due to the project activities.

6.3 Maintenance Monitoring

Following installation, the Restoration Ecologist will monitor maintenance activities conducted by the implementation contractor during the 4 month installation period and Maintenance Contractor during the rest of the 1-Year PEP and the subsequent five-year maintenance and monitoring period, in accordance with the monitoring schedule outlined in Table 17. This monitoring schedule provides guidance on planned activities; but more frequent inspections may be necessary if there are problems with contractor performance or habitat development. As reviewed in Section 7.1, monitoring memos noting any issues with plant establishment, insect pests, watering, erosion control, etc., as well as wildlife observations, will be provided to the Maintenance Contractor and the project landowners, and/or RCDSMM.

6.4 Annual Monitoring

In addition to maintenance monitoring visits, the Restoration Ecologist will conduct an annual technical monitoring visit in May or June (see Table 17) of each year during the subsequent five-year maintenance and monitoring period. Annual monitoring will involve the evaluation and mapping of native and non-native vegetative species and cover, documentation of native tree conditions and mitigation planting, observations of wildlife, photo documentation and any changes in irrigation or other site conditions. In addition, annual monitoring in Year 4 and Year 6 will also include a functional condition assessment. This will include CRAM and wetland delineation change documentation compiled based on permit requirements. The Restoration Ecologist will prepare and submit required annual permit reports including photo documentation as required by permitting agencies.

The Project Engineer will also conduct an annual monitoring visit during the five-year post-construction period. Annual monitoring may involve topographic and bathymetric surveys to evaluate changes to the lagoon and creek and to document any erosion or deposition. Methods of each component of the annual monitoring are described below. An annual report will be prepared each year including at the end of the Year 1 PEP and at the end of the subsequent five-year maintenance monitoring period (for a total of 6 years) and submitted to the CDPR, DBH, and/or RCDSMM and resource agencies.

6.4.1 Vegetation Analysis

The condition and quality of vegetation communities that will be created and restored will be assessed by methods approved in the CDP and project permits from CDFW and USACE. These are anticipated to include methods similar to those used for the Malibu Lagoon Restoration Project to assess plant diversity and cover (point/line intersect along transects), habitat health (California Rapid Assessment Method [CRAM]), and transect point and landscape level photo monitoring.

The Restoration Ecologist will provide an Initial Monitoring Report to all permitting agencies, project landowners and RCDSMM within 30 days of completion of the 120-day initial monitoring period. The report will include details and maps as necessary with regards to site preparation, irrigation, the species names and amount of container stock used, the species names and amount of seed applied, and any deviations from the recommended plant palette. The report will provide sources of seeds/stock, container size (if applicable), and details of installation, tables and maps showing the locations of all plants, access information, site condition information and any other pertinent details.

A series of photo-documentation points at the start and end of 30-meter vegetation transects located within representative vegetation communities and elevations will be established and permanently monumented to document growth over time. To protect newly established vegetation from potential trampling, transects will not be established until Year 2 (after the Year 1 PEP is successfully completed). During the Year 1 PEP, permanent photo points will be established and the photo points will be revisited each year during the six-year project. Photos will be retaken annually. Data will be collected at 1-meter intervals from the start to end resulting in 31 total points per transect (mapped via GPS) and include but not be limited to: species present, condition/height, native/non-native.

6.4.2 Native Tree Replacement Planting Mitigation, Maintenance and Monitoring Plan

The Native Tree Replacement Planting Mitigation, Maintenance and Monitoring Plan provides information needed to evaluate the impacts and benefits associated with the restoration of Topanga Lagoon. At this stage of the planning process, 30% design alternatives provide the limits for assessing loss of native and non-native trees for use with the CDP application and CEQA analysis. A total of 635 trees are located within the Project area at the lagoon and along the graded portion of TCB. Of these, 292 native trees of which 277 are of protected size plus 15 undersized that could potentially grow into protected size prior to implementation, and 343 are non-native trees representing 36 species in varying degrees of health with 252 located within the proposed lagoon project area. Once a preferred alternative is identified, it will be possible to further refine the numbers of protected native trees that will be removed or encroached upon, the benefits of removing invasive non-native trees and Arundo, and proposed locations for mitigation restoration plantings. The overall project goal is to restore native riparian and transitional upland habitat while retaining as many native trees along the existing wetted edges of the creek channel as possible. A fuel modification plan, native tree and habitat restoration plan, mitigation and monitoring plan will also be refined once the preferred alternative is identified. This report documents the condition of the native trees that will be used to develop the additional plan documents required (see Appendix X).

At minimal, annual reporting will include tree photos taken in fall each year prior to preparation of the annual report to illustrate condition at the end of each monitoring year. The Baseline Native Tree Replacement Report will also include a map of all tagged trees, species, size, condition, canopy cover, and GPS coordinates. This table will be set up to allow additional notation of growth and condition over time, as well as document any problems.

6.4.3 Incidental Wildlife Observations

Incidental observations of wildlife within the project restoration site will be documented and included in each annual report. Incidental sightings made during maintenance monitoring visits will also be included. Specific location information (GPS coordinates) will be collected for any sensitive species observed to facilitate submission of California Natural Diversity Database (CNDDB) records, and coordinate with onsite regulatory agencies, as needed. No protocol surveys are proposed as part of this Plan.

6.4.4 Photo Documentation

Photos will be taken from the same photo locations that will be established prior to the start of the project installation phase. Photos will be taken from these same locations as part of all five annual monitoring events and will be included in the respective year's annual report. The photo locations will be recorded with GPS survey points in the field and then mapped on an aerial photograph in the baseline monitoring report (as-built report following the 1-year plant establishment period) and all subsequent annual reports. To visually demonstrate the progress of the restoration effort, photos taken immediately after installation will be included in each report for comparison with the respective year's annual assessment photos.

6.4.5 Functional Condition Assessment

A wetlands condition assessment is proposed to document pre- and post-project conditions and to track progress towards anticipated improvements (i.e., "functional lift) in on-site functions and services. The wetlands condition assessment will follow the methodology of the California Rapid Assessment Method (CRAM) Estuarine Module, *California Rapid Assessment Method for Wetlands Perennial Estuarine Wetlands Field Book*, Ver. 6.1 (CRAM Wetlands 2013), or the most recent applicable CRAM module.

A CRAM assessment will be conducted prior to project installation (i.e., baseline condition) and twice during the five-year maintenance and monitoring period (i.e., during Year 4 and final Year 6) to determine whether the project has developed the target functions and services. At the end of six years, the overall post-restoration CRAM score will be compared to the baseline CRAM assessment score. Results from the Year 6 CRAM assessment will be included in the Year 6 final annual report.

6.4.6 Topographic and Bathymetric Surveys

In support of the Technical Report for Hydraulics, Sediment Transport and Sea Level Rise Analyses (Moffatt and Nichol 2022), a baseline topography and bathymetry survey was completed using LIDAR (Light Detection and Ranging) data collected by KDM Meridian Inc. in 2020. After the site grading is complete, the Project Engineer will conduct a new topographic and bathymetric survey to evaluate changes to the lagoon, creek and adjacent restored areas per agency requirements. Transects will be established after 120 days from the completion of implementation and then monitored at the same locations each year for at least five years (or longer based on permit requirements and site condition changes) to allow for comparison over time. While on site, the project engineer will identify any areas of erosion or deposition and survey those areas in addition to established transects, as necessary.

6.4.7 Annual Reports

An annual report will be prepared each year by the Restoration Manager with input from the Restoration Ecologist and Project Engineer during the post-installation five-year monitoring period. The annual reports, which will be submitted to the project landowners and/or RCDSMM and permitting agencies will review qualitative (horticultural), quantitative (botanical), and functional monitoring results, progress of the restoration areas relative to the performance goals, and any recommended remedial measures or adaptive management measures. Annual reports will be submitted to the project landowners and/or RCDSMM and permitting agencies within two months of the completion of a respective monitoring year prior to submittal to permitting agency (note: monitoring period calendar to be determined based on the installation phase completion date and permit requirements). In addition to the information listed above, the annual reports will include:

- A list of names, titles, and companies of persons who prepared the content of the report and participated in monitoring activities
- Figures including representative photographs and permanent viewpoint location photographs depicting site restoration progress over time

- Maps identifying creation/restoration areas, monitoring locations, photo point locations, sampling transects and plots, remedial planting and/or seeding location areas and invasive species removal areas, as appropriate
- A list of native and non-native species detected in all restoration areas, including any sensitive plant or wildlife species that may be detected. Specific location information for sensitive species will be collected (date, time, GPS location, habitat type, species comments)
- Maps, tables, and text to illustrate required establishment metrics and annual status updates. (This will include but not be limited to irrigation information, invasive removal information, levels of effort for staff and volunteers to maintain site, condition and percent cover based on monumented vegetation transects for each vegetation community, establishment relative to performance goals, remedial measures implemented, etc.)
- Native Tree Report documenting condition of each retained and planted tree according to requirements of the CDP and project approvals.
- Adaptive Management Recommendations and Actions Implemented

6.5 Performance Goals

Performance goals are provided to verify the jurisdictional aquatic (wetland) restoration areas achieve desirable characteristics within three to five years. The same performance goals can be used to track the progress and establishment of the upland sage scrub revegetation areas. The performance goals are based on the site's ecological conditions, composition of the native natural communities on-site, experience on other similar projects, and reasonable expectations regarding the intended condition of created/restored and enhanced native habitats after five years. Yearly performance goals are provided as milestones to help determine if the restored habitats are on an adequate trajectory, and if remedial measures and adaptive management are necessary to meet final performance goals. A combination of both mapped and tabular qualitative, quantitative, and functional monitoring results will determine if performance goals are being met and if measures need to be adjusted or implemented to meet those final goals. For example, the amount of potential re-planting and/or re-seeding would be determined by the site's performance and the recommendations of the Restoration Ecologist.

6.5.1 One-Year Establishment Period

Success at the end of the 1-Year PEP will be met if targeted non-native invasive species cover is less than 1.0 percent, other non-native cover is less than 10.0 percent, there is at least 5 percent cover from hydroseeding. 95% survivorship of container stock within planting areas will be required, and no erosion- or trash (construction debris, etc.) related issues.

6.5.2 Five-Year Maintenance Period

Annual performance goals have been set to track the progress of the restoration effort. These performance goals are summarized in **Table 18** below and are described in the following text. The performance standards are focused on the jurisdictional aquatic (wetland) restoration areas but will also be used to track the progress of all restoration areas including coastal sage scrub/upland habitat. In addition to tables documenting each metric, maps will be prepared annually to visually identify changes over time and specifically address native tree permit requirements.

TABLE 18
PERFORMANCE GOALS

Milestone	Performance Goals[1]	Remedial Measures
Year 1 Grading, Site Preparation, Initial Treatment and Removal of Invasive Species and other Non-Natives, Installation of BMPs and Temporary Irrigation System, and Planting and Seeding, 1-Year Plant Establishment Period	All invasive species initially treated and/or removed (i.e., ≤1% cover) and other non-natives adequately controlled (i.e., ≤10% cover); erosion control in place as needed; no trash; Native trees to be retained are properly fenced as required to edge of protected zones. ≥5% hydroseed cover, container plant survival ≥95%, Total native cover should be 5%.at the end of th Year 1 PEP.	Install erosion control measures; remove trash and debris, and treat and removal additional non-native species as needed
	Container plant survival ≥95%, total native absolute cover from planted, seeded, and volunteer species of ≥5%; total invasive species of ≤1% and total non-native cover of other non-native species ≤10%; no erosion or trash.	Re-plant and re-seed if necessary; intensify control of non-native species as needed; repair erosion; remove trash
Year 2	Native trees retained and mitigation plantings will have ≥95% survival. Total native cover should be 20%.at the end of Year 2.	
Year 3	Container plant survival ≥90%, total native absolute cover from planted, seeded, and volunteer species of ≥20%; total invasive exotic species of ≤1% and total non-native cover of other non-native species ≤10%; no erosion or trash; Native trees retained, and mitigation plantings will have >95% survival.Total native cover should be 30% at the end of Year 3.	Same as above, as necessary
Year 4	Total native absolute cover from planted, seeded, and volunteer species of >35%; at least 14 native species (species richness); total invasive exotic species of ≤1% and total non-native cover of other non-native species ≤10%; no erosion or trash; reduced irrigation. Native trees retained and mitigation plantings will have ≥95% survival.Total native cover should be 50% at the end of Year 4.	Same as above, as necessary
Year 5	Further reduced temporary irrigation; total native absolute cover from planted, seeded, and volunteer species of ≥55%; at least 16 native species (species richness); total invasive exotic species of ≤1% and total non-native cover of other non-native species ≤5%; no erosion or trash Native trees retained, and mitigation plantings will have ≥95% survival.Total native cover should be 60%	Same as above, as necessary
Year 6	No temporary irrigation: total native absolute cover from planted, seeded, and volunteer species of ≥75%; at least 16 native species (species richness); total invasive exotic species of ≤1% and total non-native cover of other non-native species ≤5%; no erosion or trash Native trees retained, and mitigation plantings will have ≥95% survival. Total native cover should be greater or equal to 75%.	Same as above, as necessary

[1] Invasive species are defined as species listed as “Moderate” or “High” threats to California wildlands by the California Invasive Plant Council (Cal-IPC 2020) and based on site conditions and observations.

Container Plant Survival

Container plantings should have at least 95 percent survival during the 1-Year PEP and Maintenance Year 2, and 90 percent survival for Maintenance Year 3. All native trees will be monitored according to permit requirements to ensure establishment of the total number of mitigation trees required for each species. If mortality of the original plantings exceeds these thresholds, they will be replaced at least annually by the Maintenance Contractor with appropriate species approved by project landowners and/or RCDSMM and Restoration Ecologist unless the plants are replaced by natural recruitment. Container plant survival will only be assessed for the first two years because after that time it can become difficult to differentiate accurately between container plantings and volunteers. Although container plant survival thresholds are not proposed beyond Maintenance Year 3, supplemental planting and/or seeding after Maintenance Year 3 may still potentially be needed if native plant cover is below annual performance goals.

Species Richness

Species richness and recruitment are closely linked. Species richness is the number of species present in an area – the higher the number of species, the greater the richness. Recruitment is the successful, natural reproduction, and/or establishment of plants. When recruitment is achieved by many species, richness and overall diversity will increase. No species richness goals are provided during Years 1-3 while the planting and seeding sites are in their early stages of establishment. For Year 4, the species richness goal is presence of at least 14 native species in the respective riparian and upland habitats. For Maintenance Years 5 and 6, the species richness goal is at least 16 native species in these habitats. If species richness goals are not achieved, the Restoration Ecologist will determine if the habitat conditions (including species richness) are established as desired, or if supplemental planting and/or seeding may be recommended.

Native Vegetation Cover

Performance goals for native cover are based on current observations of native cover within adjacent, habitat as well as the fact that native wetland upland habitats will take time to develop before it mirrors the stature of the mature, surrounding habitat. Native cover goals for Maintenance Years 1 PEP and Year 2 are modest (i.e., 5% and 20%, respectively) because above-ground native plant growth tends to be low in the early stages of revegetation as plants and their root systems become established. Native plant annual cover goals progressively increase to a final Maintenance Year 6 goal of ≥75 percent. If the establishment of native cover is not on track to meet interim or final goals, corrective measures (e.g., re-planting, re-seeding, adding cuttings, hand watering, and/or increasing removal of non-native species) should be implemented.

Native Tree Survival

Native tree survival may be required to be 100% for any mitigation trees by the end of seven years for oaks and 10 years for all other native tree species if the County tree protection guidelines are fully incorporated into the CDP and other project permits. Note that this extends beyond the six-year project maintenance and monitoring schedule identified here.

Non-Native Vegetation Cover

Effective treatment and control of non-native plants is a critical factor in the establishment and success of native habitat restoration projects. As the restoration successional process occurs and the revegetation effort takes hold, non-native species presence and cover should decrease due to treatment and removal of these species and expanding cover by native vegetation. In the 1-Year PEP, and Maintenance Years 2 through 6, targeted invasive species should account for no more than 1 percent cover. In Years 2 through 4, other non-native species should account for no more than 10 percent cover; and in Years 5 and 6, no more than 5 percent cover.

Conditional Assessment

A CRAM evaluation of the restoration project site will be included as part of the Year 4 and final Year 6 monitoring report. The five-year CRAM score projection will be treated as target scores. As discussed in Section 7.4.4, to determine whether the project has developed the target functions and services, the three and five-year CRAM score will be compared to the baseline CRAM assessment score. For the wetland creation and restoration portions of the project, results of the CRAM assessment during Year 4 and Year 6 will be compared to the baseline results and proposed assessment target goals.

7.0 Completion of Restoration

7.1 Notice of Completion

Once the Project has completed the Plan and met the performance goals as presented in a final project establishment monitoring report, the project landowners and/or RCDSMM will notify and coordinate with the permitting agencies to obtain concurrence and request a Notification of Completion. If requested, a site visit may be conducted with the responsible agencies to verify project site conditions. Prior to Project completion, any remaining non-biodegradable materials (e.g., temporary fencing, etc.) from the project site will be removed. The Project site may qualify for early approval if final performance goals are met, and the site has been off supplemental irrigation for at least two growing seasons prior to final approval.

7.2 Long-Term Management – Operations and Maintenance

Once the site has met the five-year performance goals and has been signed off by the permitting agencies, long-term management will be the responsibility of project landowners and their contractors. Specific management activities for the restoration Project include providing long-term maintenance and monitoring, vector control, trash removal, and non-native vegetation control, as described below.

7.2.1 Site Access and Public Access

The project landowners and/or RCDSMM staff, including designated contactors and consultants, shall have access to the site for maintenance and monitoring related activities, or as otherwise authorized.

7.2.2 Trash

Trash removal would occur as needed within the restored wetlands and uplands by hand. Trash removal would be needed after major storm events or the first storm of the season when trash is washed from the watershed down to the Lagoon. The project landowners and/or RCDSMM will coordinate with applicable resource agencies to obtain necessary approvals and/or authorizations prior to sending work crews into sensitive wetland areas to remove trash and debris within Topanga Lagoon.

7.2.3 Non-Native Vegetation Cover

Removal of invasive species should occur on site in perpetuity using methods similar to those used during implementation unless the State or County identify other preferred methods.

7.2.4 Potential Environmental Stressors

Other stressors that have the potential to negatively affect the habitat quality of the project site include, but are not limited to: fire, flood, excessive erosion or aggradation, significant streambed migration, or effects from adjacent or upstream land uses.

Should affects from environmental stressors or events be observed, the project landowners and/or RCDSMM shall perform an analysis to identify the effects of the stressor(s) and apply an adaptive management approach to formulate remedial action(s) intended to support dynamic habitat equilibrium and wildlife use of the project site. Depending on the nature of the stressor, consultation with additional regulatory agencies and/or specialists may be warranted. Any adaptive management, remedial action, or regular management activity performed shall be implemented in accordance with applicable regulatory guidelines.

Climate change is likely to produce dryer conditions and more intense and frequent rain events that could impact the site. Several studies have been conducted to estimate the potential impact of climate change on specific climate stressors including temperature and rainfall, and secondary impacts of those stressors such as wildfires, droughts, and flooding. California's Fourth Climate Change Assessment (Fourth Assessment) is a regionally focused example of a regular series of broader assessments and studies, including the U.S. National Climate Assessment (NCA) and global assessments from the Intergovernmental Panel on Climate Change (IPCC). The Fourth Assessment includes a set of state-funded research reports that examine how climate change will affect specific sectors, potential responses to climate change, and other policy-driven questions. With respect to rainfall trends, the Fourth Assessment Los Angeles Region Report says, "Despite small changes in average precipitation, dry and wet extremes are both expected to increase. By the late-21st century, the wettest day of the year is expected to increase across most of the LA region, with some locations experiencing 25-30% increases under RCP8.5. Increased frequency and severity of atmospheric river events are also projected to occur for this region." (Hall et al. 2018). Overall, drought severity will increase especially in arid regions such as Southern California (He et al. 2018).

With respect to temperatures, "Temperature is projected to increase, by 5˚F to 10 ˚F by the end of the 21st century. Along with mean temperature, heat wave frequency will increase, with more

intensity and longer duration. Marine layer clouds can help to mitigate the impacts of temperature change in the coastal regions, though these clouds are not well represented in climate models requiring further research."

For Topanga Lagoon, dryer conditions with climate change could potentially lead to lower groundwater levels and lower dry-season base flows; however, wet-season flows could increase due to wetter winters and/or increases in extreme rainfall and, as discussed further below, sea level rise is expected to increase groundwater levels. For wet-weather conditions with climate change, more intense and more frequent extreme rainfall and creek flow events could increase sediment delivery from upstream to the Lagoon. Warmer, drier summers could also lead to increased fire frequency, further increasing sediment loads.

Sea level in Los Angeles County is expected to rise in the future (Noble 2016). State guidance from the California Ocean Protection Council provides a range of probabilistic projections for sea level rise that correspond to varying levels of risk aversion: low (approximately 1.1 feet by 2050 and 3.3 feet by 2100) to medium-high (approximately 1.9 feet by 2050 and 6.8 feet by 2100) and extreme (2.6 feet by 2050 and 10.0 feet by 2100). The low risk aversion projection is appropriate for lower consequence projects (e.g., unpaved coastal trails, open space projects). The medium-high risk aversion projection can be used for medium to high consequence projects (e.g., coastal housing development). The extreme risk aversion projection is appropriate for high consequence projects (e.g., coastal power plant, wastewater treatment plant, etc.). Sea level rise is expected to increase the beach berm elevation and increase water surface elevations in Topanga Lagoon (Moffatt & Nichol 2020). Groundwater levels are projected to increase with sea level rise based on U.S. Geological Survey (USGS) modeling (Befus et al. 2020).

7.3 Funding

The project landowners and/or RCDSMM will identify a source(s) of implementation and long-term maintenance funding, through additional State and/or Federal grant opportunities for wetland restoration.

8.0 Remediation Measures

8.1 Adaptive Management

Adaptive management will be implemented, as needed, to maintain restored wetland and upland vegetation communities and suitable conditions to support and sustain endangered fish habitat. Adaptive management is defined, for the purposes of this project, as a flexible, iterative approach to the management of biological resources, directed over time by the results of ongoing monitoring activities and direct observation of environmental stressors that may be producing adverse results within the project site. Adaptive management will include the utilization of quantitative monitoring data and qualitative assessments in the field monitoring to determine if adaptive management measures are needed. Following an event, such as wildfire, flooding, erosion and sedimentation that causes damage to all or part of the project site, these data will be used in part to drive management considerations for repair of damaged areas. Achieving the key goals of project completion and supporting healthy, self-sustaining native vegetation communities

and suitable conditions for endangered fish habitat will be the focus of all adaptive management decisions. As outlined above, long-term monitoring and control of non-native invasive species should be implemented in perpetuity, to ensure that non-native species do not become re-established in the project area and ecological functions of restored habitat is maintained.

8.2 Natural Disaster

Should the project site be impacted due to a natural disaster such as fire or flood (i.e., catastrophic event), the project proponent will not be held fully responsible for resulting effects and impacts outside the proponent's control. If a natural disaster occurs, the project landowners and/or RCDSMM, Restoration Manager and Restoration Ecologist will monitor site conditions including safety considerations (i.e., erosion and further flooding) and the degree of natural recruitment of native habitat (i.e., from resprouting of planted areas and volunteers). Native plant natural recruitment will be utilized to the extent feasible. If natural recruitment by itself is not sufficient to meet project goals, the project landowners and/or RCDSMM will develop proposed remedial measures to improve site conditions. If complete attainment of performance goals is not possible (i.e., via natural recruitment and implementation of feasible remedial measures) under the changed conditions, the project landowners and/or RCDSMM will consult the regulatory agencies to agree on follow-up actions and reasonable expectations for successful completion of the restoration Project.

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Appendix A

Topanga Lagoon Restoration Alternatives Analysis Report

Report
Produced for Resource Conservation District of the Santa Monica Mountains
November 18, 2022

moffatt & nichol

TOPANGA LAGOON RESTORATION

Alternatives Analysis Report

Document Verification

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Table of Contents

1 Project Description 1
1.1 Project Background 1
1.2 Project Objectives 2
1.2.1 Physical Objectives 2
1.2.2 Biological Objectives 2
1.2.3 Archaeological, Historic, and Cultural Objectives 3
1.2.4 Integration of Public Access, Emergency, and Visitor Services 3
1.2.5 Management and Maintenance Objectives 3
2 Alternatives 4
2.1 Alternative 1 – No Project/No Build – Managed Decline 5
2.2 Alternative 2 – Maximum Lagoon Habitat, Removal of Motel 5
2.3 Alternative 3 – Limited Lagoon Habitat Expansion, Retention of Motel 6
2.4 Alternative 4 – Maximum Managed Retreat, Partial Motel Retention 6
3 Alternatives Analyses 11
3.1 Alternative Concept 1 – No Project/No Build - Managed Decline 13
3.1.1 Hydraulics/Hydrology 13
3.1.2 Sediment Transport 14
3.1.3 Lagoon/Ocean Interface Dynamics 14
3.1.4 Surf Break 15
3.1.5 Water Quality 15
3.1.6 Vegetation 16
3.1.7 Biological Resources 18
3.1.8 Recreational Opportunities 18
3.1.9 Infrastructure Changes Required 18
3.1.10 Long-Term Management Issues 19
3.1.11 Sea Level Rise and Coastal Resilience 19
3.1.12 Relative Costs 19
3.2 Alternative 2 - Maximum Lagoon Habitat, Removal of Motel 20
3.2.1 Hydraulics/Hydrology 20
3.2.2 Sediment Transport 20
3.2.3 Lagoon/Ocean Interface Dynamics 21
3.2.4 Surf Break 21
3.2.5 Water Quality 21
3.2.6 Vegetation 22
3.2.7 Biological Resources 22
3.2.8 Recreational Opportunities 22
3.2.9 Infrastructure Changes Required 23
3.2.10 Long-Term Management Issues 23
3.2.11 Sea Level Rise and Coastal Resilience 23
3.2.12 Cost Estimates 24
3.3 Alternative 3 - Limited Lagoon Habitat Expansion, Retention of Motel 25
3.3.1 Hydraulics/Hydrology 25
3.3.2 Sediment Transport 25
3.3.3 Lagoon/Ocean Interface Dynamics 26
3.3.4 Surf Break 26
3.3.5 Water Quality 26
3.3.6 Vegetation 26
3.3.7 Biological Resources 27

3.3.8 Recreational Opportunities 27
3.3.9 Infrastructure Changes Required 28
3.3.10 Long-Term Management Issues 28
3.3.11 Sea Level Rise and Coastal Resilience 28
3.3.12 Cost Estimates 29
3.4 Alternative 4 – Maximum Managed Retreat, Partial Motel Retention 29
3.4.1 Hydraulics/Hydrology 29
3.4.2 Sediment Transport 30
3.4.3 Lagoon/Ocean Interface Dynamics 31
3.4.4 Surf Break 31
3.4.5 Water Quality 31
3.4.6 Vegetation 31
3.4.7 Biological Resources 32
3.4.8 Recreational Opportunities 32
3.4.9 Infrastructure Changes Required 32
3.4.10 Long-Term Management Issues 33
3.4.11 Sea Level Rise and Coastal Resilience 33
3.4.12 Cost Estimates 34
3.5 Summary of Alternatives Analyses 34
4 References 36
Appendix A: Habitat Maps

List of Figures

Figure 1-1: Project Vicinity Map 1
Figure 1-2: Project Location and Extent 2
Figure 1-3. Study Area Land Ownership 1
Figure 2.1: Alternative 1 – No Project/No Build – Managed Decline 7
Figure 2.2: Alternative 2 – Maximum Lagoon Habitat, Removal of Motel 8
Figure 2.3: Alternative 3 – Limited Lagoon Habitat Expansion, Retention of Motel 9
Figure 2.4: Alternative 4 – Maximum Managed Retreat, Partial Motel Retention 10

List of Tables

Table 3-1. Summary of Habitat Acreages for all Alternatives 17
Table 3-2: summary of Construction cost estimates (Million) 34
Table 3-3: General performance Ranking based on technical analyses 35

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Glossary

cfs	Cubic feet per second
cms	Cubic meter per second
cy	Cubic yard
CO-OPS	Center for Operational Oceanographic Products and Services
CoSMoS	Coastal Storm Modeling System
DHI	Danish Hydraulic Institute
FIB	Fecal indicator bacteria
FM	Flexible Mesh
fps	Feet per second
ft	Feet
LACDPW	Los Angeles County Department of Public Works
LARIAC	Los Angeles Region Imagery Acquisition Consortium
MHHW	Mean Higher High Water
MLLW	Mean Lower Low Water
MM2	Mile Marker 2
M&N	Moffatt & Nichol
OPC	Ocean Protection Council
PCH	Pacific Coast Highway
RCDSMM	Resource Conservation District of the Santa Monica Mountains
SLR	Sea Level Rise
sq ft	Square foot
TAC	Technical Advisory Committee
TCB	Topanga Canyon Boulevard

1 Project Description

1.1 Project Background

Topanga Lagoon is a currently 0.56-acre lagoon in the Topanga Creek watershed in Los Angeles County, as shown in Figure 1-1 and Figure 1-2. Figure 1-2 shows the project boundary including a potential offshore disposal site. The historic lagoon at the mouth of Topanga Creek once covered almost 30 acres. In 1933, all but less than 1 acres were filled by Caltrans when Pacific Coast Highway (PCH) was re-aligned. This destroyed 93% of the lagoon wetland habitat area, completely changed existing biogeochemical processes, and severely impacted its function. This reduction in acreage resulted in devastating loss of habitat, nearly eliminating biodiversity of wetland flora, compromised water quality, and constrained flows that limit natural hydrologic and sedimentation processes from occurring. Existing downstream creek, lagoon, and PCH Bridge conditions severely limit flood conveyance to the sea, impede fish passage, prevent natural geomorphic processes from occurring, and generally limit the lagoon to function as a flood control conveyance feature rather than the genuinely sensitive and rare habitat area that it once was.

This project is intended to restore as much of the historic lagoon's wetland area, high quality, and effective function possessed as possible given current conditions. The process involves evaluating existing lagoon conditions and developing alternatives to that condition that replace lost habitat, processes, and functions; thus, restoring lost natural conditions. This report presents the existing condition and alternatives to that condition and provides an evaluation of each so that the superior alternative can be identified.

FIGURE 1-1: PROJECT VICINITY MAP

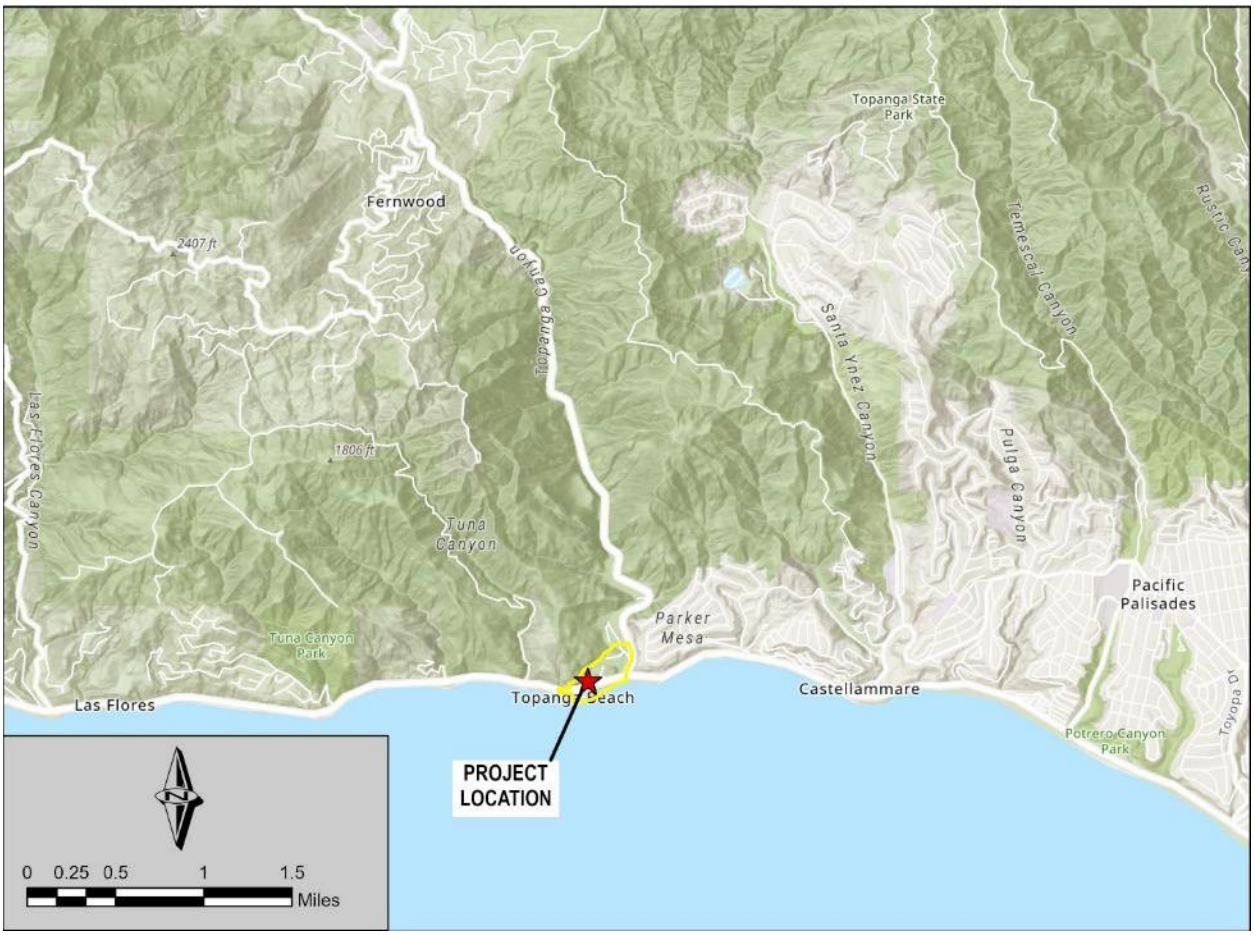
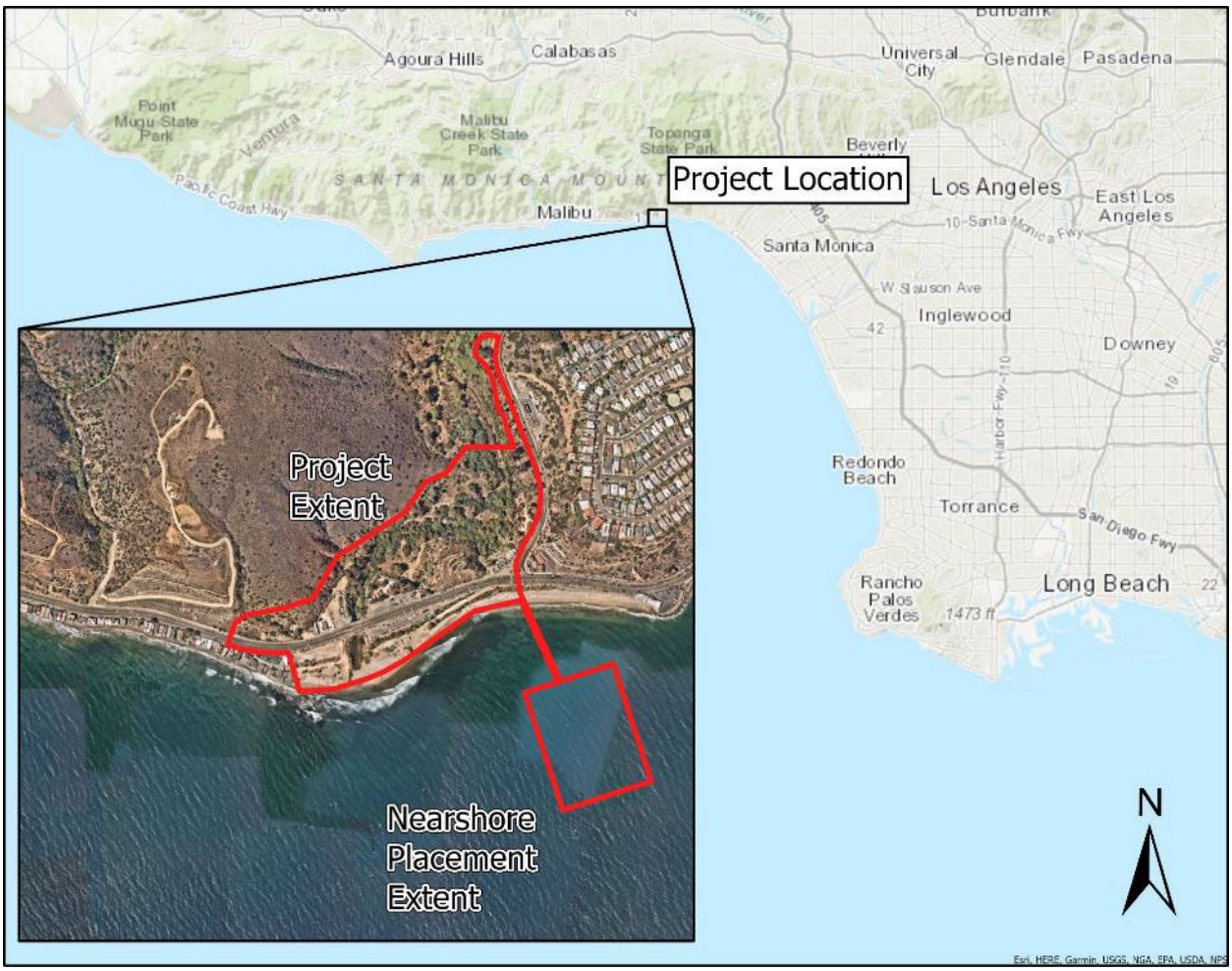


FIGURE 1-2: PROJECT LOCATION AND EXTENT



Despite its constrained condition, the lagoon supports the last remaining reproducing population of federally listed southern steelhead trout (*O. mykiss*) in the Santa Monica Bay and is considered a Core 1 high priority for restoration in the Southern California Steelhead Recovery Plan (NMFS 2012). There is also a population of federally endangered tidewater goby (*E. newberryi*) that re-colonized in 2000 that now represents one of the few reproducing and relatively stable populations in Southern California. Finally, Topanga Beach is a consistently important spawning site for California grunion (*L. tenuis*), which, although not a listed species, is both locally and regionally significant. Protecting and supporting the persistence of these important aquatic species has been identified as a priority goal in numerous planning documents.

In 2002, the final Topanga Creek Watershed and Lagoon Restoration Feasibility Report was completed for the Resource Conservation District of the Santa Monica Mountains (RCDSMM and M&N 2002). The study provided the basis for coordinated restoration and management of Topanga Lagoon and other features unique to the watershed. The 2002 report also analyzed ways to improve water quality at Topanga Beach, improve habitat for endangered fish and other aquatic species, reduce the flood hazard within the lower watershed, and improve recreational opportunities without changing the surf break. Four lagoon restoration alternatives (including the no build alternative) were evaluated based on meeting those objectives and their modeling performance.

In the years between 2002 and 2019, California State Parks acquired 1,625 acres of land in lower Topanga watershed, including a significant portion of the lagoon. The newly acquired land increased the extents of Topanga State Park from PCH to the hills of San Fernando Valley. While the General Plan and Environmental Impact Report (EIR) are being developed for the expanded park, an important alliance was

also developed between the RCDSMM and State Parks. The two agencies have worked closely together in coordinating lagoon restoration efforts. Figure 1-3 shows land ownership of the study area.

In 2019, RCDSMM began to build on previous studies and perform additional analyses including hydrologic/hydraulic modeling, sedimentation, fish passage/beach berm breaching, and sea level rise (SLR). These additional analyses are complete. A 30% plan set for the proposed alternative is developed.

Lagoon restoration alternatives that were developed in the 2002 Feasibility Report were further refined. All new alternatives propose expanding wetland, transitional, and upland habitat by grading radiating out from the edge of the existing wet limits. None of the proposed alternatives impact the archaeological resources and all are designed to protect existing lagoon habitat for tidewater gobies. Natural lagoon inlet breaching patterns based on rainfall is also preserved. The fill on the west side of the lagoon will be removed and provide an opportunity for implementing dune habitat and living shoreline protections. Except for the no build alternative, each lagoon restoration alternative includes replacing the existing bridge at PCH and Topanga Lagoon. Additionally, there are design elements that are included and evaluated in each alternative that could potentially be incorporated into other alternatives. These elements include: keeping the Caltrans bridge alignment at the current location or shifting to the north; full or partial retention of the Topanga Ranch Motel and some onsite business leases or concessions; inclusion of more than one wetted lagoon channel; expanding existing beach area through bridge realignment; alternative emergency access routes to the beach; and final placement of relocated beach facilities.

FIGURE 1-3. STUDY AREA LAND OWNERSHIP

1.2 Project Objectives

The overarching goal, or purpose, of the Topanga Lagoon Restoration Project is to protect and restore, then maintain via adaptive management, the Topanga Lagoon ecosystem and the adjacent uplands, integrating public access, recreation, and visitor serving needs while protecting important archaeological and cultural resources. Avoiding direct impacts to sensitive biological, archaeological/cultural and lagoon mouth/beach resources during the construction of the restoration has been an additional overarching guiding principle. These two goals can be further refined into five categories of objectives:

1. Physical restoration of lagoon and bar-built estuarine hydrologic functions
2. Biological restoration of habitat and species within the project area
3. Preservation of important archaeological, historic, and cultural resources
4. Integration of public access, emergency, and visitor services
5. Management and maintenance to ensure long-term viability of the restoration efforts

These objectives are further defined below.

1.2.1 Physical Objectives

A. Maintain the storm driven pattern of lagoon mouth breaching to enhance the health and ecological value of the bar-built lagoon.

B. Maintain the existing coastal littoral zone conditions along the beach face and important nearshore cobble shelf to avoid impacts to the surf break.

C. Improve water quality through restored wetland habitat, thereby reducing impacts due to high bacteria counts and the potential for mosquito-borne disease.

D. Reduce current flood problems by lengthening the bridge, removing constraining fill materials, and restoring a more natural lagoon, wetland, and transitional habitat.

E. Provide adequate area for wetland including emergent, transitional, and upland habitats that will support important life phases for endangered and sensitive species including, but not limited to: tidewater goby (*Eucyclogobius newberryi*), southern steelhead trout (*Oncorhynchus mykiss*), CA grunion (*Leuresthes tenuis*), and snowy plover (*Charadrius nivosus*).

F. Avoid, to the greatest extent possible, grading impacts to existing resources while providing the opportunity for expansion of these resources into the future by incorporating managed retreat of developed areas and resiliency for SLR.

1.2.2 Biological Objectives

A. Restore a natural gradient of habitats that considers climate change, anticipated SLR, potential upstream migration, potential for improving water quality, and heterogeneity of habitats based on analysis of historic conditions augmented by modeling of present and potential future conditions.

B. Maintain and enhance existing habitats for native species, such as the sandy lagoon preferred by the federally endangered Tidewater Goby (*E. newberryi*) and optimize fish passage opportunities during the rainy season, as well as expand potentially suitable smolt habitat within the lagoon for Southern Steelhead Trout (*O. mykiss*).

C. Protect and enhance suitable roosting and nesting habitat for the suite of birds currently using the site, as well as expand dune habitat to encourage suitable habitat for endangered snowy plovers.

D. Develop beach maintenance and grooming protocols that will protect breeding CA grunion (*Leuresthes tenuis*) and snowy plovers (*Charadrius nivosus)* if they colonize.

1.2.3 Archaeological, Historic, and Cultural Objectives

A. Avoid disturbance of archaeological or tribal cultural resources by using historical maps and information to define historical topography and lagoon/upland interface and then designing around those areas having the potential to contain cultural materials and/or human remains.

B. Site new bridge footings outside known areas of concern to the greatest extent feasible.

C. Identify options to rehabilitate and reconstruct historical resources for visitor-serving amenities.

D. Develop an interpretive plan to share site history with the public.

1.2.4 Integration of Public Access, Emergency, and Visitor Services

A. Maintain public access to the restored lagoon, beach, and transitional habitats that are consistent with resource protection needs and requirements.

B. Maintain sufficient parking and enhance public transportation access opportunities.

C. Maintain and improve pedestrian access from north of PCH to the beach.

D. Examine feasibility for overnight accommodations, including potential for adaptive reuse of the historic Topanga Ranch Motel.

E. Upgrade septic (or sewer) capacity for all visitor serving elements.

F. Maintain and improve emergency services (helipad, wildfire turnaround, lifeguard visibility, and access).

G. Promote educational opportunities consistent with resource protection needs and requirements.

H. Identify opportunities for other visitor serving concessions.

1.2.5 Management and Maintenance Objectives

A. Develop a cost-effective management and maintenance plan for supporting the proposed habitat enhancements, control of exotic species, and maintaining existing functional habitat for endangered fishes.

B. Design and implement a biological and hydrological monitoring program to assess the success of restoration efforts and to inform adaptive management decisions.

C. Identify potential sediment accretion areas and develop plans to avoid the need for future active sediment management.

2 Alternatives

Four alternatives were identified to restore the Topanga Lagoon. Three Build Alternatives (Alternatives 2 through 4) and one No Project/No Build- Managed Decline Alternative (Alternative 1). These alternatives allow consideration of the benefits and challenges of the different restoration approaches, and a final "preferred" alternative will be selected at the end of the environmental review process that best meets the Project's needs while minimizing adverse environmental impacts. The Proposed alternatives provide different road maps to restoring the lagoon area and adjacent seasonally wetted and riparian habitats, buffering its resources from future SLR, providing visitor-serving functions, and meeting the Project objectives.

Under all Project Build Alternatives, the seasonally wetted and riparian habitat areas would be expanded from the existing 0.56 acre to 7 to 10 acres, while the more upland/transition areas would increase from the existing 21.4 acres to between 23 and 24 acres, depending on which alternative is selected. This would require removing much of the historically imported fill on-site to create a more natural topography and expanded open space area. The existing wetted lagoon area and riparian habitats would be protected with grading starting at the outer edge of existing riparian trees, preserving the current lagoon banks and the majority of the existing riparian willows and native hardwoods. Most native trees would be retained throughout the Project area, and the natural breaching pattern of the lagoon would be protected by grading outside the footprint of the existing wetted lagoon and working landward of the beach berm at its mouth.

Under all Project Build Alternatives, the area of Topanga Beach for recreational users would increase with up to 50 ft of additional depth in Alternatives 2 and 3 on the east cove beach, and approximately 90 ft in Alternative 4. This adds between 1.2 to 1.8 acres of additional beach. The construction footprint includes the Topanga Beach lagoon/ocean interface on the landward side of the bar-built sand berm and extends approximately 350 feet upstream into Topanga Creek with removal of fill on both the west and east sides. Under all Project Build Alternatives, the fill material would either be trucked off site for disposal or beneficially reused in a near-shore placement location, subject to approval by USACE.

Under all Project Build Alternatives, the length of the existing 79-foot long Caltrans bridge would be expanded to accommodate a widened lagoon riparian area, which would lower flow velocities to improve adult steelhead migration opportunities and increase refugia areas for tidewater gobies and juvenile steelhead, as well as the quantity and quality of lagoon habitats. To provide for a wider lagoon and improve fish migration and refugia, the existing Caltrans bridge would be replaced with a longer bridge. The main span of the new bridge would increase to 200 feet, with secondary side spans of 130 feet on either side, increasing the total bridge span length to 460 feet. This expanded length provides space for the creek and lagoon to evolve in response to SLR and provides pedestrian access under the roadway on both sides of the lagoon, as only access on the east side is currently available. The existing alignment of the bridge and PCH roadway is maintained for two of the Project Build Alternatives but is relocated slightly to the north in the Alternative 4, as discussed below.

The new bridge would continue to accommodate two lanes in each direction with no expansion of roadway capacity. Traffic flows will also be protected during construction by way of a temporary roadway and bridge alignment. All utilities would be continued during construction, and eventually relocated underground or attached to the new bridge. All phases of construction and staging for the new bridge would be similar under each alternative.

Under all Project Build Alternatives, Native American cultural sites would be protected in place, retaining an appropriate cover over the pre-contact period surface of no less than 2 to 4 feet, and necessarily limiting the lowering of the riparian bottomland surface to actual historic elevations.

Coastal access would be maintained during construction and improved under all Project Build Alternatives. This includes the creation of a trail system through the Project area and provision of pedestrian access under PCH on the east and west sides of the lagoon. Improved parking would be provided along the PCH and TCB corridors. A dirt emergency route from PCH to the beach level would be constructed on the west

side of the lagoon to allow lifeguard access to both limit vehicle usage along the lagoon berm and provide access to the western beach even during times when the lagoon mouth is open. Parking at the beach level would be similar to existing conditions, and would only be accessible to staff, emergency vehicles, and disabled visitor parking spaces. The areas around the existing bus stops would be improved to be more welcoming to public transportation users.

Under all Project Build Alternatives, key DBH facilities on Topanga Beach would be relocated further from the ocean to protect structures from SLR. The existing lifeguard headquarters, beach restroom, and helipad would be demolished and rebuilt closer to the realigned access road, and at a higher elevation. The new buildings would be of similar size and materials to the existing building. A small two-car garage for staff would be added in the improvements. The new helipad site would re-located to the east side of the lagoon for improved access by the lifeguards and emergency responders. The size, setbacks and built elements of the new helipad would conform to all Federal Aviation Administration and Los Angeles County requirements. The permitted onsite wastewater treatment system (OWTS) that services the beach restroom would remain to support the new facility unless a sewer hookup becomes available. The existing parking lot would be modified depending on the alternative. ADA and staff parking and access at the beach level is retained in all alternatives.

A plan for determining the future configuration of the historic Topanga Ranch Motel is included in each of the Project Build Alternatives, as are potential locations for park facilities, concessions, and parking on CDPR property. Currently, the Proposed Project area accommodates authorized and unauthorized parking opportunities. All Project Build Alternatives would modify the existing parking opportunities. In general, additional coastal access parking spaces would be created, but their location and makeup would shift. Less free (and often non-conforming) parking along PCH would be available as parking is not permitted on the longer bridge deck, but would be partially shifted to the TCB corridor. More parking would be available in CDPR and DBH lots, which include new areas on the west side of Topanga Creek and along TCB. Concession parking would be reduced as fewer concessions remain in the project area.

2.1 Alternative 1 – No Project/No Build – Managed Decline

Under this alternative, existing conditions throughout the project area would remain “as-is” in terms of existing functions (or lack thereof) and conditions. Therefore, there would be no change to the lagoon footprint or habitat quality, and no new bridge would be constructed. Damage to the lifeguard headquarters due to coastal erosion would continue to occur and no relocation is included in this “No Project/No Build” alternative. The currently unusable majority of the Topanga Ranch Motel structures would continue to deteriorate without restoration, and existing non-conforming business leases and septic systems would remain in current operation but may be subject to future restriction or cessation of use in the future by enforcement of recent statewide wastewater policy changes. No improvements to habitat would occur. SLR would continue to reduce beach area available and threaten the integrity of PCH. Figure 2.1 shows the existing lagoon topography and the existing 78.6-foot-long PCH Bridge.

2.2 Alternative 2 – Maximum Lagoon Habitat, Removal of Motel

This alternative provides the maximum increase in lagoon, wetland, and riparian bank habitats. It includes restoration of more natural side channels connected to the western side of the existing lagoon based on historic topography and would allow the lagoon system to evolve to accommodate changing sea level and storm surge conditions. The Topanga Ranch Motel and onsite business leases would be removed from the project area and be replaced with riparian and transitional habitats. Partial or full relocation or replacement of public parking, business leases, and overnight accommodations from the current location on the north side of PCH to the west side of Topanga Canyon Boulevard (TCB) in the expanded project area will be developed in the next design phase. There is sufficient space along TCB in that location to replace all the parking that currently exists.

To provide for a wider lagoon and improve fish migration and refugia, the existing Caltrans bridge would be replaced with a longer one along the same road alignment. The span of the new bridge would total 460 feet

(200-foot primary span, with secondary/side spans of 130 feet each), plus an additional span to accommodate an emergency services underpass on the east side if that is included in the next phase of design development. This alternative includes ADA parking spaces on the beach level, with additional recreational parking at the PCH upper level on the south side of PCH only.

The lifeguard headquarters, beach restroom, and helipad would be demolished and rebuilt closer to the realigned access road and to each other on the same beach level. Figure 2.2 presents the proposed grading and bridge of Alternative 2.

2.3 Alternative 3 – Limited Lagoon Habitat Expansion, Retention of Motel

This alternative also provides expanded lagoon, wetland, riparian, and transitional habitat in the west part of the existing creek channel but allows for only the existing main channel within the lagoon area itself. The remaining Topanga Ranch Motel structures are restored in their historic configuration, including relocation of some of the structures from the west side, which is currently experiencing flood and bank erosion. One existing concession (restaurant lessee) would be remodeled and continue operation in place. No other business leases remain. If the emergency underpass is removed as the design evolves, this would provide additional parking on the north side of PCH. Partial or full relocation or replacement of public parking, business leases, and overnight accommodations from the current location on the north side of PCH to the west side of TCB in the expanded project area will be developed in the next design phase. There is sufficient space along TCB in that location to replace all the parking that currently exists.

All the changes to the new 460-foot Caltrans bridge (200-foot center span, with secondary/side spans of 130 feet each) are the same as for Alternative 2. However, the access road alignment is kept slightly to the east. This might change if no underpass is included. Figure 2.3 illustrates the proposed bridge and restored lagoon grading of Alternative 3.

2.4 Alternative 4 – Maximum Managed Retreat, Partial Motel Retention

The alignment of PCH moves north, expanding the maximum amount of beach area and managed retreat from SLR. The portion of the historic Topanga Ranch Motel east of the current motor court access lane is retained. Adjacent parking is adjusted, and a remodeled restaurant lessee would continue to operate, while providing expanded lagoon, wetland, riparian, and transitional habitats, primarily on the west side of the existing channel due to removal of all fill in that western area. No other business leases remain. Partial or full relocation or replacement of public parking, business leases, and overnight accommodation from the current location on the north side of PCH to the west side of TCB in the expanded project area will be developed in the next design phase. There is sufficient space along TCB in that location to replace all parking that currently exists.

Due to the curve of its alignment, the Caltrans bridge has the greatest length under this alternative, though the actual span lengths are similar to the other alternatives with a total of 460 feet consisting of a 200-foot-long center span and a 130-foot side span on each side. This PCH alignment eliminates shoulder parking on the bridge spans but has the greatest number of beach side parking spaces.

The helipad and lifeguard headquarters are arranged with staff, emergency, and ADA parking between these two functions and accommodate sight lines required for the expanded recreational beach area. This alternative maximizes managed retreat, recreational beach area (and/or living shoreline features such as dunes) and provides the most SLR resilience. The proposed bridge of Alternative 4 and the restored lagoon grading are presented in Figure 2.4.

FIGURE 2.1: ALTERNATIVE 1 – NO PROJECT/NO BUILD – MANAGED DECLINE

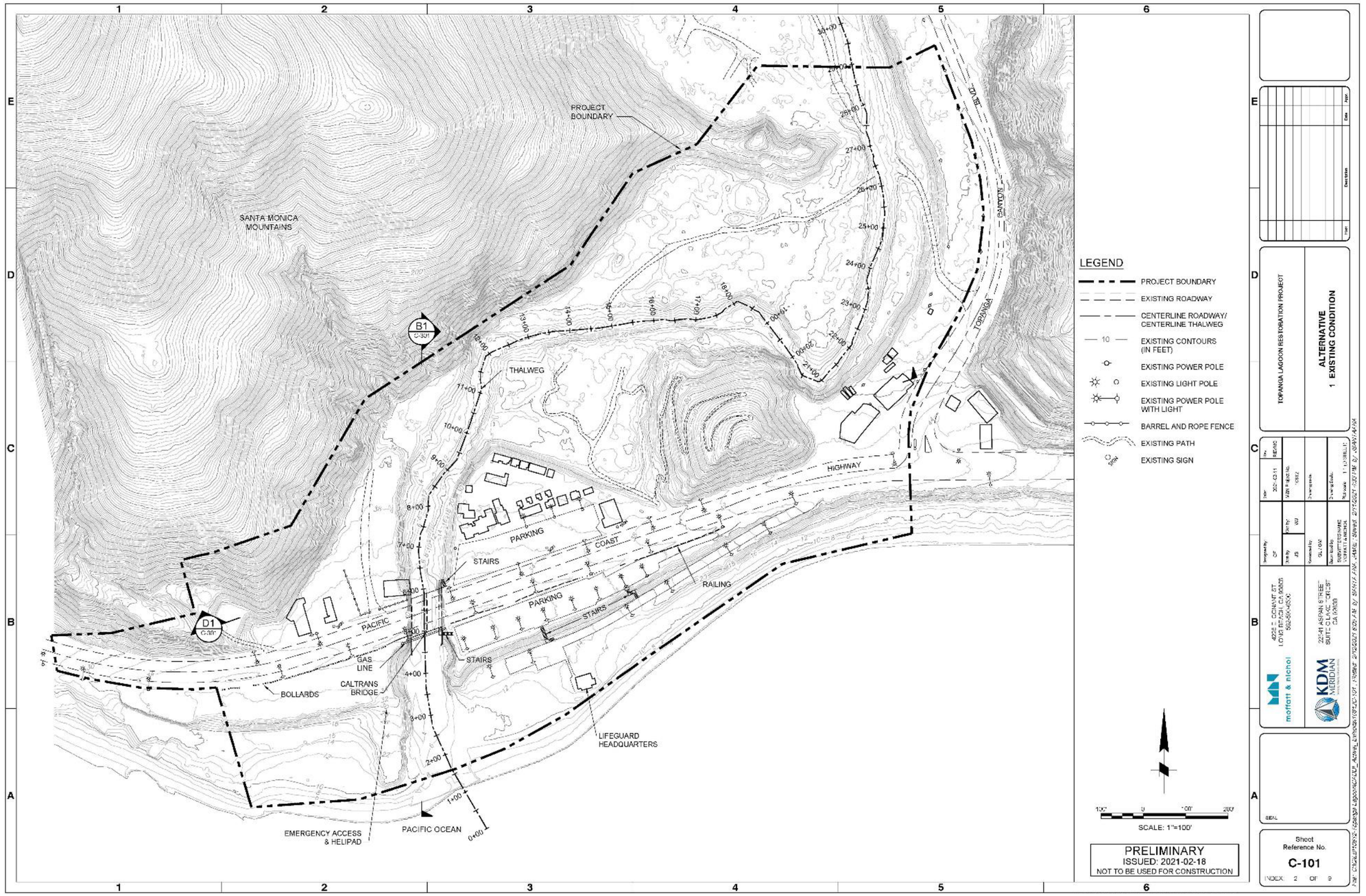


FIGURE 2.2: ALTERNATIVE 2 – MAXIMUM LAGOON HABITAT, REMOVAL OF MOTEL

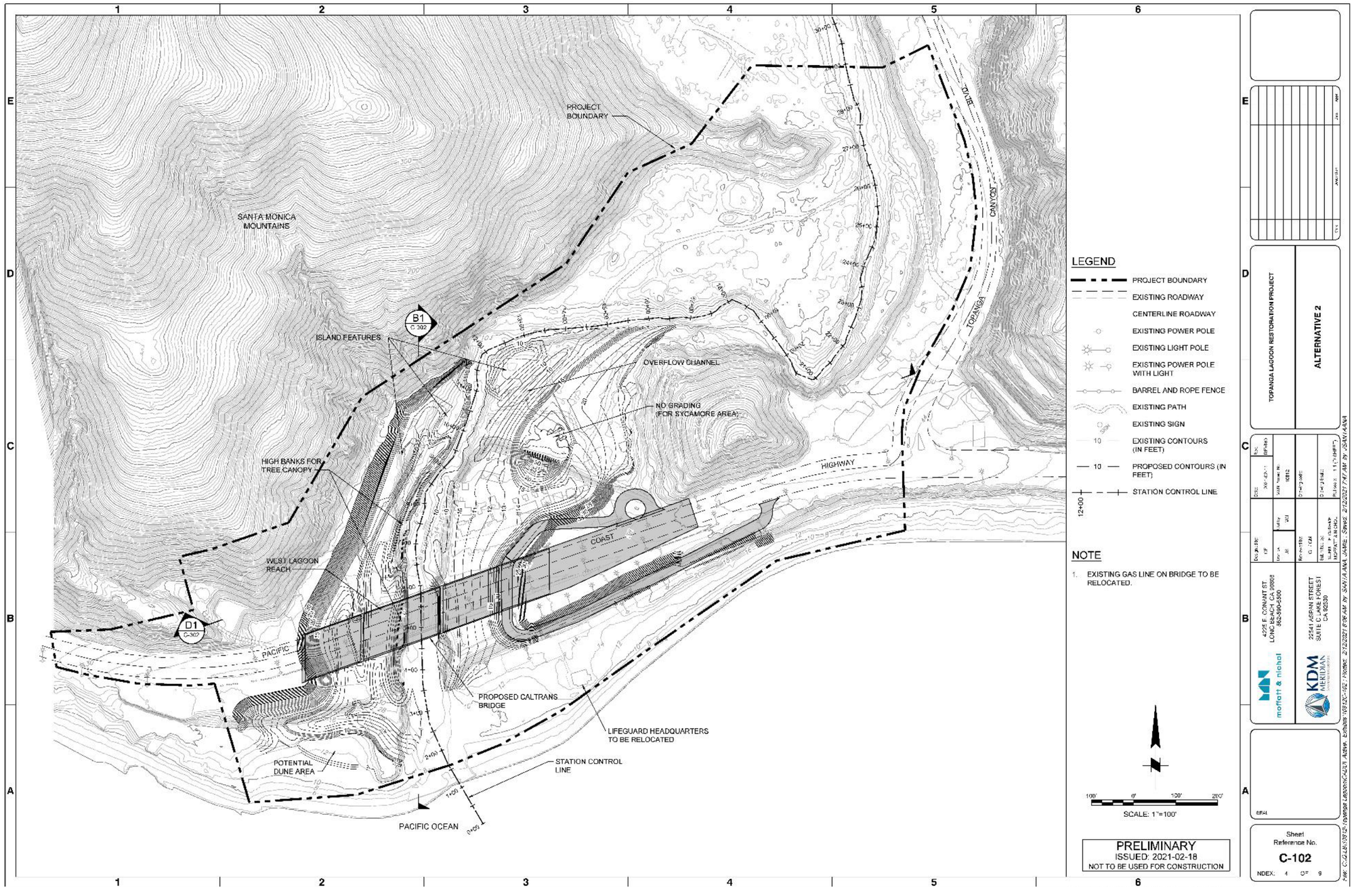


FIGURE 2.3: ALTERNATIVE 3 – LIMITED LAGOON HABITAT EXPANSION, RETENTION OF MOTEL

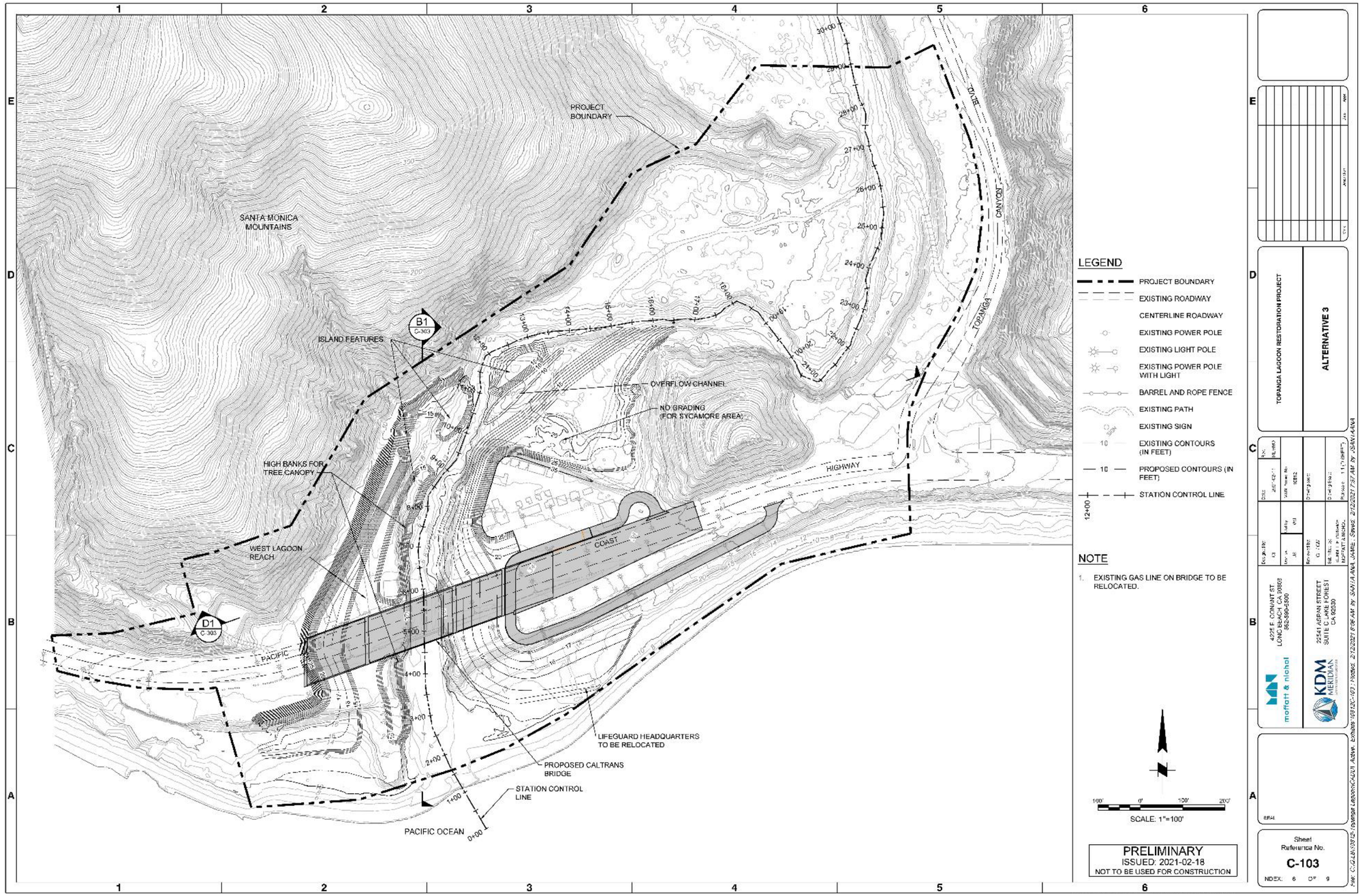
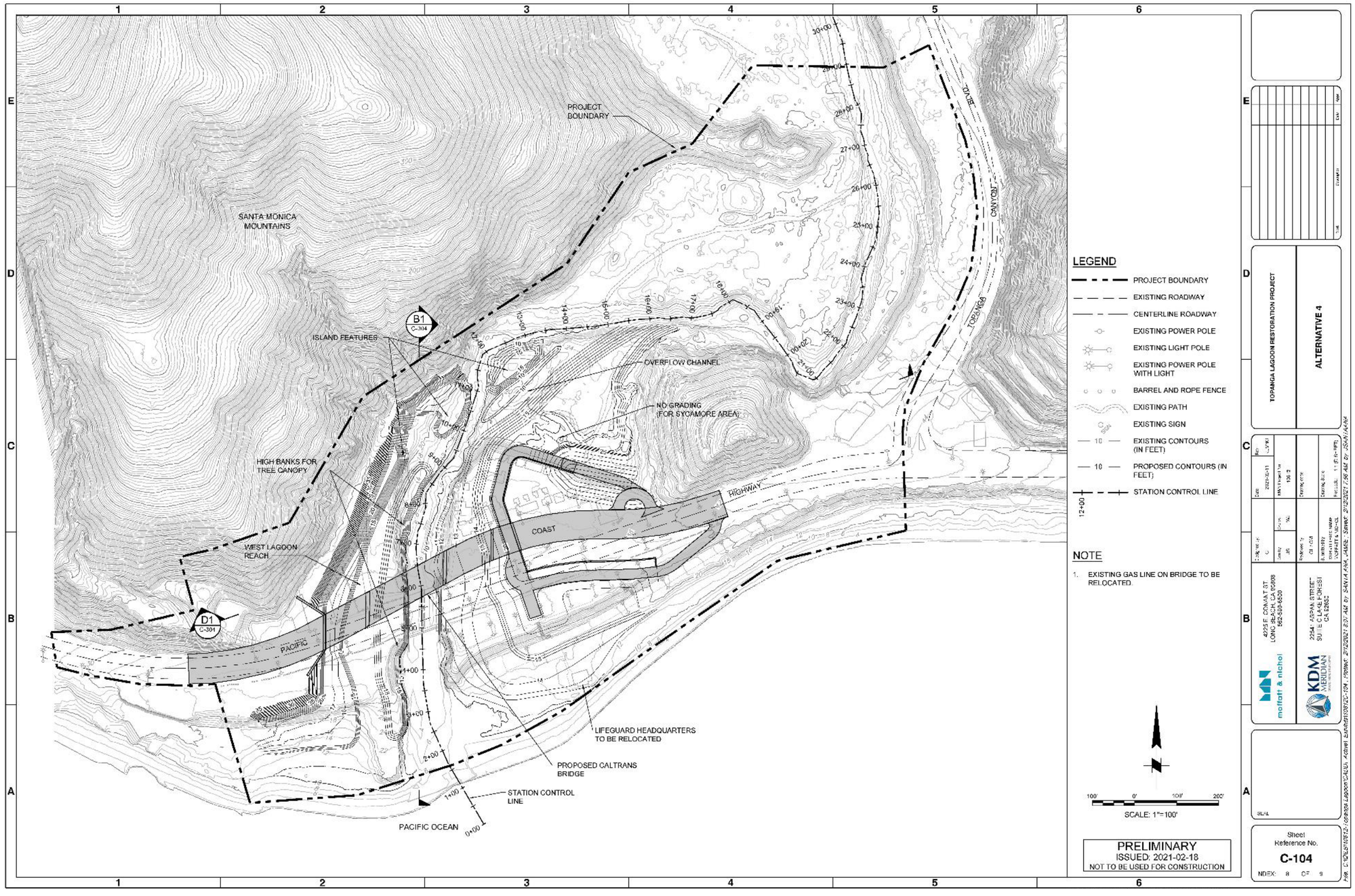


FIGURE 2.4: ALTERNATIVE 4 – MAXIMUM MANAGED RETREAT, PARTIAL MOTEL RETENTION



3 Alternatives Analyses

Prior to human impacts, the lagoon provided almost 30 acres of seasonally and tidally inundated wetlands, and the canyon mouth was unconstrained by roads or fill. The lagoon was substantial enough that the LA Athletic Club purchased the property in 1924 with the intention of creating a small yacht harbor. Changes to the lagoon as a result of installation of the PCH Bridge in 1924 and realignment of the highway in 1933 ultimately reduced the lagoon to its current size of less than 1 acre.

The cross-section under the existing bridge is approximately one-half the size of the cross-section of the bridge prior to the 1933 highway realignment. The current bridge has a cross-sectional area of 1,600 square feet compared to 3,600 square feet for the prior bridge.

The constraints of high fill banks and a narrow creek cross-section under PCH Bridge impede flood conveyance sufficiently to cause backwater of the flood, sedimentation within the creek channel upstream of the bridge, and high flood flow velocities and water elevations as the water is forced through the narrow cross-section. In addition, the channel cross-section can become blocked by large debris during floods.

The proposed alternatives analyzed in this report address the downstream bridge and fill constraints at the lagoon. The 1876 U.S. Coast Survey lagoon map, which illustrates the extent of the lagoon prior to human impacts, was used as the optimal reference for restoring the lagoon to the maximum extent possible. The larger the area available for a system to establish, the better the conditions and chances for it to succeed. Large, undeveloped watershed and lagoon systems evolve to be as efficient as possible under the physical laws of thermodynamics. Small, constrained systems are not able to optimize their processes to become maximally efficient and functional.

Increasing the size of the lagoon and associated habitat areas will enable the system to revert to a more natural condition and closer to the historical condition. More space provides a better opportunity for the entire system to establish functional processes of:

- Hydrology/Hydraulics – with channel meandering and establishment of a more natural gradient, profile, cross-sectional area, and shape;
- Sedimentation – formation of sand/cobble bars from upstream and ocean sources;
- Soil formation – soil structure, horizon development, and nutrient retention for plant roots;
- Vegetation colonization – native plant establishment and sustainability;
- Soil and water chemistry – improved sediment and water quality for native plants and animals;
- Food pyramid – re-establishment of natural trophic levels for higher level species; and
- Faunal colonization – by benthic, fish, crustaceans, birds, and mammals as part of the food pyramid.

These conditions will all lead to restored habitat areas, flood plain processes, and mouth breaching processes. The larger the lagoon, the more space is available for these processes to occur, the more constituents that are available for the building blocks of ecological foundations, and the better these processes can work. The more space that is provided maximizes the freedom they have to be dynamic and evolve. The historic lagoon was as functional as possible (highly functional), considering site constraints of its 30-acre footprint. The existing lagoon is so highly constrained by its 0.56-acre footprint that it is low-functioning and over-run by non-natives that can survive in the impaired conditions. Restoring the lagoon back toward the historic footprint will massively improve the conditions needed for re-establishment of functional natural processes and habitat.

Each of the alternatives was analyzed for their performance according to various criteria using numerical and analytical modelling tools. Criteria include hydraulics/hydrology, sediment transport, lagoon/ocean interface dynamics, surf break, water quality, vegetation, biological resources, recreational opportunities, infrastructure changes required, long-term management issues, SLR, and coastal resilience and relative costs.

Comprehensive technical analyses on hydrology and hydraulics, sediment transport, SLR impacts, beach morphology, and fish passage assessment were conducted for both existing and proposed alternatives. The one-dimensional (1-D) Mike11 model with integrated hydrology, hydraulic, and sediment transport modules is applied for simulating the creek and lagoon hydraulics and sedimentation. The simulation periods include an average flow period (October 1996 to March 2001) and a high flow period (November 1979 to March 1984). The results were used for assessing lagoon sedimentation, sediment transport to the ocean, flood water level, and velocity and resilience to SLR. A two-dimensional (2-D) Mike21-FM hydrodynamic model was created for the lagoon and nearshore ocean to generate flow velocity and depth data to be used by ESA for fish passage analyses. The simulated flows range from dry weather low flows to a 5-year storm flow. The ocean boundary conditions include both the mean lower low water (MLLW) and mean higher high water (MHHW) under no SLR, 1.6-feet SLR, and 6.8-feet SLR conditions. The 2-D modeling was done for all alternatives. Modeling methods, data, and results are described in the companion Technical Report for Hydraulics, Sediment Transport and Sea Level Analyses (M&N 2022).

A fish passage and refuge habitat suitability model using the results of (2-D) hydraulic modeling performed by Moffatt & Nichol (M&N 2022), as well as a lagoon mouth dynamic and water level model were developed by ESA. The modeling results were used to assess how the proposed Topanga Lagoon restoration alternatives would potentially affect adult steelhead passage as well as refugia for tidewater goby and juvenile steelhead. The ESA study also includes an assessment of habitat elevations for use in mapping habitat zones for the restoration alternatives. These habitat elevations developed by ESA were used by Moffatt & Nichol to map projected habitats for the restoration alternatives in the Moffatt & Nichol (2022) Technical Report. Modeling methods, data, and assessment results are documented in the companion Ecohydrology Report: Fish Passage, Fish Habitat Suitability, and Habitat Zone Elevations (ESA 2022).

The Resource Conservation District of the Santa Monica Mountains (RCDSMM) in collaboration with the Bay Foundation prepared a Water Quality Pre-Construction Baseline Report (RCDSMM and the Bay Foundation 2022). The report summarized 2004 and 2014 historic water quality studies. Both the 2004 and 2014 studies found that bacterial exceedances were associated with storm events only by the time the water was tested at the Bridge on TCB, which is located approximately halfway between the town and the ocean. Ocean exceedances were, therefore, coming from sources at the beach or lagoon and increased when there was a breach condition during storm events. The report also documented the recorded temperature, pH, Electrical Conductivity (EC), turbidity, dissolved oxygen, Oxygen Reduction Potential (ORP), and salinity from June to November 2021 by the Bay Foundation, as well as grab sample and nutrient monitoring, algae monitoring, and water temperature monitoring results in the lagoon.

To assess existing and projected vegetation, Moffatt & Nichol created maps of projected habitat zones for each of the four restoration alternatives under three different SLR conditions: no SLR, 1.6 feet of SLR, and 6.8 feet of SLR. Zones were mapped using estimated habitat elevations provided by ESA for the existing conditions and restoration alternatives for existing sea level and the two SLR scenarios. The habitat elevations represent an average of habitat elevations for low and moderate salinity lagoon wetland habitats and were based on ESA's modeling of the Topanga Lagoon inundation frequency distributions and habitat zone inundation frequency criteria for low salinity and moderate salinity habitats.

To create the habitat zones, contours representing the top and bottom elevations of each habitat type were extracted from the topography data for each individual alternative and used to create a habitat zone polygon for each habitat type within the project boundary in ESRI ArcGIS software. The roadways/developed/ landscaped layer was created using existing developed or landscaped and roadway areas for the existing condition, and existing roadway and proposed bridge footprints for the proposed alternatives.

Sand area was determined based on the current footprint of sand and the proposed design of the lagoon and bridge for each alternative. Data from the Coastal Storm Modeling System (CoSMoS) representing the "hold the line" shoreline position at Topanga Beach for both 1.6-feet and 6.6-feet SLR scenarios was used to define the extent of beach for each of the two SLR alternatives. Note CoSMoS 6.6-feet SLR scenario was used for the 6.8-feet SLR condition as the 6.8-feet SLR data are not available from the CoSMoS and the two elevations are close enough for planning analyses.

A Biological Assessment of the Project area was prepared by the RCDSMM in collaboration with the California Department of Parks and Recreation (CDPR) (RCDSMM and CDPR 2022). The assessment describes the biological resources known and anticipated to be present within the project footprint and adjacent areas of the Topanga Lagoon Restoration Project. Resource types documented include jurisdictional waters, natural plant communities exhibiting various degrees of disturbance, multiple disturbed and non-native plant communities and developed areas, protected and non-native tree species, plant and animal observations, and special status species including tidewater goby, southern steelhead trout and arroyo chub.

Opinion of restoration construction costs for proposed alternatives are also presented. Wetlands contribute to the local economy by producing resources, providing benefits such as wildlife habitat, improved water quality and pollution control, flood protection and fisheries support, and enabling recreational activities (U.S. EPA 2006). In 2011, 90.1 million U.S. residents 16 years and older participated in wildlife-related recreational activities, according to the U.S. Fish and Wildlife Service. Nationwide, these activities generate billions of dollars in revenue, creating an economic engine fueled partly by healthy wetlands (USDA NRCS 2021).

According to the 2012 Greater Los Angeles County Open Space for Habitat and Recreation Plan, wetland losses in Los Angeles County exceed 95%. Topanga Lagoon represents a valuable opportunity to restore a coastal wetland in heavily urbanized Southern California. Results of the 2002 Feasibility Study indicate that the present and future conditions within the Topanga Creek Watershed are suitable to support restoration and will benefit from the action. With the inclusion of the former LA Athletic Club property into Topanga State Park, the entire extent of the former lagoon is now in public ownership. This offers a unique chance to develop a more functional lagoon system providing improved water quality at Topanga Beach, improved habitat for endangered fishes and birds, and improved recreational opportunities while retaining the quality of the surf break at the point.

3.1 Alternative Concept 1 – No Project/No Build - Managed Decline

3.1.1 Hydraulics/Hydrology

Hydraulic and hydrology conditions are crucial to fish passage and habitat conditions. Hydraulic analyses also address flood protection and climate resilience. The detailed hydraulic modeling and analyses are included in the Technical Report for Hydraulics, Sediment Transport and SLR Analyses (M&N 2022).

Fish Passage: The fish migration from ocean to Topanga Lagoon and its upstream creek is only feasible when the lagoon is breached and connected to the ocean (i.e., steelhead trout). The fish passage is also controlled by whether the water depth is deep enough, and the flow velocity is sufficiently slow when the lagoon is breached. Within the lagoon area, the PCH Bridge is a controlling location with relatively high velocities. Based on the last ten years of fish passage observations, fish passages occurred during storms with a return period of less than 5 years. Hence, flows up to the 5-year storm were modeled to support fish passage analyses (M&N 2022).

Over the last 10-years, there were 13 passable storm events. The accumulative passable area at PCH Bridge from the hydraulic model is 1,249 square feet (sq ft) under MLLW tidal condition and 1,290 sq ft under MHHW condition. The peak velocities at the PCH Bridge under Alternative 1 vary from 13.3 feet per second (fps) to 13.9 fps during a 5-year storm, depending on the size of the lagoon mouth breach channel. The passable flow velocity is less than 6 fps for adult steelhead trout passage, 1.5 fps for juvenile steelhead refugia, and 1 fps for tidewater goby refugia.

Flood Protection: The limited capacity of the existing lagoon and the short existing PCH Bridge cause storm flow backup upstream of the PCH Bridge. High velocities up to 18 fps at the bridge during a 100-year flood event will cause damage to the bridge and adjacent structures. Meanwhile, debris from upstream could be flushed and dammed at the PCH Bridge. This would result in an even smaller cross-section and further increase flow velocities at the PCH Bridge. The high flow velocity could wash out the fish nurturing habitat in the lagoon.

Resilience: With projected 1.6-feet and 6.8-feet SLRs, the peak velocity during a 100-year storm decreases to 17.7 fps and 16.8 fps, respectively. The highest water level modeled during a 100-year storm at PCH is 15.3 ft NAVD88. With SLR, the peak water level remains the same under 1.6-feet SLR or increases by half a foot under 6.8-feet SLR. In summary, the high flow velocity and high flood water level don't change much with SLR for Alternative 1. SLR helps increase the passable area and slightly lower velocities in the lagoon basin and at the PCH Bridge.

Habitat: Habitat establishment depends on the hydrology conditions. The lagoon is closed most of the time. Under the closed condition, dry weather and groundwater inflows balance with evaporation and infiltration processes. The monitoring data indicate that the lagoon breaches when the water level reaches around 9.5 feet NAVD88. Under lagoon breached conditions, the low tide is truncated around 5 feet NAVD88 by the cobble berm at the mouth, and the high tide reaches the ocean high tide conditions.

3.1.2 Sediment Transport

This section compares sediment transport in the creek and to the ocean and sedimentation in the lagoon. The detailed sediment transport modeling and modeling results are included in the Technical Report for Hydraulics, Sediment Transport and SLR Analyses (M&N 2022).

Sedimentation in Upper and Lower Reach of Topanga Creek: The upper reach is under erosion mode during storms due to its relatively steep slope. The lower reach is a mixed region with erosion upstream to deposition downstream, as its slope changes from steep to mild. During storm events, sediments get eroded from the watershed and delivered into Topanga Creek. Part of the sediments settle in the lower reach, and the rest are transported to the lagoon and the ocean. The amount of the sediments transported through the system is almost tripled during the high flow period than the average flow period. According to the sediment transport model, SLR has no or minimal impact on the erosion or accretion in the upper and lower reach of Topanga Creek.

Sedimentation in Lagoon: The sediment transport model indicates the lagoon area is under deposition mode. The sedimentation volume in the lagoon is largely impacted by the storm intensity. The sediment transport model predicted that approximately 28.1% of the sediment settles in the lagoon during the average storm period and only 3.3% during the high flow period. During the average flow period, more sediments are deposited in the lagoon compared to the percentage that goes to the ocean. During the high flow period, it is reversed. Note that the total amount of sediments from the upstream creek is higher during the high flow period than in the average storm period. With SLR, the flow cross-section will increase, and the velocity will decrease under a similar storm. Hence, the sediment deposit volume in the lagoon will increase with SLR.

Sediment Transport to Ocean: More sediments from the watershed get transported to the ocean during the large storm period than the average storm period. The sediment transport model predicted that only 6.4% of the sediment goes to the ocean during the average storm period, and 26.4% of the total sediments get flushed to the ocean during the high flow period. More sediment passes through the lagoon to the ocean means more sediment to nourish the beach and littoral environment. SLR could gradually reduce sediment to the ocean. However, the model results indicate that the relative change is small.

Potential Erosion around PCH Bridge: As stated in the hydraulic and hydrology section, the modeled 100-year peak velocity at PCH Bridge is as high as 18 fps. This high velocity is very erosive and could cause erosion at the PCH Bridge and its adjacent structures.

Potential Impacts to Fish Habitat and Foraging/Nursing Area: The high velocity within the lagoon during storms would cause erosion, and also pose risks to fish habitat and its nurturing area.

3.1.3 Lagoon/Ocean Interface Dynamics

Breaching Frequency: Topanga inlet is an unstable inlet in that the lagoon mouth opens intermittently when streamflow is large enough to breach the beach berm. During dry season, the lagoon mouth is closed, and the site is essentially a pond. The monitoring data indicated that the lagoon breaches around 9.5 feet

NAVD88. In the wet season, the lagoon is breached to convey the streamflow to the ocean. As part of this project, ESA has studied the lagoon breach morphology of the existing condition (Alternative 1) based on historical aerial photos and surveys from 2005 to 2020. A baseline was established in terms of inlet breaching frequency, duration, and breach channel geometry. Other alternatives are evaluated in the following sections using Alternative 1 as a baseline. The detailed analyses are documented in Ecohydrology Report: Fish Passage, Fish Habitat Suitability, and Habitat Zone Elevations (ESA 2022).

Beach Berm: The existing cobble berm crest is around 4 feet NAVD88. The breach channel invert is generally around this elevation during the 2020 to 2021 monitoring period. However, it may be eroded down during extreme storm events. The beach berm is elevated due to wave actions after the breach channel is closed. The 2021 monitoring data indicated that the beach berm breached around elevation 9.5 feet NAVD88.

SLR Impacts: The beach berm is expected to be elevated with SLR. However, the breaching channel thalweg could remain at the current cobble berm crest elevation due to its resistance to erosion. If the cobble berm crest elevation remains at its current elevation, the tidal range will increase when the inlet is open due to higher high tide. Increased sea level will also inundate more higher land in the lagoon, leading to an increase in tidal prism when the lagoon is breached. With a larger lagoon body, it will require a larger storm to breach the inlet. ESA (2022) has predicted more inlet closures due to SLR for Alternative 1. However, it may require more wave action to close the lagoon due to the increased tidal prism. The latter is limited due to the small lagoon size for Alternative 1.

3.1.4 Surf Break

Surfing is mainly affected by either: 1) changes to bathymetry (ocean bottom contours), or 2) changes to the exposure of the shore to waves by either blocking waves from reaching the shoreline or varying their properties. Two other factors that also affect surfing are access to the surf sites and water quality, but both of these factors are maintained as similar for each alternative (public access is provided and water quality is preserved or enhanced) and there are no effects to surfing from them for this project.

Surfing will not change with the existing condition because no changes are proposed to the lagoon. Bathymetry of the surf site will remain as is, and no changes to wave exposure will occur.

3.1.5 Water Quality

The open water areas of the existing lagoon are significantly degraded due to impaired/limited habitat and water quality concerns; unmanaged human use syringes, human feces, and trash are commonly encountered. Two comprehensive sampling and monitoring studies have been done in the Topanga Creek watershed, the first in 2003-2004 (Dagit et al. 2004) and the second in 2013-2014 (Dagit et al. 2014). High levels of bacteria that exceed state criteria have been measured in the lagoon for total and fecal coliform. The lagoon bacterial exceedances have been chronic, and the 2014 study looked at the source of these bacteria and found that dogs and birds contribute the most, but that human feces can also be a factor (Dagit et al. 2014). In addition to examining fecal indicator bacteria (FIB) conditions, other variables such as nutrients (nitrates, nitrites, orthophosphates, ammonia), turbidity, and algal cover were also documented (RCDSMM and the Bay Foundation 2022).

Both the 2004 and 2014 studies found that bacterial exceedances were associated with storm events only by the time the water was tested at the bridge on TCB, which is located approximately halfway between the town and the ocean. Ocean exceedances were, therefore, coming from sources at the beach or lagoon and increased when there was a breach condition during storm events.

In addition to the 2004 and 2014 studies, LA City Environmental Monitoring Division also collects ocean water grab samples to test for FIB, Enterococcus, and E. coli in the surf zone in front of the lagoon mouth on Topanga Beach weekly as part of a permit requirement. These results are reported by Heal the Bay as a Beach Report Card grade. A summary of grades for the Topanga Lagoon is included in the Draft Water Quality Pre-Construction Baseline Report (RCDSMM and The Bay Foundation 2022).

Another concern in the lagoon is water temperature. The limited size of the open water area also exposes sensitive species to significant temperature changes with few retreat areas to use during drought, heat waves, and other extreme weather events. Water temperature has been monitored for many years (RCDSMM and the Bay Foundation 2022).

Alternative 1 will continue to generate relatively poor water quality at the beach and lagoon, assuming input concentrations to the lagoon remain the same over time. Contributions of nearby septic systems, non-point source pollution from stormwater runoff, and other possible inputs are not known at this time. The lagoon is relatively small, so dilution of contamination is minimal without influences of the tide or ocean. The only mechanism to reduce contaminant concentrations under existing conditions is to reduce input concentrations.

3.1.6 Vegetation

The existing lagoon contains a narrow band of emergent marsh and a pocket area of salt grass. Upstream of the lagoon, the site is riparian and upland dominant. The mapped locations of each habitat were compared to the project topography to estimate the elevation ranges for each habitat type. Under existing conditions downstream of the PCH Bridge, the upper end of the jurisdictional wetlands occurs around 9.6 feet NAVD, transitioning to upland habitat above this elevation. The salt grass (*Distichlis spicata*) on site occurs on the south side of the lagoon mouth, close to where the inlet begins, in the range of 6.2 to 8.7 feet NAVD according to the available topography. Bulrush (*Schoenoplectus californicus*) and cattails (*Typha* sp.) are found in the lagoon mouth on the south side of the lagoon mouth near the bridge. These emergent marsh species are found in the elevation range of 5.2 to 6.2 feet NAVD according to the available topography (ESA 2022).

The habitat ranges of each habitat type estimated by ESA were used to create maps of existing vegetation acreages under three SLR scenarios: no SLR, 1.6 feet of SLR, and 6.8 feet of SLR (see Appendix A). Developed areas and existing beach area were determined based on a jurisdictional delineation of Topanga Lagoon completed by WRA, Inc. Water levels for each of the two scenarios containing SLR were mapped based on the CoSMoS “hold the line” shoreline position for 1.6 feet and 6.6 feet of SLR respectively. Habitat acreages mapped for all alternatives under each SLR scenario are provided in Table 3-1 below.

TABLE 3-1. SUMMARY OF HABITAT ACREAGES FOR ALL ALTERNATIVES

Habitat Type	NO SLR Condition				1.6 ft SLR Condition				6.8 ft SLR Condition			
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 1	Alt 2	Alt 3	Alt 4	Alt 1	Alt 2	Alt 3	Alt 4
Open Water	0.06	0.04	0.08	0.07	1.21	1.19	1.23	1.22	5.07	5.78	5.22	5.14
Seasonal Shallow Open Water	0.42	0.69	0.44	0.38	0.42	0.69	0.44	0.38	0.08	0.32	0.12	0.08
Seasonally Unvegetated Flat	0.16	1.51	0.28	0.27	0.38	1.69	0.28	0.51	0.99	3.87	2.77	2.53
Emergent Marsh	0.47	1.12	0.5	0.5	0.39	1.87	0.5	0.82	0.24	0.94	0.59	0.8
Saltgrass	0.07	N/A	N/A	N/A	0.07	N/A	N/A	N/A	0.01	N/A	N/A	N/A
Riparian	2.46	6.09	6.42	6.36	2.32	5.16	6.42	5.79	1.62	2.59	3.11	3.13
Wetted Area Below Riparian/Upland Transition	3.6	9.5	7.7	7.6	4.8	10.6	8.9	8.7	8.0	13.5	11.8	11.7
Riparian/Upland Transition	6.06	6.14	6.34	6.23	6.06	6.14	6.34	6.23	6.06	6.14	6.34	6.22
Coastal Sage Scrub	3.66	2.98	2.98	2.98	3.66	2.98	2.98	2.98	3.65	2.98	2.98	2.98
Upland	11.16	13.84	14.37	14.49	11.15	13.84	14.37	14.49	11.16	13.84	14.35	14.49
Disturbed Upland/Trails	0.49	N/A	N/A	N/A	0.49	N/A	N/A	N/A	0.49	N/A	N/A	N/A
Roadways/Developed/Landscaped	12.43	4.84	5.78	5.78	12.43	4.84	5.78	5.78	11.99	4.84	5.78	5.78
Above Riparian/Upland Transition	33.8	27.8	29.5	29.5	33.8	27.8	29.5	29.5	33.4	27.8	29.5	29.5
Sand (Beach)	4.2	4.4	4.4	4.6	3.1	3.2	3.3	3.4	0.3	0.3	0.4	0.5
TOTAL PROJECT AREA	41.6	41.6	41.6	41.6	41.6	41.6	41.6	41.6	41.6	41.6	41.6	41.6

3.1.7 Biological Resources

A biological assessment of the Project site was completed in 2022 by RCDSMM and CDPR. Vegetation documented included ten natural plant communities and multiple disturbed and non-native plant communities. Natural plant communities identified included California Sycamore Woodland/Red and Arroyo Willow and Mulefat Understory, Arroyo Willow thickets. Individual native trees, several coastal sage scrub communities, riparian habitat, giant wildrye grassland, and salt grass flats. Non-native communities identified included non-native tree stands, Arundo stands, and non-native annual grasslands. A total of 154 species of plants were recorded during project surveys.

According to the Biological Assessment, ninety-eight animal species were observed during project surveys, including 14 special status species. Documented special status fish species include steelhead trout, tidewater goby, California grunion and arroyo chub. More common species including topsmelt, mullet and California killifish, and nonnative Mississippi silverside and goldfish were also encountered. Reptiles and amphibians surveyed included California and Pacific tree frogs, western fence lizards, common side-blotched lizard, and the San Bernardino ring-necked snake. Several special-status species of birds were found, including Cooper's hawk, olive sided flycatcher, and snowy egret, along with several species suited to the disturbed nature of the site such as American crow, black phoebe and rock pigeon, among others. Terrestrial mammal species observed included several mouse species, two woodrat species, two species of rabbit, coyote, gray fox, bobcat, mountain lion, racoon, Virginia opossum, and mule deer. Seven species of bats were also documented within the project area.

ESA (2022) modeled passage suitability for adult steelhead during 4-month passage window from January to April in 2011 to 2020 based on M&N's hydraulic inputs. For the existing condition without SLR, the breach channel is modeled passable for adult steelhead during high tides most of time, and only several days over the 10-year period is passable also on low tides. The lagoon provides suitable refugia for tidewater goby and juvenile steelhead during low flows when lagoon is open. Under storm flows, the velocities throughout the lagoon exceed the refugia threshold and cause refuge problems for tide goby and juvenile steelhead.

Alternative 1 would keep in place the existing configuration and degraded nature of the habitat. No temporary disturbance of vegetation would occur beyond ongoing limited management of non-native species, the habitat integrity and ecosystem health are anticipated to continue to decline. Alternative 1 would result in further deterioration of grunion habitat as beach areas continue to shrink due to storm damage. The diversity and abundance of reptiles and amphibians is expected to continue to decline under Alternative 1.

3.1.8 Recreational Opportunities

Recreational activities are concentrated at the mouth of the creek on Topanga Beach. There are currently no recreational facilities along the mainstem of Topanga Creek. The recreational opportunities presented by the various Topanga Lagoon restoration alternatives are significant.

Alternative 1 presents the existing recreational opportunities such as walking, hiking, bicycling, surfing, beach use, and bird watching. Existing opportunities are limited by the layout of parking, pedestrian walkways, and natural amenities. Pedestrian walkways include an underpass at PCH connecting the parking lot of the Ranch Motel with the County Beach parking lot, and a stair from the County Beach parking lot to the beach. All other access is ad hoc and uses the existing beach access road for lifeguard and emergency vehicle from PCH to the County Lifeguard Headquarters building. Also, an open vacant lot northwest of the lagoon mouth provides an overlook for views and hikers. Biking is limited to the road shoulder along both PCH and TCB. Beach use is available at the County Beach, and surfing occurs just off of that beach. Parking is available at the four corners of the lagoon and along PCH.

3.1.9 Infrastructure Changes Required

Infrastructure at the lagoon includes PCH and the bridge with existing utilities (natural gas, water, telephone, and three storm drains), the County Beach Lifeguard Headquarters building and utilities, the public parking lot, public access walkways and trails to the beach (east of the lagoon), and an informal helipad and

emergency beach access ramp west of the lagoon. No changes to these facilities will occur from Alternative 1.

3.1.10 Long-Term Management Issues

Continued long-term maintenance is recommended for Alternative 1, including potential removal of exotic vegetation and debris from the lagoon and periodic repair of the PCH Bridge and roadway. No change in long-term maintenance will be required for Alternative 1; however, PCH Bridge and roadway maintenance activities may increase over time as these facilities age. As the existing lagoon is not self-sustaining and is gradually degrading in quality, area, and function, there will be increased maintenance needs for habitat and existing natural processes over time to meet biological resource demands.

3.1.11 Sea Level Rise and Coastal Resilience

Flood protection: the peak velocity during the 100-year storm decreases with the projected SLR, but the peak water level in the lagoon remains similar under the 1.6-feet SLR scenario and increases slightly under the 6.8-feet SLR scenario.

Sediment Transport: sediment deposition volume in the lagoon increases with SLR, and sediment delivery to the ocean decreases with SLR for all alternatives. Since the overall sediment delivery from the Topanga watershed to the ocean is minimal, the overall impact to the littoral cell is negligible.

Beach/Ocean Interface: the beach berm is expected to be elevated with SLR. However, the breaching channel thalweg will likely remain at the current cobble berm crest elevation. Increased sea level will also inundate more higher land in the lagoon, leading to increase in tidal prism when the lagoon is breached. With a larger lagoon body, it will require a larger storm to breach the inlet. ESA (2022) has predicted more inlet closures due to SLR for Alternative 1. However, the opening duration may become longer, as it may require more wave action to close the lagoon due to the increased tidal prism. The latter is limited due to the small lagoon size for Alternative 1.

Surf Break: the beach profile is expected to shift landward and upward with SLR for all alternatives if there is sufficient sand available in the littoral cell. The surfing condition is likely to remain similar to the current conditions in the near-term. The long-term condition will depend on the sand supply in the littoral cell.

Water Quality: the dry weather lagoon closed water quality conditions will likely remain the same as the existing conditions, or slightly improve due to slightly larger lagoon surface. During the lagoon inlet open conditions, the water quality may improve with SLR due to potentially larger tidal range with increasing sea level.

Beach Area: beach area will gradually decrease with SLR. It is expected to be reduced from the current 4.2 acres to 3.1 acres with 1.6 feet of SLR and 0.3 acres with 6.8 feet of SLR.

Vegetation: the wetted vegetation area (below riparian/upland transition) will increase with SLR, mainly due to the loss of beach area. The area above riparian/upland transition will slightly increase with SLR.

Fish Passage: SLR helps increase the passable area and lower velocities in the lagoon basin and at the PCH Bridge. In the near-term with 1.6 feet of SLR, the number of passable events will remain the same, but the accumulated passable area will increase. In the long-term with 6.8 feet of SLR, the number of passable events will be less, but the accumulated passable area will increase.

Infrastructure: with SLR, the lifeguard tower and restroom building will be subject to further coastal erosion and will eventually be damaged.

3.1.12 Relative Costs

Alternative 1 requires no new construction; hence, the relative cost is zero. The ongoing maintenance is necessary but is not included in the cost estimate.

3.2 Alternative 2 - Maximum Lagoon Habitat, Removal of Motel

3.2.1 Hydraulics/Hydrology

Fish Passage: Hydraulic modeling up to 5-year storm of Alternative 2 provides flow conditions for the fish passage analysis. The peak velocity at the PCH Bridge under Alternative 2 has a 30% to 40% reduction from the peak velocities under the existing condition (Alternative 1) due to its enlarged lagoon footprint and lengthened PCH Bridge. Storms that fish are not passable under the existing condition may become passable under this proposed Alternative 2 due to reduced velocity, especially on floodplains where velocity is lower than the main creek.

According to ESA's lagoon mouth morphology analysis (ESA 2022), the lagoon mouth during the 13 historical passable storm events would remain open and passable to adult steelhead with the proposed Alternative 2 restoration under the existing condition. Compared to Alternative 1, the accumulative passable area at PCH Bridge increases from 1,249 sq ft to 1,422 sq ft under MLLW, and from 1,290 sq ft to 1,459 sq ft under MHHW condition. It is an approximately 13% increase in passable area for Alternative 2 under both tidal conditions. Alternatives 3 and 4 have similar passable areas to Alternative 1, and the change in accumulative passable areas is less than 5%. Alternative 2 has the largest accumulative passable area among all the alternatives. Hence, Alternative 2 improves fish passage conditions by increasing passable area.

Flood Protection: With the enlarged lagoon retention capacity and the lengthening of the PCH Bridge, the flow backup issue upstream of the PCH Bridge will be improved under Alternative 2. Peak velocity at the bridge reduces to 10.9 fps (40% reduction compared to Alternative 1) during a 100-year flood event. The peak water level would also be lowered in the lagoon compared to Alternative 1. The reduced flow velocity and water level help to achieve the restoration goal of improving flood protection. Lower flow velocity in the lagoon could also reduce impact to the fish nurturing habitat. Hence, Alternative 2 improves flood protection and reduces the erosive velocity compared to Alternative 1. It will also perform better than Alternatives 3 and 4.

Resilience: With projected 1.6-feet and 6.8-feet SLRs, the peak velocity during the 100-year storm decreases to 10.2 fps and 8.2 fps, respectively. The highest water level modeled during the 100-year storm at PCH decreases from 15.3 ft NAVD88 to 12.8 ft NAVD, compared to Alternative 1. With SLR, the peak water level remains the same under 1.6-feet SLR or increases by a foot under 6.8-feet SLR. The trend of flow velocity and water levels in the lagoon with SLR under Alternative 2 is similar to Alternative 1. However, with both reduced velocity and water level, Alternative 2 would be more resilient to SLR than the existing condition, as well as better than Alternatives 3 and 4.

Habitat: Same as Alternative 1, the low tide is truncated near the berm height and high tide will inundate the habitat during the high tide condition. The beach berm is expected to breach at a similar elevation as it will be limited by the existing cobble bed elevation. The tidal prism of the restored Alternative 2 when the lagoon is connected is much larger than the existing Alternative 1 due to a larger lagoon area. Alternative 2 provides the largest habitat expansion compared to other alternatives (as discussed in Section 3.1.6).

3.2.2 Sediment Transport

Sedimentation in Upper and Lower Reach of Topanga Creek: As the sediment transport model indicated, the erosion/deposition mode does not change in the upper and lower reach of Topanga Creek under Alternative 2. Furthermore, the modeled sediment erosion and deposition volumes in the upper and lower reach among the alternatives are almost identical. Therefore, the restoration of the downstream lagoon does not pose any negative impact to the upstream reaches in terms of erosion. Similar to Alternative 1, SLR has no or minimal impact on the erosion or accretion in the upper and lower reach of Topanga Creek.

Sedimentation in Lagoon: The sediment transport model predicts deposition in the lagoon area with Alternative 2, same as Alternative 1. There are approximately 32.2% of the total eroded sediments from

upstream that will settle in the lagoon during the average storm period and 8.5% during the high flow period. Compared to Alternative 1, Alternative 2 has increased sediment deposition volume in the lagoon under both flow periods. This is due to the larger lagoon area of Alternative 2 since the sediment deposition depth is similar to Alternative 1. With SLR, the sediment deposit volume in the lagoon will increase similar to Alternative 1.

Sediment Transport to Ocean: The percentage of sediments predicted to be flushed to the ocean is similar to Alternative 1 for both average and high flow periods. SLR could gradually reduce sediment to the ocean, but the amount of sediment reduction is small.

Potential Erosion around PCH Bridge: The modeled 100-year peak velocity at PCH Bridge of Alternative 2 is reduced to 60% of the existing peak velocity (Alternative 1), as low as 10.9 fps. The lowered velocity in the lagoon and under the PCH Bridge will reduce erosion potential at the roadway embankments and its adjacent structures. Also, the new bridge will be designed to the anticipated scour.

Potential Impacts to Fish Habitat and Foraging/Nursing Area: The high velocity within the lagoon during storms will be lowered under Alternative 2 due to a longer PCH Bridge. The proposed PCH Bridge has a longer main span than Alternative 1, specially designed for fish passage. The lowered velocity would also reduce impacts to the foraging and nursing fish habitat.

3.2.3 Lagoon/Ocean Interface Dynamics

Breaching Frequency: According to ESA's lagoon mouth dynamics analysis (ESA 2022), Alternative 2 has increased wetted lagoon volume perched above tides. The increased lagoon volume required larger storms to fill the lagoon and breach naturally. The predicted lagoon close time is 5% to 25% more in Alternative 2 than in Alternative 1. Although there is more chance of a closed inlet in Alternative 2, the passable events of Alternative 2 remain at 13, the same as other alternatives under the current sea level condition. With 1.6-feet SLR, the passable events in Alternative 2 are predicted to be reduced from 13 to 10 events due to less breaching, and it is the lowest among all alternatives. The passable storm events of Alternative 2 are further reduced to 7 events under 6.8-feet SLR, more than Alternative 4 but less than Alternatives 1 and 3.

Beach Berm: The proposed Alternative 2 does not change cobble berm crest elevation and lagoon breach elevation. The lagoon breaching condition will be similar to the existing condition.

SLR Impacts: SLR will build the beach berm higher, which is equivalent to adding lagoon volume in terms of lagoon breaching. The beach berm moves up with SLR. The proposed lagoon of Alternative 2 is predicted to have more inlet closure with increased sea levels. This trend is consistent for all alternatives. The larger tidal prism due to SLR will require larger wave action to close the lagoon, but potentially keep the inlet open longer.

3.2.4 Surf Break

This alternative proposes significant changes to the lagoon, but all are landward of the highest elevation of the beach berm. Therefore, no direct changes are proposed to the bathymetry of the surf site, nor to the beach adjacent to the surf site. In addition, there will be no changes to wave exposure and waves will continue to reach the surf site without modification. Therefore, no effects should occur to surfing from Alternative 2 as compared to existing conditions.

3.2.5 Water Quality

The lagoon design proposed for Alternative 2 provides the largest lagoon footprint and, therefore, could provide the most wetland, emergent and riparian vegetation to assist in shading the water to moderate temperatures, and providing nutrient cycling. It also provides a larger dry weather wet lagoon body, which could reduce potential contaminant concentration due to dilution. Reducing contaminant inputs from septic systems and non-point source road runoff will be another project benefit to improved water quality.

3.2.6 Vegetation

This alternative provides the optimal opportunity for establishment of the most diverse wetland community possible. After contouring of the new lagoon area is completed, a suite of wetland species would be introduced based on soil sampling, gradient, and expected tidal and seasonal inundation levels. The habitat elevation ranges estimated by ESA were used to project proposed vegetation and create maps of habitat vegetation acreages under the no SLR, 1.6-feet SLR, and 6.8-feet SLR scenarios (see Appendix A). Developed area acreages were determined based on the proposed bridge design footprint for the alternative and existing roadways. Water levels for 1.6-feet SLR and 6.8-feet SLR conditions were mapped based on the CoSMoS "hold the line" shoreline positions for 1.6 feet and 6.6 feet of SLR respectively. Habitat acreages mapped for Alternative 2 under each SLR condition are provided in Table 3-1.

Compared to Alternative 1, Alternative 2 has increased areas of several habitat types, including seasonal shallow open water, seasonally unvegetated flat, emergent marsh, riparian, riparian/upland transition, and upland habitats. This alternative also reduces the footprint of roadways/developed/landscaped areas and increases beach area by 0.21 acre under the no SLR scenario condition. Open water is reduced slightly in Alternative 2 compared to Alternative 1 due to increased area of emergent marsh.

Under the 1.6-feet SLR condition, total beach area in Alternative 2 is reduced by 1.15 acres. Beach area under 6.8 feet of SLR is 0.34 acre, a reduction of 4.05 acres compared to the no SLR condition.

Based on mapping of projected habitat zones, Alternative 2 has the largest proposed areas of seasonal shallow open water, seasonally unvegetated flat and emergent marsh, and the smallest proposed roadways/developed/landscaped area compared to the other alternatives.

3.2.7 Biological Resources

This alternative provides the greatest potential for restoring the biological functions of Topanga Lagoon. Due to the greater area of lagoon and wetland areas, the creek will be able to develop natural meanders, side channels, and depositional bars that will significantly increase the habitat diversity available.

Under Alternative 2, significant vegetation removal would occur in existing wetted areas. Willow trees lining the wetted banks of the creek would be protected during grading, but most other vegetation outside of the wetted areas would be removed. Due to the larger area of lagoon and wetland areas created, Alternative 2 would have the most extensive vegetation removed outside the wetted area among Alternatives 2-4. This alternative would also remove the existing historically imported fill to create a more natural topography and expanded open space areas. Seasonally wetted, riparian, and riparian-upland transition areas would be expanded compared to the existing condition. This alternative would also result in the greatest extent of restored native habitats compared to the other alternatives.

Alternative 2 would have the most ground disturbance during construction. Standard animal protection practices would be implemented to minimize impacts to animals. Over the long term, Alternative 2 would provide substantial benefits to animals compared to Alternative 1 because the project would increase the quantity and variety of habitats and improve the quality of habitats through removal of invasive species. Additional retreat and refuge areas are available under Alternative 2 to better buffer animals from adverse effects of climate change and SLR. For aquatic amphibians, Alternatives 2-4 allow for the potential reestablishment of aquatic species like the California and Pacific tree frogs with the expansion and improvement of lagoon, wetland, riparian and transitional habitats. Resident and migrating fish would also benefit from additional refugia areas and better protected migration corridors found under this alternative. Alternative 2 also provides improved conditions for grunion, tidewater gobies and steelhead, and improved aquatic and terrestrial habitats.

3.2.8 Recreational Opportunities

Alternative 2 also presents the same recreational opportunities as existing conditions (walking, hiking, bicycling, surfing, beach use, and bird watching), but a formal walking trail will be added around the future lagoon as a northern perimeter route. Pedestrian walkways will include an underpass at PCH connecting

the area north of PCH with the County Beach parking lot, and a beach access stair will be provided from the County Beach parking lot to the beach. Access can still be somewhat ad hoc and use the existing beach access road for lifeguard and emergency vehicle from PCH to the expanded beach area. A new County Lifeguard Headquarters building will be located on the bluff. Biking will remain limited to bike lanes along both PCH and TCB. Beach use will continue to be available at the County Beach with a larger beach area available, and surfing can still occur just off of that beach. Parking will be available along PCH south of the lagoon and along Topanga Canyon Road. Alternative 2 will increase recreation over Alternative 1 due to the larger beach area and formal perimeter lagoon walking trail.

3.2.9 Infrastructure Changes Required

Infrastructure at the lagoon consists of a new PCH roadway and bridge over the lagoon, reconfigured parking, removal of the Ranch Motel, relocation of the County Lifeguard Headquarters building and helipad, and a new pedestrian underpass under the bridge along the east bank. The proposed PCH Bridge will be a much longer bridge, while the roadway alignment will remain the same. Utility lines on the bridge will also have to be moved, although it should be possible to retain the water main in its existing location, and power may need to be moved from overhead to on the bridge. Installation of state-of-the-art stormwater runoff and non-point source pollution devices are planned for the bridge, the new roadway, and parking areas. The Lifeguard Headquarters building will be relocated to the back of the beach and along the new beach access road. The final design will also need to include access for emergency vehicles to the upstream area and safe access to the beach.

3.2.10 Long-Term Management Issues

All new items will require some measure of maintenance but will not need it as frequently as the existing (Alternative 1) roadway, bridge, and utility lines. The new infrastructure will be longer-lasting and more resilient than existing infrastructure due to improved construction material quality and up-to-date design and construction methods. As the lagoon will be in a more natural condition regarding biogeochemical processes, there should be less management needed of vegetation, sediment, debris, water quality, etc. The lagoon is designed to be self-sustaining and that should reduce management needs. The same type of human-related management such as trespass and homelessness will exist for any alternative. Access and trespass may be more readily controllable with new infrastructure as compared to existing infrastructure. New trails, overlooks, and any fences will require maintenance. Also, storm drains and culverts may need inspection and periodic maintenance.

3.2.11 Sea Level Rise and Coastal Resilience

Flood protection: the peak velocity during the 100-year storm decreases with the projected SLR, but the peak water level in the lagoon remains similar under the 1.6-feet SLR scenario and increases slightly under the 6.8-feet SLR scenario. Both water level and velocity are much lower compared to Alternative 1; hence, Alternative 2 is more flood resilient than Alternative 1 and is also more resilient than Alternatives 3 and 4.

Sediment Transport: sediment deposition volume in the lagoon increases with SLR, and sediment delivery to the ocean decreases with increased SLR for all alternatives. Since the overall sediment delivery from the Topanga watershed to the ocean is minimal, the overall impact to the littoral cell is negligible.

Beach/Ocean Interface: the condition and trend will be similar to the existing condition. The beach berm is expected to be elevated with SLR. However, the breaching channel thalweg could remain at the current cobble berm crest elevation. Increased sea level will also inundate more higher land in the lagoon, leading to an increase in tidal prism. With a larger lagoon body, it will require a larger storm to breach the inlet. However, the opening duration may become longer as it will require more wave action to close the lagoon due to the increased tidal prism. All alternatives will have similar trend.

Surf Break: the beach profile is expected to shift landward and upward with SLR for all alternatives if there is sufficient sand in the littoral cell. The surfing condition is likely to remain similar to the current conditions

in the near-term. The long-term condition will depend on the sand supply in the littoral cell. The proposed lagoon grading will not change the surfing conditions.

Water Quality: the dry weather lagoon closed water quality conditions will likely remain the same as the existing conditions, or slightly improve due to slightly larger lagoon surface. During the lagoon inlet open conditions, the water quality may improve with SLR due to potentially larger tidal range with increasing sea level. Alternative 2 has the largest lagoon body and vegetation acreage for cleaning the system, so it will perform better than other alternatives.

Beach Area: similar to Alternative 1, beach area will gradually decrease with SLR. It is expected to be reduced from the current 4.4 acres to 3.2 acres with 1.6 feet of SLR and 0.3 acres with 6.8 feet of SLR. All alternatives will experience similar trend. Alternative 4 will retain 0.2 acre more beach area than Alternatives 1 and 2. Alternative 3 will retain 0.1 acre more beach area than Alternatives 1 and 2.

Vegetation: the wetted vegetation area (below riparian/upland transition) will increase with SLR, mainly due to the loss of beach area. The area above riparian/upland transition will slightly increase with SLR. Alternative 2 will retain more wetted vegetation area than other alternatives due to lagoon restoration.

Fish Passage: SLR helps increase the passable area and lower velocities in the lagoon basin and at the PCH Bridge. In the near-term with 1.6 feet of SLR, the number of passable events will be reduced from 13 to 10 over the 10-year simulation period compared to Alternative 1. In the long-term with 6.8 feet of SLR, the number of passable events will be reduced from 10 to 7, but the accumulated passable area will be almost doubled. Also, larger storms currently not passible may become passible in Alternative 2 due to lowered velocity. In general, the resilience may be similar for alternatives in the short time, and Alternatives 1, 2, and 3 will be better than Alternative 4 in the long-term.

Infrastructure: the Lifeguard Headquarters, beach restroom, and helipad would be demolished and rebuilt closer to the realigned access road and to each other on the same beach level. They will be more resilient than Alternative 1.

3.2.12 Cost Estimates

The opinion of the construction cost includes the lagoon grading and building a new PCH Bridge over the lagoon. The ongoing maintenance is necessary but is not included in the cost estimate.

For the lagoon grading, the estimated construction cost is $8.6 million based on the items considered, including mobilization of equipment, earthwork and stockpiling, irrigation and planning, demobilization of equipment, construction support, and material disposal.

The following items are assumed in the cost estimate of the lagoon grading for Alternatives 2, 3, and 4:

- This cost estimate represents year 2021 costs.
- This cost estimate is an opinion of construction cost made by the Consultant. In providing opinions of construction cost, it is recognized that neither the Client nor the Consultant has control over the costs of labor, equipment, materials, or over the Contractors' methods of determining prices and bids. This opinion of construction cost is based on the Consultant's reasonable professional judgment and experience. This estimate does not constitute a warranty, expressed or implied, that the Contractors' bids or negotiated prices of work will correspond with the Owner's budget or the opinion of construction cost prepared by the Consultant.
- Cost of earthwork increases with distance; i.e., less if loading and hauling within 2 miles ($15/cy), and more if within 5 miles ($24/cy), and even more if within 10 miles ($35/cy).
- The tipping cost for hazardous material decreases to $56/ton if a special handling facility is not required.
- It is assumed that 5,000 cubic yards of the disposal material are hazardous, requiring hazard material tipping fee.

For the new PCH Bridge and roadway, the estimated construction cost is $42.1 million, which was escalated to year 2021 from year 2004 when the 2004 PSR-PDS was prepared.

3.3 Alternative 3 - Limited Lagoon Habitat Expansion, Retention of Motel

3.3.1 Hydraulics/Hydrology

Fish Passage: Hydraulic modeling of Alternative 3 provided flow conditions for the fish passage analysis. The peak velocity at the PCH Bridge under Alternative 3 will be 16% to 18% lower than that of Alternative 1 due to lengthening of the PCH Bridge, but the reduction is less than that of Alternative 2.

According to ESA's lagoon mouth morphology analysis, the lagoon mouth during the 13 historical passable storm events would remain open and passable to adult steelhead with the proposed Alternative 3 restoration without SLR. Compared to Alternative 1, the accumulative passable area at PCH Bridge under Alternative 3 is slightly increased, from 1,249 sq ft to 1,290 sq ft under MLLW and from 1,290 sq ft to 1,326 sq ft under MHHW condition. Such increase (approximately 3%) in the passable area is considered insignificant. Hence, the fish passage condition of Alternative 3 is considered to be similar to Alternatives 1 and 4, but not as good as Alternative 2.

Flood Protection: With the enlarged lagoon retention capacity and lengthening of the PCH Bridge, the flow backup issue upstream of the PCH Bridge will be improved under Alternative 3. Peak velocity at the bridge reduces to 11.7 fps (35% reduction compared to Alternative 1) during a 100-year flood event. The peak water level in the lagoon during a 100-year storm is predicted to be similar to Alternative 1. The reason is that the lagoon expansion of Alternative 3 is mostly located at elevations above 9.5 ft NAVD88, above most of lagoon water levels; therefore, no significant change in lagoon volume compared to Alternative 1. However, the reduced flow velocity would still help to achieve the restoration goal by reducing erosion and improving flood protection. The reduced flow velocity in the lagoon could also reduce impact to the fish nurturing habitat. Hence, Alternative 3 improves flood protection and reduces the erosive velocity compared to Alternatives 1 and 4, but it is not as good as Alternative 2. Alternative 2 lowers both flow velocity and water level during extreme storms.

Resilience: With projected 1.6-feet and 6.8-feet SLRs, the peak velocity during the 100-year storm decreases to 11.6 fps and 8.8 fps, respectively. The highest water level during the 100-year storm at PCH Bridge remains similar to Alternative 1 for both SLR scenarios. The differences in peak water level between Alternative 1 and Alternative 3 is less than 0.2 feet. With reduced velocity, Alternative 3 would be more resilient to SLR than Alternatives 1 and 4, but not as good as Alternative 2.

Habitat: Same as Alternative 1, the low tide is truncated near the berm height and high tide will inundate the habitat during the high tide condition. The beach berm is expected to breach at a similar elevation as it will be limited by the existing cobble bed elevation. The expanded lagoon area provides opportunities for habitat growth. Alternative 3 provides larger habitat expansion compared to Alternative 1, mostly at higher elevations for riparian and upland habitat. When compared to other proposed Alternatives, Alternative 3 is similar to Alternative 4 but worse than Alternative 2 (as discussed in Section 3.2.1).

3.3.2 Sediment Transport

Sedimentation in Upper and Lower Reach of Topanga Creek: The sediment transport model indicated that the erosion/deposition mode does not change in the upper and lower reach of Topanga Creek under Alternative 3. The modeled sediment erosion and deposition volumes in the upper and lower reach among the alternatives are almost identical. Therefore, the restoration of the downstream lagoon does not pose any negative impact to the upstream reaches. Similar to Alternative 1, SLR has no or minimal impact on the erosion or accretion in the upper and lower reach of Topanga Creek.

Sedimentation in Lagoon: The sediment transport model predicts deposition in the lagoon area for Alternative 3 similar to Alternative 1. There are approximately 31.7% of the total eroded sediments from upstream that will settle in the lagoon during the average storm period and 3.1% during the high flow period. Compared to Alternative 1, Alternative 3 has slightly increased sediment deposition volume in the lagoon under average flow period, and similar accretion volume during high flow period. During the high flow period,

most sediment that would deposit in the lagoon during the average flow will be flushed to the ocean. With SLR, the sediment deposit volume in the lagoon will slightly increase, similar to Alternative 1.

Sediment Transport to Ocean: The percentage of sediments predicted to be flushed to the ocean is similar for all alternatives under both the average and high flow periods. SLR could gradually reduce sediment to the ocean, but the amount of sediment reduction is negligible since sediment transport to the ocean from Topanga watershed is minimal (USACE 2009).

Potential Erosion around PCH Bridge: The modeled 100-year peak velocity at PCH Bridge of Alternative 3 is reduced by 35% of the existing peak velocity (Alternative 1), as low as 11.7 fps. Although the velocity reduction of Alternative 3 is not as high as Alternative 2, the lowered velocity at the lagoon and under the PCH Bridge in Alternative 3 will reduce erosion potential at the roadway embankments and its adjacent structures. Also, the new bridge will be designed to the anticipated scour.

Potential Impacts to Fish Habitat and Foraging/Nursing Area: The high velocity within the lagoon during storms will be lowered under Alternative 3 due to a longer PCH Bridge. The proposed PCH Bridge has a longer main span than Alternative 1, specially designed for fish passage. The lowered velocity would also reduce storm impacts to the foraging and nursing fish habitat.

3.3.3 Lagoon/Ocean Interface Dynamics

Breaching Frequency: As indicated in ESA's lagoon mouth dynamics analysis (ESA 2022), Alternative 3 has increased the wetted lagoon volume perched above tides, although not as large as Alternative 2. Compared to Alternative 1, the predicted lagoon close time change in Alternative 3 is generally less than 5%. The fish passable events of Alternative 3 remain at 13, the same as Alternative 1 under no SLR and 1.6-feet SLR. With 6.8-feet SLR, the passable storm events of Alternative 3 are reduced to 8 due to enlarged lagoon volume, which is more than Alternatives 2 and 4, but less than Alternative 1.

Beach Berm: The proposed Alternative 3 does not change cobble berm crest elevation and lagoon breach elevation. The lagoon breaching condition will be similar to the existing condition.

SLR Impacts: SLR will build the beach berm higher, which is equivalent to adding lagoon volume in terms of lagoon breaching. The beach berm moves up with SLR. The proposed lagoon of Alternative 3 is predicted to have more inlet closure with increased sea levels. This trend is consistent for all alternatives.

3.3.4 Surf Break

This alternative also proposes significant changes to the lagoon, but all proposed changes are to occur above and landward of the highest elevation of the beach berm. Therefore, no direct changes are proposed to the bathymetry of the surf site, nor to the beach adjacent to the surf site. In addition, there will be no changes to wave exposure and waves will continue to reach the surf site without being changed in any way. Therefore, no effects should occur to surfing from Alternative 3 compared to existing conditions.

3.3.5 Water Quality

The lagoon design proposed for Alternative 3 will not expand the dry weather wet areas in the lagoon and is not expected to provide as much potential water quality benefit compared to Alternative 2. Reducing contaminant inputs from septic systems and non-point source road runoff will be another benefit from the project which will improve water quality.

3.3.6 Vegetation

Although not as extensive as Alternative 2, this alternative provides a significant opportunity for establishment of a diverse wetland community. After contouring of the new lagoon area is completed, a suite of wetland species would be introduced based on soil sampling, gradient, and expected tidal and seasonal inundation levels. The habitat elevation ranges estimated by ESA were used to project proposed vegetation and create maps of habitat vegetation acreages under the no SLR, 1.6-feet SLR, and 6.8-feet SLR scenarios (see Appendix A). Developed area acreages were determined based on the proposed bridge

design footprint for the alternative and existing roadways. Water levels for 1.6-feet SLR and 6.8-feet SLR conditions were mapped based on the CoSMoS "hold the line" shoreline positions for 1.6 feet and 6.6 feet of SLR respectively. Habitat acreages mapped for Alternative 3 under each SLR condition are provided in Table 3-1.

Compared to the existing conditions, Alternative 3 has increased areas of open water, seasonal shallow open water, seasonally unvegetated flat, emergent marsh, riparian, riparian/upland transition, and upland habitats. This alternative also reduces the footprint of roadways/developed/landscaped areas and increases beach area by 0.24 acre under the no SLR scenario condition.

Under the 1.6-feet SLR and 6.8-feet SLR conditions, total beach area in Alternative 3 is reduced by 1.14 and 4.07 acres respectively compared to the no SLR condition.

Based on mapping of projected habitat zones, Alternative 3 would have the largest areas of riparian and riparian/upland transition habitats compared to the other alternatives.

3.3.7 Biological Resources

The amount and quality of habitat will increase substantially with Alternative 3. Significant vegetation removal would occur in existing wetted areas. Willow trees lining the wetted banks of the creek would be protected during grading, but most other vegetation outside of the wetted areas would be removed. This alternative would also remove the existing historically imported fill to create a more natural topography and expanded open space areas. Seasonally wetted, riparian, and riparian-upland transition areas would be expanded compared to the existing condition.

Alternative 3 would have some ground disturbance during construction. Standard animal protection practices would be implemented to minimize impacts to animals. Over the long term, Alternative 3 would provide substantial benefits to animals compared to Alternative 1 because the project would increase the quantity and variety of habitats and improve the quality of habitats through removal of invasive species. Additional retreat and refuge areas are available under Alternative 3 to better buffer animals from adverse effects of climate change and SLR. For aquatic amphibians, Alternative 3 allows for the potential reestablishment of aquatic species like the California and Pacific tree frogs with the expansion and improvement of lagoon, wetland, riparian and transitional habitats. Resident and migrating fish would also benefit from additional refugia areas and better protected migration corridors found under this alternative. Alternative 3 also provides improved conditions for grunion, and improved aquatic and terrestrial habitats.

3.3.8 Recreational Opportunities

Alternative 3 presents the same recreational opportunities as existing conditions and Alternative 2 (walking, hiking, bicycling, surfing, beach use, and bird watching), but will add more beach area than either previous scenario, a formal walking trail around the future lagoon as a northern perimeter route, and a portion of the Ranch Motel will be improved and available for some visitor services that could include overnight accommodations depending on the potential for improving wastewater services. Pedestrian walkways will include an underpass at PCH connecting the Ranch Motel and an area north of PCH with the County Beach parking lot, and a beach access stair will be provided from the County Beach parking lot to the beach. Access can still be ad hoc and use the existing beach access road for lifeguard and emergency vehicle from PCH to the expanded beach area. A new County Lifeguard Headquarters building will be relocated to be up on the bluff. Biking will remain limited to bike lanes along both PCH and TCB. Beach use will continue to be available at the County Beach with a slightly expanded beach area compared to Alternatives 1 and 2 under SLR conditions, and surfing can still occur just off of that beach. Parking will be is available along PCH south of the lagoon and at the Ranch Motel but provides the least amount of parking compared to other alternatives. Alternative 3 will increase recreation over Alternatives 1 and 2 due to the future larger beach area, formal perimeter lagoon walking trail, and remodeled Ranch Motel.

3.3.9 Infrastructure Changes Required

Infrastructure at the lagoon for Alternative 3 is similar to that of Alternative 2, except the Ranch Motel remains in place but is slightly reduced in area. Also proposed are a new PCH roadway and bridge over the lagoon, reconfigured parking, relocation of the County Lifeguard Headquarters building and helipad closer to PCH, and a new pedestrian underpass under the bridge along both east and west banks. The proposed PCH Bridge (460 feet) will be much longer than the existing bridge (78.6 feet) while the roadway alignment will remain the same. Utility lines on the bridge will also have to be moved, although it should be possible to retain the water main in its existing location, and power may need to be moved from overhead to on the bridge. Installation of state-of-the-art stormwater runoff and non-point source pollution devices are planned for the bridge, the new roadway, and parking areas. The Lifeguard Headquarters building will be set back farther from the ocean and slightly farther east (relocated to the back of the beach and along the new beach access road). The final design will also need to include access for emergency vehicles to the upstream area and safe access to the beach.

3.3.10 Long-Term Management Issues

Similar to Alternative 2, Alternative 3 will require maintenance but will not need it as frequently as the existing (Alternative 1) roadway, bridge, and utility lines. The new infrastructure will be longer-lasting and more resilient than existing infrastructure due to improved construction material quality and up-to-date design and construction methods. As the lagoon will be in a more natural condition regarding biogeochemical processes, there should be less management needed of vegetation, sediment, debris, water quality, etc. The lagoon is designed to be self-sustaining and that should reduce management needs. The same type of human-related management such as trespass and homelessness will existing for any alternative. Access and trespass may be more readily controllable with new infrastructure as compared to existing infrastructure. New trails, overlooks, and any fences will require maintenance. Also, storm drains and culverts may need inspection and periodic maintenance. Finally, retaining walls may also require maintenance over time.

3.3.11 Sea Level Rise and Coastal Resilience

Flood protection: the peak velocity during the 100-year storm decreases with the projected SLR, but the peak water level in the lagoon remains similar under the 1.6-feet SLR scenario and increases slightly under the 6.8-feet SLR scenario. Both water level and velocity are much lower compared to Alternative 1, but higher than Alternative 2. Hence, Alternative 2 is more flood resilient, followed by Alternative 3, Alternative 4, and Alternative 1.

Sediment Transport: sediment deposition volume in the lagoon increases with SLR, and sediment delivery to the ocean decreases with increased SLR for all alternatives. Since the overall sediment delivery from the Topanga watershed to the ocean is minimal, the overall impact to the littoral cell is negligible.

Beach/Ocean Interface: the condition and trend will be similar to the existing condition. The beach berm is expected to be elevated with SLR. However, the breaching channel thalweg could remain at the current cobble berm crest elevation. Increased sea level will also inundate more higher land in the lagoon, leading to increase in tidal prism. With a larger lagoon body, it will require a larger storm to breach the inlet. However, the opening duration may become longer as it will require more wave action to close the lagoon due to the increased tidal prism. All alternatives will have similar trend.

Surf Break: the beach profile is expected to shift landward and upward with SLR for all alternatives if there is sufficient sand in the littoral cell. The surfing condition is likely to remain similar to the current conditions in the near-term. The long-term condition will depend on the sand supply in the littoral cell. The proposed lagoon grading will not change the surfing conditions.

Water Quality: the dry weather lagoon closed water quality conditions will likely remain the same as the Alternative 1, or slightly improve due to larger lagoon surface. During the lagoon inlet open conditions, the water quality may improve with SLR due to potentially larger tidal range with increasing sea level.

Alternative 2 has the largest lagoon body and vegetation acreage for cleaning the system, so it will perform better than other alternatives. Alternatives 3 and 4 will perform similarly, but better than Alternative 1.

Beach Area: similar to Alternative 1, beach area will gradually decrease with SLR. It is expected to be reduced from the current 4.4 acres to 3.2 acres with 1.6 feet of SLR and 0.3 acres with 6.8 feet of SLR. All alternatives will experience similar trend. Alternative 4 will retain 0.2 acre more beach area than Alternatives 1 and 2. Alternative 3 will retain 0.1 acre more beach area than Alternatives 1 and 2.

Vegetation: the wetted vegetation area (below riparian/upland transition) will increase with SLR, mainly due to the loss of beach area. The area above riparian/upland transition will slightly increase with SLR. Alternative 2 will retain more wetted vegetation area than other alternatives due to lagoon restoration, followed by Alternatives 3 and 4.

Fish Passage: SLR helps increase the passable area and lower velocities in the lagoon basin and at the PCH Bridge. In the near-term with 1.6 feet of SLR, the number of passable events will remain the same as Alternative 1 and the accumulative passable area will slightly increase compared to Alternative 1. In the long-term with 6.8 feet of SLR, the number of passable events will be reduced from 10 to 8, but the accumulated passable area will be similar to Alternative 1. Also, larger storms currently not passible may become passible in Alternative 3 due to lowered velocity. In general, the resilience may be similar for alternatives in the short-time, and Alternatives 1, 2, and 3 will be better than Alternative 4 in the long-term.

Infrastructure: the Lifeguard Headquarters and restroom building will be moved to higher and further away from the beach for Alternatives 2, 3, and 4, and they will be more resilient than Alternative 1. The helipad would be located at PCH with a gated separation from the west end of the parking lot on the same level and be more resilient than the existing conditions.

3.3.12 Cost Estimates

The opinion of the construction cost includes the lagoon grading and building a new PCH Bridge over the lagoon. The ongoing maintenance is necessary but is not included in the cost estimate.

For the lagoon grading, the estimated construction cost is $6.9 million based on the items considered including mobilization of equipment, earthwork and stockpiling, irrigation and planning, demobilization of equipment, construction support, and material disposal as well as hazard material tipping fee. Assumptions included in Alternative 2 also apply to this Alternative.

For the new PCH Bridge and roadway, the estimated construction cost is $42.1 million, which was escalated to year 2021 from year 2004 when the 2004 PSR-PDS was prepared.

3.4 Alternative 4 – Maximum Managed Retreat, Partial Motel Retention

3.4.1 Hydraulics/Hydrology

Fish Passage: Hydraulic modeling of Alternative 4 provides flow conditions for the fish passage analysis. The peak velocity at the PCH Bridge under Alternative 4 is similar to that under Alternative 1, but it is higher than that of Alternatives 2 and 3.

Per ESA's lagoon mouth morphology analysis (ESA 2022), the lagoon mouth during the 13 historical passable storm events would remain open and passable to adult steelhead with the proposed Alternative 4 without SLR. Compared to Alternative 1, the accumulative passable area at PCH Bridge under Alternative 4 is slightly decreased, from 1,249 sq ft to 1,193 sq ft under MLLW and from 1,290 sq ft to 1,227 sq ft under MHHW condition. Such changes (approximately 5%) in the passable area of Alternative 4 are considered insignificant. Hence, the fish passage condition of Alternative 4 is not as good as Alternative 2, but similar to Alternatives 1 and 3.

Flood Protection: With the enlarged lagoon retention capacity and the lengthening of the PCH Bridge, the flow backup issue upstream of the PCH Bridge will be improved under Alternative 3. Peak velocity at the

bridge reduces to 13.6 fps (25% reduction compared to Alternative 1) during a 100-year flood event. The peak water level in the lagoon during 100-year storm is predicted to be similar to Alternative 1. Similar to Alternative 3, the grading of Alternative 4 is mostly at elevations above 9.5 ft NAVD88. The expanded lagoon capacity is located above the water levels most of the time; therefore, no significant change in lagoon volume compared to Alternative 1. However, the reduced flow velocity would still help to achieve the restoration goal by reducing erosion and improving flood protection. The reduced flow velocity in the lagoon could also reduce storm impact to the fish nurturing habitat. Hence, Alternative 4 improves flood protection and reduces the erosive velocity compared to Alternatives 1, but it is not as good as Alternatives 2 and 3. Alternative 2 is the best in terms of flood protection, as it will reduce both flow velocity and water level during extreme storms.

Resilience: With projected 1.6-feet and 6.8-feet SLRs, the peak velocity during a 100-year storm decreases to 13.6 fps and 10.2 fps, respectively. The highest water level during the 100-year storm at PCH Bridge remains similar to Alternative 1 for both SLR scenarios. The differences in peak water level between Alternative 1 and Alternative 4 is less than 0.1 feet. With reduced velocity, Alternative 4 would be more resilient to SLR than Alternative 1, but less resilient than Alternatives 2 and 3.

Habitat: Same as other alternatives, the low tide is truncated near the berm height and high tide will reach the ocean high tide condition. The beach berm is expected to breach at a similar elevation, as it will be limited by the existing cobble bed elevation. Similar to Alternative 3, Alternative 4 provides habitat expansion compared to Alternative 1, mostly at higher elevations for riparian and upland habitat. But Alternative 2 provides more habitat increases than any of the other alternatives (as discussed in Section 3.3.6).

3.4.2 Sediment Transport

Sedimentation in Upper and Lower Reach of Topanga Creek: The sediment transport model shows that the erosion/deposition mode does not change in the upper and lower reach of Topanga Creek under Alternative 4. The modeled sediment erosion and deposition volumes in the upper and lower reach among the alternatives are almost identical. Therefore, the restoration of the downstream lagoon does not pose any negative impact to the upstream reaches. Similar to Alternative 1, SLR has no or minimal impact on the erosion or accretion in the upper and lower reach of Topanga Creek.

Sedimentation in Lagoon: The sediment transport model predicts deposition in the lagoon area with Alternative 4, same as Alternative 1. There are approximately 28.7% of the total eroded sediments from upstream that will settle in the lagoon during the average storm period and 1% during the high flow period. Compared to Alternative 1, Alternative 4 has similar accretion volume in the lagoon under average flow period, and less accretion volume during the high flow period. Considering the percentage of accretion during the high flow period is low (less than 5%), such a decrease in deposition volume is considered negligible. During the high flow period, most sediment that would deposit in the lagoon during the average flow will directly be flushed to the ocean. Same as other alternatives, the sediment deposit volume in the lagoon will increase with SLR.

Sediment Transport to Ocean: The percentage of sediments predicted to be flushed to the ocean is similar for all alternatives under both the average and high flow periods. SLR could gradually reduce sediment transport to the ocean, but the amount of sediment reduction is minimal.

Potential Erosion around PCH Bridge: The modeled 100-year peak velocity at PCH Bridge of Alternative 4 is reduced by 25% compared to Alternative 1, as low as 13.6 fps. Although the velocity reduction from the existing condition in Alternative 4 is not as much as Alternatives 2 and 3, the lowered velocity at the lagoon and PCH Bridge in Alternative 4 will reduce erosion potential at the roadway embankments and its adjacent structures. Also, the new bridge will be designed to the anticipated scour.

Potential Impacts to Fish Habitat and Foraging/Nursing Area: The high velocity within the lagoon during storms will be lowered under Alternative 4 due to a longer PCH Bridge. The proposed PCH Bridge has a longer main span than Alternative 1, specially designed for fish passage. The lowered velocity would also reduce impacts to the foraging and nursing fish habitat.

3.4.3 Lagoon/Ocean Interface Dynamics

Breaching Frequency: As presented in ESA's lagoon mouth dynamics analysis (ESA 2022), Alternative 4 has increased the wetted lagoon volume perched above tides, although not as large as Alternative 2. Compared to Alternative 1, the predicted lagoon close time change in Alternative 4 is generally less than 5%. The passable events of Alternative 4 remain at 13, same as Alternative 1 under no SLR and 1.6-feet SLR. With 6.8-feet SLR, the passable storm events of Alternative 4 are reduced to 3 events, which is the lowest among all four alternatives.

Beach Berm: The proposed Alternative 4 does not change cobble berm crest elevation and lagoon breach elevation. The lagoon breaching condition will be similar to the existing condition.

SLR Impacts: SLR will build the beach berm higher, which is equivalent to adding lagoon volume in terms of lagoon breaching. The beach berm moves up with SLR. The proposed lagoon of Alternative 4 is predicted to have more inlet closure with increased sea levels. This trend is consistent for all alternatives.

3.4.4 Surf Break

This alternative also proposes the same change to the lagoon as Alternative 3. All proposed changes are to occur above and landward of the highest elevation of the beach berm. Therefore, no direct changes are proposed to the bathymetry of the surf site, nor to the beach adjacent to the surf site. In addition, there will be no changes to wave exposure and waves will continue to reach the surf site without being changed in any way. Therefore, no effects should occur to surfing from Alternative 4 compared to existing conditions.

3.4.5 Water Quality

The lagoon design proposed for Alternative 4 will not expand the dry weather wet areas in the lagoon and is not expected to provide as much potential water quality benefit compared to Alternative 2. Reducing contaminant inputs from septic systems and non-point source road runoff will be another benefit from the project which will improve water quality.

3.4.6 Vegetation

This alternative provides a significant opportunity for establishment of a diverse wetland community and increases the area of the back beach, which could potentially present an opportunity for dunes and dune vegetation. After contouring of the new lagoon area is completed, a suite of wetland species would be introduced based on soil sampling, gradient, and expected tidal and seasonal inundation levels. The habitat elevation ranges estimated by ESA were used to project proposed vegetation and create maps of habitat vegetation acreages under the no SLR, 1.6-feet SLR, and 6.8-feet SLR scenarios (see Appendix A). Developed area acreages were determined based on the proposed bridge design footprint for the alternative and existing roadways. Water levels for 1.6-feet SLR and 6.8-feet SLR conditions were mapped based on the CoSMoS "hold the line" shoreline positions for 1.6 feet and 6.6 feet of SLR respectively. Habitat acreages mapped for Alternative 4 under each SLR condition are provided in Table 3-1

Compared to the existing conditions, Alternative 4 has increased areas of open water, seasonally unvegetated flat, emergent marsh, riparian, riparian/upland transition, and upland habitats This alternative also reduces the footprint of roadways/developed/landscaped areas and increases beach area by 0.38 acre under the no SLR scenario condition.

Under the 1.6-feet SLR and 6.8-feet SLR conditions, total beach area in Alternative 4 is reduced by 1.15 and 4.08 acres respectively compared to the no SLR condition.

Based on mapping of projected habitat zones, Alternative 4 would have the largest area of beach compared to the other alternatives.

3.4.7 Biological Resources

Under this alternative, the amount of beach area is largest and the amount and quality of lagoon habitat will be about the same as Alternative 3.

Under Alternative 4, significant vegetation removal would occur in existing wetted areas. Willow trees lining the wetted banks of the creek would be protected during grading, but most other vegetation outside of the wetted areas would be removed. This alternative would also remove the existing historically imported fill to create a more natural topography and expanded open space areas. Seasonally wetted, riparian, and riparian-upland transition areas would be expanded compared to the existing condition.

Alternative 4 would have some ground disturbance during construction. Standard animal protection practices would be implemented to minimize impacts to animals. Over the long term, Alternative 4 would provide substantial benefits to animals compared to Alternative 1 because the project would increase the quantity and variety of habitats and improve the quality of habitats through removal of invasive species. Additional retreat and refuge areas are available under Alternative 4 to better buffer animals from adverse effects of climate change and SLR. For aquatic amphibians, Alternative 4 allows for the potential reestablishment of aquatic species like the California and Pacific tree frogs with the expansion and improvement of lagoon, wetland, riparian and transitional habitats. Resident and migrating fish would also benefit from additional refugia areas and better protected migration corridors found under this alternative. Alternative 4 has the most benefit potential for grunion because it maximizes the increase in beach habitat, which in turn increases spawning opportunities for California grunion. This alternative also provides improved aquatic and terrestrial habitats.

3.4.8 Recreational Opportunities

Alternative 4 presents the same recreational opportunities as existing conditions and Alternatives 2 and 3 (walking, hiking, bicycling, surfing, beach use, and bird watching), but will add more beach area than Alternatives 1, 2, and 3, a formal walking trail around the future lagoon as a northern perimeter route, a portion of the Ranch Motel will be available for accommodations, and PCH is moved inland to expand the beach area. Pedestrian walkways will include an underpass at PCH connecting the Ranch Motel and area north of PCH with the County Beach parking lot, and a beach access stair will be provided from the County Beach parking lot to the beach. Access can still be ad hoc and can still use the existing beach access road for lifeguard and emergency vehicles from PCH to the expanded beach area. A new County Lifeguard Headquarters building will be relocated to be up on the bluff. Biking will remain limited to bike lanes along both PCH and TCB. Beach use will continue to be available at the County Beach with the largest beach area available, and surfing can still occur just off of that beach. Parking will be is available along PCH south of the lagoon and along Topanga Canyon Road. Alternative 4 will increase recreation over Alternatives 1, 2, and 3 due to the largest beach area, formal perimeter lagoon walking trail, and remodeled Ranch Motel.

3.4.9 Infrastructure Changes Required

The PCH roadway and bridge are moved north under Alternative 4 as compared to previous alternatives, and the configuration of the Ranch Motel is modified as well as parking and Lifeguard Headquarters building and helipad south of PCH. However, the same infrastructure is proposed as with the previous two alternatives. A new PCH roadway and bridge are proposed over the lagoon, with reconfigured parking, relocation of the County Lifeguard Headquarters building and helipad farther north, and a new pedestrian underpass under the bridge along both east and west banks. The proposed PCH Bridge (460 feet) will be much longer than the existing bridge and the roadway alignment is moved north. Utility lines on the bridge will also have to be moved, and power may need to be moved from overhead to on the bridge. Installation of state-of-the-art stormwater runoff and non-point source pollution devices are planned for the bridge, the new roadway, and parking areas. The Lifeguard Headquarters building will be set back farthest from the ocean and farthest east. The final design will also need to include access for emergency vehicles to the upstream area and safe access to the beach.

3.4.10 Long-Term Management Issues

Similar to Alternatives 2 and 3, Alternative 4 will require maintenance but will not need it as frequently as the existing (Alternative 1) roadway, bridge, and utility lines. The new infrastructure will be longer-lasting and more resilient than existing infrastructure due to improved construction material quality and up-to-date design and construction methods. As the lagoon will be in a more natural condition regarding biogeochemical processes, there should be less management needed of vegetation, sediment, debris, water quality, etc. The lagoon is designed to be self-sustaining and that should reduce management needs. The same type of human-related management such as trespass and homelessness will existing for any alternative. Access and trespass may be more readily controllable with new infrastructure as compared to existing infrastructure. New trails, overlooks and any fences will require maintenance. Also, storm drains and culverts may need inspection and periodic maintenance. Finally, retaining walls may also require maintenance over time.

3.4.11 Sea Level Rise and Coastal Resilience

Flood protection: the peak velocity during the 100-year storm decreases with the projected SLR, but the peak water level in the lagoon remains similar under the 1.6-feet SLR scenario and increases slightly under the 6.8-feet SLR scenario. Both water level and velocity are much lower compared to Alternative 1, but higher than Alternative 2. Hence, Alternative 2 is more flood resilient, followed by Alternative 3, Alternative 4, and Alternative 1.

Sediment Transport: sediment deposition volume in the lagoon increases with SLR, and sediment delivery to the ocean decreases with increased SLR for all alternatives. Since the overall sediment delivery from the Topanga watershed to the ocean is minimal, the overall impact to the littoral cell is negligible.

Beach/Ocean Interface: the condition and trend will be similar to the existing condition. The beach berm is expected to be elevated with SLR. However, the breaching channel thalweg could remain at the current cobble berm crest elevation. Increased sea level will also inundate more higher land in the lagoon, leading to increase in tidal prism. With a larger lagoon body, it will require a larger storm to breach the inlet. However, the opening duration may become longer as it will require more wave action to close the lagoon due to the increased tidal prism. All alternatives will have a similar trend.

Surf Break: the beach profile is expected to shift landward and upward with SLR for all alternatives if there is sufficient sand in the littoral cell. The surfing conditions are likely to remain similar to the current conditions in the near term. The long-term condition will depend on the sand supply in the littoral cell. The proposed lagoon grading will not change the surfing conditions.

Water Quality: the dry weather lagoon closed water quality conditions will likely remain the same as the existing conditions, or slightly improve due to slightly larger lagoon surface. During the lagoon inlet open conditions, the water quality may improve with SLR due to potentially larger tidal range with increasing sea level. Alternative 2 has the largest lagoon body and vegetation acreage for cleaning the system, so it will perform better than other alternatives. Alternatives 3 and 4 will perform similarly, but better than Alternative 1.

Beach Area: similar to Alternative 1, beach area will gradually decrease with SLR. It is expected to be reduced from the current 4.4 acres to 3.2 acres with 1.6 feet of SLR and 0.3 acres with 6.8 feet of SLR. All alternatives will experience similar trend. Alternative 4 will retain 0.2 acre more beach area than Alternatives 1 and 2. Alternative 3 will retain 0.1 acre more beach area than Alternatives 1 and 2.

Vegetation: the wetted vegetation area (below riparian/upland transition) will increase with SLR, mainly due to the loss of beach area. The area above riparian/upland transition will slightly increase with SLR. Alternative 2 will retain more wet vegetation area than other alternatives due to lagoon restoration, followed by Alternatives 3 and 4.

Fish Passage: SLR helps increase the passable area and lower velocities in the lagoon basin and at the PCH Bridge. In the near term with 1.6 feet of SLR, the number of passable events and the accumulative

passable area will remain the same as Alternative 1. In the long-term with 6.8 feet of SLR, the number of passable events will be reduced from 10 to 3 and the accumulated passable area will be also reduced compared to Alternative 1. In general, the resilience may be similar for alternatives in the short time, and Alternatives 1, 2 and 3 will be better than Alternative 4 in the long term.

Infrastructure: The helipad and Lifeguard Headquarters are arranged with staff, emergency, and ADA parking between these two functions and accommodates sight lines required for the expanded recreational beach area. This alternative maximizes managed retreat, recreational beach area (and/or living shoreline features such as dunes) and so provides the most SLR resilience.

3.4.12 Cost Estimates

The opinion of the construction cost includes the lagoon grading and building a new PCH Bridge over the lagoon. The ongoing maintenance is necessary but is not included in the cost estimate.

For the lagoon grading, the estimated construction cost is $7.6 million based on the items considered including mobilization of equipment, earthwork and stockpiling, irrigation and planning, demobilization of equipment, construction support, and material disposal as well as hazard material tipping fee. Assumptions included in Alternative 2 also apply to this Alternative.

For the new PCH Bridge and roadway of the northern alignment, the estimated construction cost is $42.6 million, which was based on Caltrans price index for the first quarter ending March 2021. The utility relocation and the right-of-way portion of the cost estimate was escalated to year 2021 from year 2004 when the 2004 PSR-PDS was prepared. Table 3-2 compares estimates of the new construction cost, not including any maintenance cost.

TABLE 3-2: SUMMARY OF CONSTRUCTION COST ESTIMATES (MILLION)

Alternative	Lagoon Grading	PCH Bridge	Subtotal
Alt1	0	0	0
Alt2	$8.6	$42.1	$50.7
Alt3	$6.9	$42.1	$49.0
Alt4	$7.6	$42.6	$50.2

3.5 Summary of Alternatives Analyses

As previously stated, each of the alternatives was analyzed for their performance according to various criteria using numerical and analytical modelling tools. Criteria include hydraulics/hydrology, sediment transport, lagoon/ocean interface dynamics, surf break, water quality, vegetation, biological resources, recreational opportunities, infrastructure changes required, long-term management issues, SLR and coastal resilience, and relative costs. Table 3-3 summarizes the general order of performance ranking. For example, the performance of hydraulics and hydrology, Alternative 2 (Alt2) will perform better than Alt3, Alt3 will perform better than Alt4, and Alt4 will perform better than Alt1; hence the performance order is Alt2, Alt3, Alt4, Alt1. An "=" sign indicates a similar performance between the two alternatives. For example, the performance of sediment transport, "Alt1 = Alt2 = Alt3 = Alt4" indicates all alternatives have a similar performance in terms of. Excluding items (Items No. 2, 3 and 4) that have the same ranking, there are 9 remaining items. Alternative 2 ranked first 4 times and tied 2 times with Alternatives 3 and 4. There are 3 times that Alternative 3 is better than Alternative 4 and 2 times that Alternative 4 is better than Alternative 3. The cost of Alternative 3 is less than Alternative 4.

In summary, the ranking based on the technical analyses is Alt2, Alt3, Alt4, and Alt1.

TABLE 3-3: GENERAL PERFORMANCE RANKING BASED ON TECHNICAL ANALYSES

Item No.	Technical Aspects	The Order of Ranking
1	Hydraulics/Hydrology	Alt2 > Alt3 > Alt4 > Alt1
2	Sediment Transport	Alt1 = Alt3 = Alt4 = Alt2
3	Lagoon/Ocean Interface	Alt1 = Alt3 = Alt4 = Alt2
4	Surf Conditions	Alt1 = Alt3 = Alt4 = Alt2
5	Water Quality	Alt2 > Alt3 = Alt4 > Alt1
6	Vegetation	Alt2 > Alt3 > Alt4 > Alt1
7	Biological Resources	Alt2 > Alt3 > Alt4 > Alt1
8	Recreational Opportunities	Alt4 > Alt3 > Alt2 > Alt1
9	Infrastructure Changes	Alt2 = Alt3 = Alt4 > Alt1
10	Long-term Management Cost (less to more)	Alt2 = Alt3 = Alt4 < Alt1
11	SLR/Coastal Resilience	Alt4 > Alt2 = Alt3 > Alt1
12	Construction Cost (less to More)	Lagoon grading: Alt1 < Alt3 < Alt4 < Alt2 PCH bridge: Alt1 < Alt2 = Alt3 < Alt4
	Summary	**Alt2 > Alt3 > Alt4 > Alt1**

4 References

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Topanga Lagoon Habitat

Alternative 1, No Sea Level Rise

moffatt & nichol

1 INCH = 200 FEET

0 100 200 400 600 FT

N W E S

Project Boundary

Habitat

- Open water (1.21)
- Seasonally shallow open water (0.42)
- Seasonally unvegetated flat (0.38)
- Emergent marsh (0.39)
- Saltgrass (0.07)
- Riparian (2.32)
- Sand (3.05)
- Riparian/upland transition (6.06)
- Coastal sage scrub (3.66)
- Upland (11.15)
- Disturbed upland/trails (0.49)
- Roadways/developed/landscaped (12.43)

RCD Resource Conservation District of the Santa Monica Mountains

July 14, 2021

PRELIMINARY

Topanga Lagoon Habitat

Alternative 1, 1.6 ft Sea Level Rise

moffatt & nichol

1 INCH = 200 FEET

0 100 200 400 600 FT

N W E S

Project Boundary

Habitat Type (Acres)

- Open water (5.07)
- Seasonally shallow open water (0.08)
- Seasonally unvegetated flat (0.99)
- Emergent marsh (0.24)
- Coastal sage scrub (3.65)
- Saltgrass (0.01)
- Riparian (1.62)
- Sand (0.27)
- Riparian/upland transition (6.06)
- Upland (11.16)
- Disturbed upland/trails (0.49)
- Roadways/developed/landscaped (11.99)

RCD Resource Conservation District of the Santa Monica Mountains

July 14, 2021

PRELIMINARY

Topanga Lagoon Habitat

Alternative 1, 6.8 ft Sea Level Rise

moffatt & nichol

1 INCH = 200 FEET

0 100 200 400 600 FT

N W E S

Topanga Lagoon Habitat

Alternative 2, No Sea Level Rise

moffatt & nichol

1 INCH = 200 FEET

0 100 200 400 600 FT

N W E S

Topanga Lagoon Habitat

Alternative 2, 1.6 ft Sea Level Rise

moffatt & nichol

1 INCH = 200 FEET

0 100 200 400 600 FT

N W E S

Topanga Lagoon Habitat

Alternative 2, 6.8 ft Sea Level Rise

moffatt & nichol

1 INCH = 200 FEET

0 100 200 400 600 FT

N W E S

Project Boundary
Proposed Bridge

Habitat Type (Acres)

- Open water (0.08)
- Seasonally shallow open water (0.44)
- Seasonally unvegetated flat (0.28)
- Emergent marsh (0.5)
- Riparian (6.42)
- Sand (4.42)
- Riparian/upland transition (6.34)
- Coastal sage scrub (2.98)
- Upland (14.37)
- Roadways/developed/landscaped (5.78)

RCD Resource Conservation District of the Santa Monica Mountains

July 7, 2021

PRELIMINARY

Topanga Lagoon Habitat

Alternative 3, No Sea Level Rise

moffatt & nichol

1 INCH = 200 FEET

0 100 200 400 600 FT

N W E S

Topanga Lagoon Habitat

Alternative 3, 1.6 ft Sea Level Rise

moffatt & nichol

1 INCH = 200 FEET

0 100 200 400 600 FT

N W E S

Topanga Lagoon Habitat

Alternative 3, 6.8 ft Sea Level Rise

moffatt & nichol

1 INCH = 200 FEET

0 100 200 400 600 FT

N W E S

Topanga Lagoon Habitat

Alternative 4, No Sea Level Rise

moffatt & nichol

1 INCH = 200 FEET

0 100 200 400 600 FT

N W E S

Topanga Lagoon Habitat

Alternative 4, 1.6 ft Sea Level Rise

moffatt & nichol

1 INCH = 200 FEET

0 100 200 400 600 FT

N W E S

Topanga Lagoon Habitat

Alternative 4, 6.8 ft Sea Level Rise

moffatt & nichol

1 INCH = 200 FEET

0 100 200 400 600 FT

N W E S

Appendix M

Topanga Lagoon Restoration Ecohydrology Report: Fish Passage, Fish Habitat Suitability and Habitat Zone Elevations (ESA 2022)

The Appendices herein contain supporting information. These Appendices contain highly detailed figures and other graphic information, which are difficult to translate for screen reading software; therefore, the Appendices have not been translated into an auditory format. If you have a disability and/or have difficulty accessing any material in this document, please contact us by mail, email, or telephone, and we will work with you to make all reasonable accommodations. Please indicate 1) the nature of the accessibility need; 2) your preferred format; 3) the material you are trying to access and its location within this document; and 4) how to reach you if questions arise while fulfilling your request. You can direct your requests to:

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Final

TOPANGA LAGOON RESTORATION

Ecohydrology Report: Fish Passage, Fish Habitat Suitability, and Habitat Zone Elevations

Prepared for
Resource Conservation District of Santa Monica Mountains

January 2022

ESA

Final

TOPANGA LAGOON RESTORATION

Ecohydrology Report: Fish Passage, Fish Habitat Suitability, and Habitat Zone Elevations

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January 2022

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TABLE OF CONTENTS

Topanga Lagoon Restoration Ecohydrology Report

Page

Executive Summary **ES-1**

Section 1: Introduction **1**
- 1.1 Study Background and Goals 2
- 1.2 Steelhead Life History 3
- 1.3 Tidewater Goby Life History 4

Section 2: Modeling **4**
- 2.1 2-D Hydrodynamic Model 4
- 2.2 Lagoon Mouth Dynamics and Water Level Model 5
- 2.3 Data Sources 8
- 2.4 Model Scenarios 10
- 2.5 QCM Results for Existing Conditions 10

Section 3: Fish Passage & Refuge **20**
- 3.1 Fish Passage & Refuge Criteria 20
- 3.2 Passage and Refugia Suitability Model Methods 22

Section 4: Model Results **25**
- 4.1 Lagoon Mouth Dynamics Modeling Results 25
- 4.2 Adult Steelhead Passage Results 35
- 4.3 Tidewater Goby & Juvenile Steelhead Refugia Results 54

Section 5: Habitat Elevations **60**
- 5.1 Existing Habitats 61
- 5.2 Project Alternative Habitats 64
- 5.3 Future Habitats 69

Section 6: Conclusions **77**

Section 7: References **80**

Page

List of Figures

Figure 2-1 Quantified Conceptual Model Flow Chart of Inputs and Outputs 6
Figure 2-2 Schematic of Lagoon Hydrology with Intermittent Mouth Conditions 7
Figure 2-3a Time Series Hindcast of Existing Conditions 12
Figure 2-3b Time Series Hindcast of Existing Conditions (Zoomed) 13
Figure 2-3c Time Series Hindcast of Existing Conditions Compared to Observed Inlet Conditions 14
Figure 2-4 Water Level Exceedance Curves 15
Figure 2-5 Seasonal Closure Comparison for the QCM and Several Other Parameters 17
Figure 2-6 Conceptual Diagram of Water Level Fluctuations in Topanga Lagoon 19
Figure 3-1 Model Cross-Section Schematic 24
Figure 3-2 2D Hydraulic Model Bathymetry and Cross-Section Locations for Channel Type 3 24
Figure 4-1 Time Series, Existing vs. Project Conditions 26
Figure 4-2 Closure Seasonality, Existing vs. Project Conditions 28
Figure 4-3a Time Series Model Results for Existing Conditions Vs Sea Level Rise of 1.6 To 6.8 Feet 30
Figure 4-3b Time Series of Modeled Alternative 2 Under Existing Sea Level and with 1.6 To 6.8 Feet of Sea Level Rise 31
Figure 4-3c Time Series of Modeled Alternative 3 Under Existing Sea Level and with 1.6 To 6.8 Feet of Sea Level Rise 32
Figure 4-3d Time Series of Modeled Alternative 4 Under Existing Sea Level and with 1.6 To 6.8 Feet of Sea Level Rise 33
Figure 4-4 Closure Seasonality with Sea Level Rise 34
Figure 4-5 M&N Hydraulic Model Bathymetry for Alternatives 1 and 2 with Upstream Cross-Section Labeled 36
Figure 4-6 M&N Modeled Storm Event Water Surface Elevations for Existing Conditions (Alternative 1) and Alternative 2 Showing a Decrease in the Water Surface Elevation Downstream of the Labeled Cross-Section in Alternative 2 36
Figure 4-7 M&N Modeled Storm Event Velocity for Existing Conditions (Alternative 1) and Alternative 2 Showing an Increase in Velocity at the Labeled Cross-Section in Alternative 2 37
Figure 4-8 M&N Modeled Discharge-Current Speed (i.e., velocity) Rating Curve at the Cross-Section Labeled in Figures X, Y, and Z 37
Figure 4-9a Modeled adult steelhead passage, 2011–2015 39
Figure 4-9b Modeled adult steelhead passage, 2016–2020 40
Figure 4-10a Modeled adult steelhead passage with 1.6’ sea level rise, 2011–2015 50
Figure 4-10b Modeled adult steelhead passage with 1.6’ sea level rise, 2016–2020 51
Figure 4-11a Modeled adult steelhead passage with 6.8’ sea level rise, 2011–2015 52
Figure 4-11b Modeled adult steelhead passage with 6.8’ sea level rise, 2016–2020 53
Figure 4-12a Modeled Tidewater Goby Refugia, 2011–2015 56
Figure 4-12b Modeled Tidewater Goby Refugia, 2016–2020 57
Figure 4-13a Modeled Juvenile Steelhead Refugia, 2011–2015 58
Figure 4-13b Modeled Juvenile Steelhead Refugia, 2016–2020 59

Page

Figure 5-1 Schematic Sketch of Habitat Elevations for Restored Conditions with Current Sea Level 65
Figure 5-2 Comparison of Existing Biological Communities from Wetland Delineation and Elevation-Based Habitat Mapping for Existing Conditions 66
Figure 5.3 Project Alternatives Inundation Frequency Curves 67
Figure 5.4 Project Alternatives Habitat Elevation Zones Comparison 68
Figure 5-5 Future Habitat Elevations for Alternative 1 73
Figure 5-6 Future Habitat Elevations for Alternative 2 74
Figure 5-7 Future Habitat Elevations for Alternative 3 75
Figure 5-8 Future Habitat Elevations for Alternative 4 76

List of Tables

Table ES-1 Fish Passage & Refugia Results Summary ES-3
Table 2-1 Summary of Sources of Data Used for Modeling 8
Table 2-2 Oceanside Sea level rise Scenarios 9
Table 3-1 NOAA criteria for salmonid passage through culverts 21
Table 3-2 Steelhead Passage Criteria 21
Table 3-3 Tidewater Goby and Juvenile Steelhead Refugia Criteria 22
Table 3-4 Channel Morphology Types 23
Table 4-1 Summary of adult steelhead fish passage modeling results with current sea levels 42
Table 4-2 Summary of adult steelhead fish passage modeling results with 1.6 ft of sea level rise 46
Table 4-3 Summary of adult steelhead fish passage modeling results with 6.8 ft of sea level rise 48
Table 4-4 Summary of Refugia Results for Storm Flow Events, 2011-2020 (excluding 2017*) 55
Table 5-1 Current Conditions Habitat Elevations (Feet NAVD) 63
Table 5-2 Current and Future Conditions Habitat Elevations (Feet NAVD) 70
Table 5-3 Alternative 2 Habitat Elevations (Feet NAVD) 70
Table 5-4 Alternative 3 Habitat Elevations (Feet NAVD) 71
Table 5-5 Alternative 4 Habitat Elevations (Feet NAVD) 72
Table 6-1 Fish Passage & Refugia Results Summary 79

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TOPANGA LAGOON RESTORATION

Ecohydrology Report: Fish Passage, Fish Habitat Suitability, and Habitat Zone Elevations

Executive Summary

This Topanga Lagoon Restoration Ecohydrology Report documents the fish passage and habitat suitability assessment for Southern Steelhead and Tidewater Goby for the Topanga Lagoon Restoration project in northwest Los Angeles County adjacent to Malibu, CA. The fish passage and refuge habitat suitability model developed in this study combined the results of two-dimensional (2-D) hydraulic modeling performed by Moffat & Nichol (M&N) (M&N 2022a), lagoon mouth modeling performed by ESA, and biological criteria to assess how the proposed Topanga Lagoon restoration alternatives would potentially affect adult steelhead passage as well as refugia and habitat improvements for tidewater goby and juvenile steelhead. This report also includes an assessment of habitat elevations for use in mapping habitat zones for the restoration alternatives. These habitat elevations developed by ESA were used by M&N to map projected habitats for the restoration alternatives in the M&N (2022b) Topanga Lagoon Restoration Alternatives Analysis Report.

The four alternatives identified to restore the Topanga Lagoon are explained in detail in the M&N Topanga Lagoon Restoration Technical Report for Hydraulics, Sediment Transport and Sea Level Rise Analyses (2022a). These four alternatives are:

- Alternative 1 – No Project/Managed Decline (Existing Conditions)
- Alternative 2 – Maximum Lagoon Habitat, Removal of Motel
- Alternative 3 – Limited Lagoon Habitat Expansion, Retention of Motel
- Alternative 4 – Maximum Managed Retreat, Partial Motel Retention.

Alternatives 2, 3, and 4 include replacing the existing 82 ft span bridge on Pacific Coast Highway with a new longer span bridge. See Section 1.1 below for descriptions of the alternatives and M&N (2022a and 2022b) reports for alternative maps and figures.

Overall, Alternative 2 will create new expanded lagoon and transition zone habitat that are expected to benefit fish and other species. Alternatives 3 and 4 will expand and restore transition habitat above the existing lagoon. The restored transition zone habitat in Alternatives 2, 3 and 4

are expected to enhance the existing lagoon habitat and allow the lagoon to expand with future sea level rise, thereby creating lagoon habitat and likely improving refugia. Alternative 4 realigns the PCH bridge to the north and is therefore expected to improve overall habitat resiliency and increase beach area with sea level rise compared to other alternatives. These overall habitat benefits are assessed in the Topanga Lagoon Alternatives Analysis Report (M&N 2022b).

ESA's methodology and model results from this study are focused on assessing restoration alternatives for potential changes to adult steelhead passage and refuge for juvenile steelhead and tidewater goby. **Table ES-1** below summarizes the results and conclusions of this study, which are briefly summarized below.

Adult steelhead passage. With the current sea level, based on this analysis, expanding the lagoon in Alternative 2 increases storm flow conveyance and storage in the lagoon compared to existing conditions (Alternative 1). Modeling shows that expanding and increasing storage in the lagoon increases lagoon mouth closure in Alternative 2, but that increasing storm flow conveyance and storage decreases velocities upstream of the PCH bridge and at the breach during and after storm events. The analysis shows that decreased velocities in Alternative 2 benefit adult steelhead passage by increasing the time and opportunity for passage during and after storm events when adult steelhead are most likely to be able to migrate upstream, despite the lagoon mouth being closed more often during other times. Modeling (from M&N 2022a) also indicates that lengthening the PCH bridge in conjunction with expanding the lagoon in Alternative 2 improves conditions for passage at the PCH bridge. With future sea level rise of between 1.6 ft and 6.8 ft, Alternative 2 is not expected to increase the time and opportunity for passage relative to Alternative 1, but is still expected to improve conditions for passage at the PCH bridge.

Alternatives 3 and 4 are not expected to benefit adult steelhead passage opportunity or conditions for passage at the PCH bridge relative to Alternative 1. This is because the transition zone habitat restoration and grading in Alternatives 3 and 4 is above the elevation of the existing lagoon and therefore does not have much of an effect on lagoon mouth opening or modeled storm velocities. The existing bridge is not modeled as a fish passage constraint and lengthening the bridge in Alternatives 3 and 4 therefore does not increase the time available for passage in the model. Lengthening the bridge is expected to provide other key physical and ecological benefits, including increasing the area of restored habitat and improving habitat connectivity.

The upstream end of the lagoon may act as a fish passage barrier under existing conditions during large storm events. The restoration alternatives widen the lagoon corridor and increase velocity at the upstream end of the lagoon where flows "drop" into the wider lagoon corridor. Future phases of restoration alternative design will further assess the flow divergence at the upstream end of the restoration and refine the grading to reduce the increase in velocity as possible. Refinements to the restoration alternative grading at this location could provide the benefit of removing or reducing this existing fish passage barrier.

Tidewater goby and juvenile steelhead refuge. ESA's model results for tidewater goby and juvenile steelhead refugia in the lagoon show that the lagoon provides refugia when the lagoon is closed and during low flow conditions when the mouth is open. During storm flows, flow

velocities in the lagoon increase and can exceed criteria for refugia, indicating that the portion of the lagoon that provides refugia reduces during storm flows. Compared to existing conditions (Alternative 1), model results show that Alternative 2 improves refugia for tidewater gobies and juvenile steelhead during storm flows because the expanded lagoon areas provide lower velocity areas. The expanded lagoon in Alternative 2 is therefore expected to provide refugia that is not present under existing conditions. Model results indicate that Alternatives 3 and 4 significantly improve refugia for juvenile steelhead, using a slightly higher velocity criteria (1.5 ft/s), but do not significantly improve refugia for tidewater gobies (lower velocity criteria of 1 ft/s).

TABLE ES-1
FISH PASSAGE & REFUGIA MODELING RESULTS SUMMARY

	Description	**Adult Steelhead Passage**	**Tidewater Goby & Juvenile Steelhead Refugia**
Alternative 1	*Existing conditions (baseline for comparison to restoration Alternatives 2, 3, and 4)*	*-Time and opportunity for passage limited by high velocities at breach and upstream end of lagoon during storm events* *-With sea level rise, mouth closure may increase, but lower velocities through larger lagoon may increase time and opportunity for passage*	*-High velocities during storm events reduce the portion of the lagoon that provides refugia for tidewater gobies and juvenile steelhead* *-With sea level rise, the lagoon is expected to increase in size and increase areas of refugia*
Alternative 2	Expands lagoon and transition zone, includes new longer PCH bridge	-Increases mouth closure, but lower velocities through expanded lagoon increase time and opportunity for passage with current sea level -Is not expected to increase the time and opportunity for fish passage with sea level rise compared to Alternative 1 -Reduces velocities and Improves conditions for passage at Pacific Coast Highway bridge with current sea level and future sea level rise	-Creates new lagoon habitat for fish -Improves refugia for tidewater gobies and juvenile steelhead during storm flows with current sea levels -With sea level rise, allows lagoon to expand, creates habitat, and likely improves refugia
Alternative 3	Expands transition zone, includes new longer PCH bridge	-Does not improve time and opportunity for passage or conditions for passage at Pacific Coast Highway bridge with current sea level or future sea level rise	-Improves refugia for juvenile steelhead during storm flows with current sea levels -With sea level rise, allows lagoon to expand, creates habitat & likely improves refugia
Alternative 4	Expands transition zone, realigns PCH north for managed retreat from sea level rise and includes new longer PCH bridge	-Does not improve time and opportunity for passage or conditions for passage at Pacific Coast Highway bridge with current sea level or future sea level rise	-Improves refugia for juvenile steelhead during storm flows with current sea levels -With sea level rise, allows lagoon to expand, creates habitat & likely improves refugia

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TOPANGA LAGOON RESTORATION

Ecohydrology Report: Fish Passage, Fish Habitat Suitability, and Habitat Zone Elevations

Section 1: Introduction

This Topanga Lagoon Restoration Ecohydrology Report documents the fish passage and habitat suitability assessment for Southern Steelhead and Tidewater Goby for the Topanga Lagoon Restoration project in northwest Los Angeles County adjacent to Malibu, CA. This report describes the components and results of the assessment, which includes a lagoon mouth dynamics and water level model developed by ESA and utilizes Moffat & Nichol two-dimensional (2-D) hydrodynamic model stream velocity results from the Moffat & Nichol (2022a) Topanga Lagoon Restoration Technical Report for Hydraulics, Sediment Transport and Sea Level Rise Analyses. The assessment analyzes four alternatives, using existing conditions (Alternative 1) as a baseline, for current sea level and conditions with sea level rise. This report compares fish passage and habitat suitability assessment results for existing conditions and the restoration alternatives to assess potential effects and benefits of the Topanga Lagoon Restoration. This report also includes an assessment of habitat elevations for use in mapping habitat zones for the restoration alternatives. These habitat elevations developed by ESA were used by Moffat & Nichol to map habitats for the restoration alternatives in the Moffat & Nichol (2022b) Topanga Lagoon Restoration Alternatives Analysis Report.

The four alternatives identified to restore the Topanga Lagoon are explained in detail in the M&N (and 2022b) reports. These four alternatives are described below with excerpts from M&N (2022a):

- Alternative 1 – No Project/Managed Decline (Existing Conditions). Under this alternative the project would not occur. Therefore, there would be no change to the lagoon footprint or habitat quality, and no new bridge would be constructed. No improvements to habitat would occur. Sea level rise would continue to reduce available beach area and threaten the integrity of Pacific Coast Highway (PCH).
- Alternative 2: Maximum Lagoon Habitat, Removal of Motel (9.5 wetted acres, with 27.8 riparian/transitional/upland acres restored and beach expansion to 4.39 acres): This alternative provides the maximum increase in lagoon, wetland, and riparian bank habitats. It includes restoration of more natural side channels connected to the western side of the existing lagoon based on historic topography and would allow the lagoon system to evolve to accommodate changing sea level and storm surge conditions. The Topanga Ranch Motel and onsite business leases would be removed from the project area and be replaced with riparian

and transitional habitats. Partial or full relocation or replacement of public parking, business leases and overnight accommodations from the current location on the north side of PCH to the west side of Topanga Canyon Boulevard (TCB) in the expanded project area will be developed in the next design phase. There is sufficient space along TCB in that location to replace all of the parking that currently exists. To provide for a wider lagoon and improve fish migration and refugia, the existing Caltrans bridge would be replaced with a longer one along the same road alignment. The span of the new bridge would total 460 feet (200-foot primary span, with secondary/side spans of 130 feet each), plus an additional span to accommodate an emergency services underpass on the east side if that is included in the next phase of design development. This alternative includes ADA disabled parking spaces on the beach level, with additional recreational parking at the PCH upper level on the south side of PCH only. The lifeguard headquarters, beach restroom and helipad would be demolished and rebuilt closer to the realigned access road and to each other on the same beach level.

- Alternative 3 – Limited Lagoon Habitat Expansion, Retention of Motel (7.7 wetted acres, with 29.47 riparian/transitional/upland acres restored and beach expansion to 4.42 acres): This alternative also provides expanded lagoon, wetland, riparian and transitional habitat in the west part of the existing creek channel, but allows for only the existing main channel within the lagoon area itself. The remaining Topanga Ranch Motel structures are restored in its historic configuration, including relocation of some of the structures from the west side that is currently experiencing flood and bank erosion. One existing concession (restaurant lessee) would be remodeled and continue operation in place. No other business leases remain. If the emergency underpass is removed as the design evolves, this would provide additional parking on the North side of PCH. Partial or full relocation or replacement of public parking, business leases and overnight accommodations from the current location on the north side of PCH to the west side of Topanga Canyon Boulevard (TCB) in the expanded project area will be developed in the next design phase. There is sufficient space along TCB in that location to replace all of the parking that currently exists. All of the changes to the new 460 ft. Caltrans bridge (200-foot center span, with secondary/side spans of 130 feet each) are the same as for Alternative 2. However, the access road alignment is kept slightly to the east. This might change if no underpass is included. The lifeguard headquarters and beach restroom would be rebuilt closer to the realigned access road moving slightly east to enhance sight lines along the beach, and the helipad would be located at PCH with a gated separation from the west end of the parking lot on the same level.

- Alternative 4 – Maximum Managed Retreat, Partial Motel Retention (7.6 wetted acres, with 29.48 riparian/transitional/upland acres restored and beach expansion to 4.56 acres): The alignment of PCH moves north expanding the maximum amount of beach area and managed retreat from sea level rise. The portion of the historic Topanga Ranch Motel east of the current motor court access lane is retained. Adjacent parking is adjusted and a remodeled restaurant lessee would continue to operate. This alternative will provide expanded lagoon, wetland, riparian and transitional habitats, primarily on the west side of the existing channel due to removal of all fill in that western area. No other business leases remain. Partial or full relocation or replacement of public parking, business leases and overnight accommodations from the current location on the north side of PCH to the west side of Topanga Canyon Boulevard (TCB) in the expanded project area will be developed in the next design phase. There is sufficient space along TCB in that location to replace all of the parking that currently exists. Due to the curve of its alignment, the Caltrans bridge has the greatest length under this alternative, though the actual span lengths are similar to the other alternatives with a total of 460 feet consisting of a 200-foot long center span and a 130 ft. side span on each side. This PCH alignment eliminates shoulder parking on the bridge spans, but has the greatest number

of beach side parking spaces. The helipad and lifeguard headquarters are arranged with staff, emergency and ADA disabled parking between these two functions and accommodate sight lines required for the expanded recreational beach area. This alternative maximizes managed retreat, recreational beach area (and/or living shoreline features such as dunes) and provides the most sea level rise resilience. 1.1Study Background and Goals

For adult anadromous *Oncorhynchus mykiss* (adult steelhead) to immigrate into and upstream in Topanga Creek and smolts (juvenile steelhead that are ready for ocean life) to emigrate out of Topanga Creek, two key variables have to be aligned. First, the lagoon entrance needs to be open and passable to the ocean. Second, the base stream flow level needs to be high enough to ensure surface flow connectivity in areas with minimal depth and to provide sufficient depth for fish to pass natural low flow barriers and impediments (Dagit et al. 2018).

This analysis is focused on steelhead movements during the high-flow season (winter-spring) and quantitative modeling of hydrology and fish passage. The goals of the Topanga Lagoon Ecohydrology analyses were to understand existing (Alternative 1) and project alternatives (Alternatives 2 through 4) for each of the following:

1. Lagoon mouth dynamics,
2. Steelhead movements during the high-flow season (winter-spring),
3. Tidewater goby and juvenile steelhead refugia during high-flow season conditions,
4. Lagoon habitat suitability, and
5. The effects of sea level rise on the above.

1.2 Steelhead Life History

Upstream migration of adults - Adult steelhead enter spawning streams from late fall to spring (November to May), following the first storm flows (aka “freshets”) resulting in breaching of the sand berm (Shapovalov and Taft 1954; Behnke 1992). Peak spawning activity occurs between January and March, based on other populations in the southern California steelhead DPS (Busby et al. 1996). Monitoring of Topanga Creek during 2001-2018 documented storm events scattered throughout the rainy season between December and March (Dagit et al. 2018). This resulted in a wide annual variation in the timing and duration of potential anadromous adult or smolt migration opportunities. The window of opportunity for migration in recent drier years has often been fewer than 5 days (Dagit et al. 2018).

Downstream migration of juveniles - Downstream migration in Topanga Creek appears to occur from early January to early April and is a function of instream flows and rain events, since the lower reach of Topanga Creek (0.5–1.5 RKM) is often dry from May through November. In general *O. mykiss* migrating downstream were between 100 - 250 mm fork length (FL). Fish migrating downstream in early January were generally larger than 150 mm FL, whereas fish migrating a few weeks later in the end of January tended to be smaller than 150 mm (Dagit et al. 2018). Studies in Central California (Scott Creek) suggest the earlier migrations in February through April are composed of larger fish (> 150 mm) moving through estuaries very quickly (1 to a few days) (Hayes and Kocik 2014) and heading straight to sea (Hayes et al. 2011).

Lagoon residence – In some central California streams like Scott Creek, smaller/younger fish migrate downstream later in May and June to recruit to estuarine habitat, where they grow for extended periods of time on the order of weeks to months during the summer (Hayes et al. 2011). Steelhead use of coastal lagoons in southern California seems less prevalent than in central California, where temperature increases, and water quality and quantity decline to the point of lagoons being uninhabitable to even steelhead (Hayes and Kocik 2014). Juvenile steelhead have not been documented rearing in the Topanga lagoon. Dagit et al. (2018) concluded that "the size and condition of the lagoon is such that it likely does not promote rapid growth, and based on the low number of fish ever observed in the lagoon, it's likely that fish do not spend too much time in the lagoon, but rather move through it quickly into the ocean." If juveniles do end up trapped and/or rearing in the closed lagoon, they would likely be entering toward the end of the outmigration season when flows are tapering (May and later) and velocities are low.

1.3 Tidewater Goby Life History

Tidewater gobies are found in shallow water habitat, usually less than 3 feet deep. Favorable habitat attributes include a seasonally closed lagoon, shallow low-salinity waters, still-to-slow-moving water, sand and silt substrate, and submerged and emergent aquatic vegetation (USFWS 2013). They are frequently associated with the submerged aquatic vegetation (*Ruppia maritima)* and can occur at the edge of emergent vegetation such as bulrush (*Scirpus*) and cattail (*Typha latifolia)*.

While lagoons are the archetypal habitat of this species (Swift et al. 1993), marshes are also important habitats (Swenson 1999). Tidewater gobies are not strong swimmers and prefer slack water habitat. They will use backwater pools and channels if flows in the creek are too fast. The availability of slack-water refuges, such as marshes and backwater areas of lagoons, may be critical during the winter high-flow season. Access to refuges depends on water elevations that connect a main channel to marsh sloughs. Marshes also appear to provide better conditions for growth and/or survival. In estuaries that have connected lagoon, marsh and creek habitats, tidewater gobies from the marsh habitats were significantly larger than tidewatwer gobies from the lagoon and creek (Swenson 1999). Tidewater gobies in marsh habitats also tended to feed on larger types of prey, suggesting that marsh habitats may provide better feeding opportunities (Swenson and McCray 1996).

Section 2: Modeling

2.1 2-D Hydrodynamic Model

Moffat & Nichol (M&N) developed the 2-D hydraulic model of Topanga Lagoon using 2D MIKE21 Flexible Mesh (M&N 2022a). The hydraulic model was used to simulate hydrodynamics under a variety of lagoon mouth morphology scenarios, and velocity and depth results were output at seven different cross-sections in the system. These results fed into the habitat suitability model described in Section 3 of this report.

Full details about the Moffat & Nichol model can be found in M&N's Technical Report for Hydraulics, Sediment Transport and Sea Level Rise Analyses (M&N 2022a).

2.2 Lagoon Mouth Dynamics and Water Level Model

ESA analyzed the Topanga Lagoon mouth opening and closing dynamics to inform the restoration design by:

- Providing a greater understanding of existing mouth dynamics,
- Analyzing breach conditions to provide inlet dimensions for M&N's 2D modeling,
- Estimating daily mouth conditions to evaluate fish passage conditions, and
- Assessing the impact of restoration on lagoon and mouth function.

Section 2.1 provides a brief introduction to the modeling approach. Section 2.2 discusses the data sources, and Section 2.3 summarizes the model scenarios. Section 2.4 provides the model results for existing conditions. Results for the restoration alternatives and potential future conditions are provided in Section 4.1. An explanation of how the model results are applied to the fish passage and refuge analysis is provided in Section 3.1.

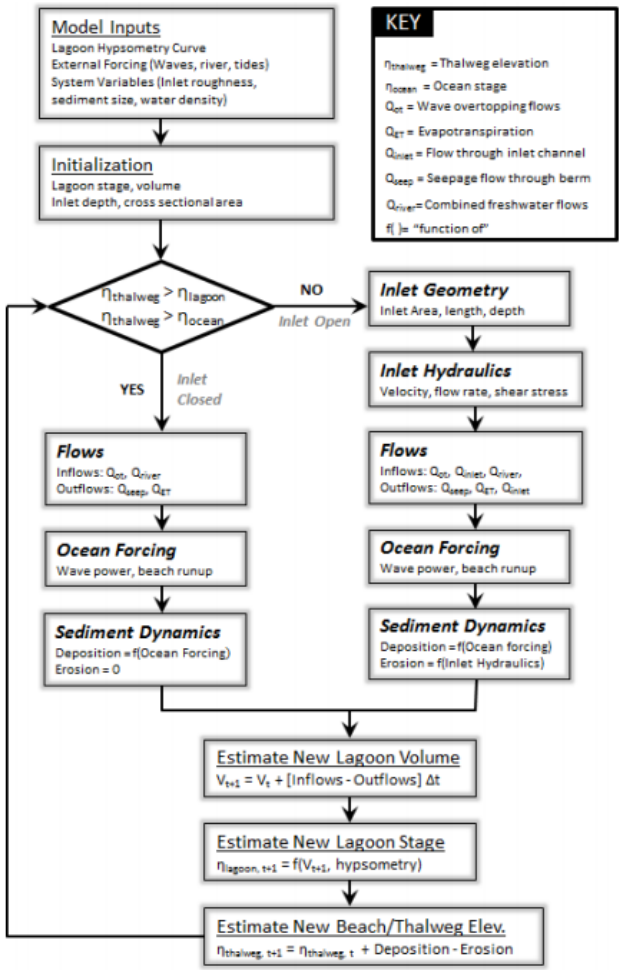
2.2.1 Lagoon Modeling Approach

ESA has developed a lagoon hydrology/mouth morphology model to assess the mouth dynamics of coastal lagoons, referred to as the Quantified Conceptual Model or QCM. The QCM was applied to Topanga Lagoon under existing conditions, and was used to gauge the potential for change in mouth and lagoon conditions under a range of future conditions, which include the conceptual restoration alternatives and progressive amounts of sea level rise. This model has been developed and tested specifically for small coastal lagoons in California, and provides time series predictions (every 1/2000 days, about every minute) of lagoon water level and the timing and duration of mouth closure events.

The QCM approach is based on a water budget for the lagoon, which is coupled with a sediment budget for the lagoon mouth (inlet). The model is based on two core concepts:

- All water entering and leaving the system should balance.
- The net erosion/sedimentation of the inlet channel results from a balance of erosive (fluvial and tidal) and constructive (wave) processes.

The model uses time series of nearshore waves and tides, watershed runoff, and evapotranspiration data as boundary conditions. Using these as forcing conditions, the model dynamically simulates time series of inlet, beach, and lagoon state. A flowchart of the model's inputs and outputs is provided below in **Figure 2-1**. With each user set time step (usually 5 minutes or less), the net inflows or outflows to the system are estimated, along with the net sedimentation or erosion of the inlet bed.

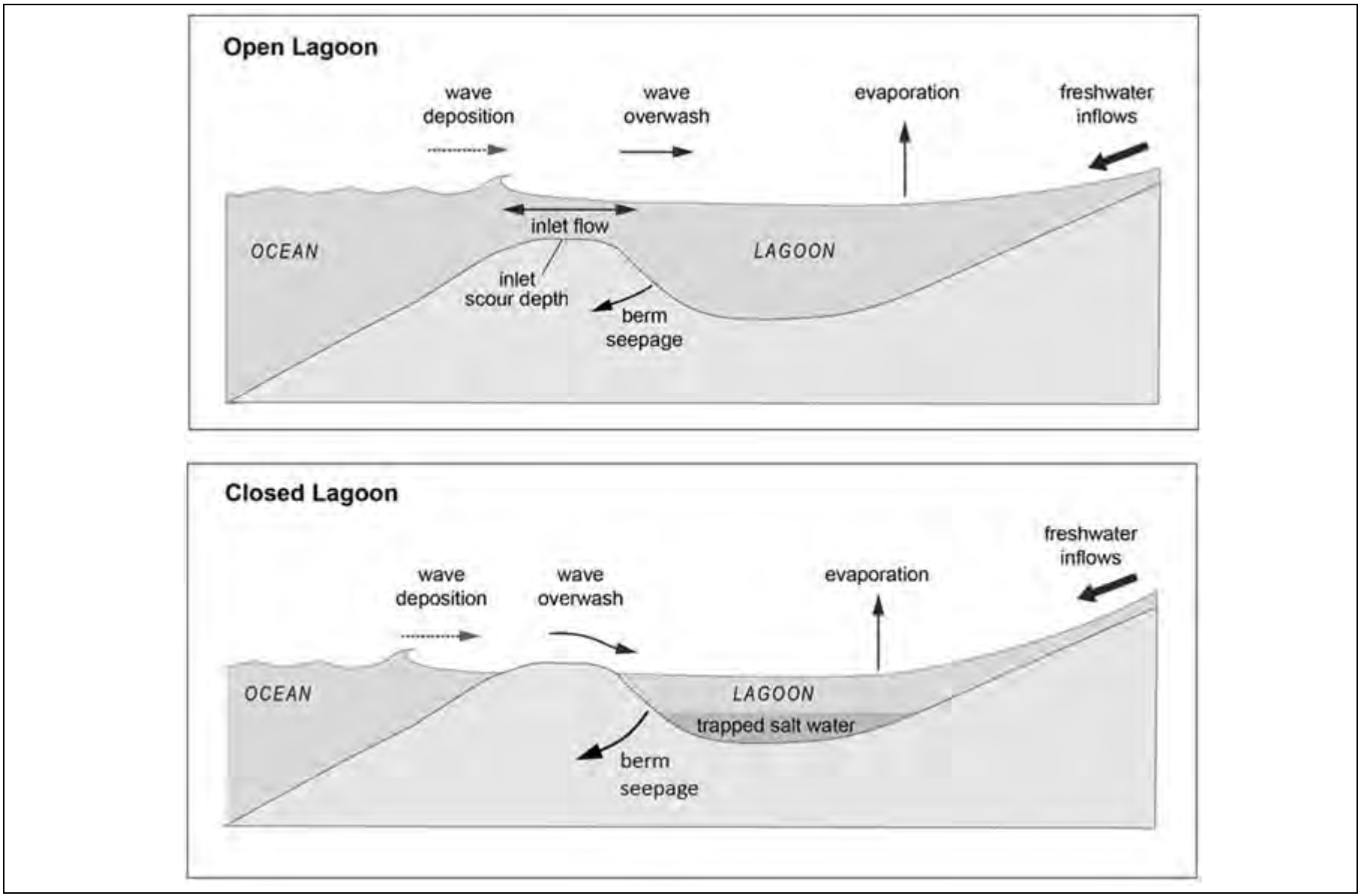


SOURCE: Behrens et. al 2015

Topanga Lagoon Restoration

Figure 2-1
Quantified Conceptual Model Flow Chart of Inputs and Outputs

As shown in **Figure 2-2**, the flow terms vary depending on whether the mouth of the lagoon is open or closed. During closed conditions, net inflows are based on watershed runoff, wave overwash into the lagoon, and losses from beach berm seepage and evapotranspiration. When the inlet is open, tidal flows into and out of the inlet are included. Sand deposition in the inlet channel is based on wave power when the inlet bed is lower than ocean tides, and it is based on both wave power and wave runup when the inlet bed is perched above tide levels. To approximate scour, inlet channel flows are used to estimate both the bedload rate and the rate that bed sediments mix with the water volume to become suspended load. For more information on how the model resolves different processes, refer to Behrens et al. (2015).



SOURCE: Behrens et al. 2015

Topanga Lagoon Restoration

Figure 2-2
Schematic of Lagoon Hydrology with Intermittent Mouth Conditions

ESA

As the model steps forward in time, it continuously transitions the mouth through tidal, perched, and closed conditions. When deposition in the inlet bed exceeds erosion, the bed rises vertically, eventually perching above most tidal elevations and closing. Closure occurs in the model when sediment fills the inlet bed higher than lagoon water levels. Once closure occurs, the inlet thalweg effectively becomes the "beach," and the beach crest is allowed to grow vertically when wave runup reaches the crest height. Breaching occurs in the model when water levels eventually overtop the beach berm crest, eroding a new inlet.

Model accuracy is tested by comparing modeled lagoon water level time series against gauged observations, and by comparing the timing and length of inlet closure events to those of historical records. Although there are a large number of processes involved in this modeling approach, closure time series and lagoon water level time series usually provide a good indication of which processes are dominating the system at a given time, such as freshwater runoff during floods, or powerful waves prior to closure. Thus, approximately reproducing these time series is taken to mean that the dominant processes are meaningfully represented.

2.3 Data Sources

Table 2-1 lists the boundary condition data used for driving the model, as well as observations of lagoon water level and mouth state (open or closed), which were used to train the model and test its accuracy.

TABLE 2-1
SUMMARY OF SOURCES OF DATA USED FOR MODELING

Parameter	Source/Location	Measurement Period
Coastal Influences		
Offshore Waves	CDIP MOP Point L0809	1970–present
Tide Stage	NOAA Santa Monica Gage (# 9410840)	1924–present
Beach and Lagoon Conditions		
Inlet Condition (Open/Closed)	RCD of the Santa Monica Mountains	2011-2016,2019-2020
Beach Crest/Profile	Alternative Surfaces provided by M&N	2020
	USGS Coastal LiDAR	2016
	USACE TopoBathy	2014
	Coastal Conservancy LiDAR	2013
Beach Sediment	ESA Observations; Photos from RCDSMM	2020
Lagoon Stage	M&N Topanga Lagoon Gauge	2019–2020
Lagoon Hydrology		
Creek Discharge	LACDPW gage station F54C-Hourly (provided by M&N)	1996–2019
Evapotranspiration	CIMIS Santa Monica Station (#99)	2000–present

Most boundary condition data were obtained from publicly available sources. The ocean tidal data came from NOAA, nearshore wave estimates from CDIP, and evapotranspiration data from

CIMIS. Long-term, continuous river flow gauge data from Los Angeles County Department of Public Works (LACDPW) gage station F54C-R was provided by LACDPW to M&N and by M&N to ESA. Due to issues with the river flow gauge, the gauge did not record low flows or baseflow in certain years. ESA added baseflow onto this record in years where the gauge data appeared to go dry. To do this, we developed a seasonal baseflow time series that averages out to about 0.75 cfs over many years, but in a given year varies by month (1 cfs in wetter months and about 0.5 cfs in drier months). We based the shape of this seasonal baseflow on the seasonal shape from the wetter years before 2010, and then added it to flow data for the 2010-2020 model period. We only applied this if flows dropped below a threshold that seemed to be associated with going dry. This gave the baseflow a "floor" of 0.5 to 1 cfs for periods of time when it seemed like the flow data were affected by the gauge going dry. This range on the low end is an estimate, based on comparing the watershed size to others nearby that had USGS flow records.

The available lagoon stage data was provided by M&N, and consists of values collected at 6-minute intervals near the mouth of the lagoon. The data set includes the time frame of October 10, 2019 to July 2, 2020. Note that multiple years of lagoon stage data that capture many breach and closure events, through both dry and wet years, would improve the QCM modeling by allowing calibration against multiple seasons and lagoon conditions.; however, the QCM can and has been effectively applied using shorter lagoon stage data sets.

A stage versus storage relationship was developed for the present-day lagoon by making a combined topographic/bathymetric digital elevation model (DEM) and processing the surface in ArcMap 10.6 to obtain volumetric information. The DEM was generated by combining the topobathy surface received from M&N with 2016 USGS Coastal LiDAR into a single surface. A stage-storage curve was developed for existing conditions and each of the proposed restoration alternatives based on the conceptual designs for each alternative.

Projected sea level rise scenarios were chosen from the State of California Sea-Level Rise Guidance (OPC 2018) for Santa Monica. **Table 2-2** presents the scenario date ranges and corresponding amounts of sea-level rise.

TABLE 2-2
OCEANSIDE SEA LEVEL RISE SCENARIOS

		Potential Amount of Sea level rise	
Scenario	**Date Range**	**(ft)**	**(m)**
Existing Conditions	Now	0	0
Mid Term	2040–2070	1.6	0.5
Long Term	2070–2100	3.3	1
Longer Term	2100–2140	6.8	2.07

SOURCE: OPC 2018

2.4 Model Scenarios

To provide a baseline for comparison, the QCM was used to create a hindcast of lagoon mouth conditions and lagoon water levels in Topanga Lagoon from October 10, 2010 to August 31, 2020. The hindcast was refined using the available data on lagoon water levels and mouth conditions from October 2019 to July 2020. To model restored and future conditions, the same time period from 2010 to 2020 was run with different lagoon stage-storage relationships to reflect restoration alternatives and then lastly, with sea level rise. The QCM was run for the following cases:

- **Existing Conditions:** A hindcast of 2010 to 2020 to train the model against water level and mouth condition observations over this period. This was used as a way of understanding the level of uncertainty in future predictions. These "no project" conditions are considered as Alternative 1.
- **Project Conditions:** These runs were used to predict changes to the hydrology and mouth morphology of Topanga Lagoon under the three restoration alternatives, Alternatives 2 through 4. Reports by M&N (2022a and 2022b) describe and document the alternatives.
- **Future Conditions:** These runs were used to understand the effects of sea level rise on the present-day lagoon (i.e., "no project" conditions) and the restoration alternatives:
  - Existing conditions with 1.6 ft sea level rise (Mid-term scenario)
  - Existing conditions with 3.3 ft sea level rise (Long-term scenario)
  - Existing conditions with 6.8 ft sea level rise (Longer-term scenario)
  - Project conditions with 1.6 ft sea level rise (Mid-term scenario)
  - Project conditions with 3.3 ft sea level rise (Long-term scenario)
  - Project conditions with 6.8 ft sea level rise (Longer-term scenario)

2.5 QCM Results for Existing Conditions

The model hindcast of existing conditions is shown in **Figure 2-3a** for the period of available consecutive lagoon stage data, October 2019 to July 2020. Overall, the model compares well against the available data. The model reproduces a number of important aspects (**Figure 2-3b**), such as (1) periods of inlet scour during spring tides and high watershed runoff, (2) seepage losses and (3) sediment accumulation on the beach during closure, (4) the progressively shallower mouth cutting off lower tides in the lagoon, (5) subsequent inlet closure, and (6) inlet breaching. Also, despite the complexity of the Topanga Lagoon system, the QCM generally predicts the timing of most closure and breach events within a few weeks of observations. The QCM provides a tool that accounts for the dynamic processes described above over long periods of time, which provides a better representation of lagoon processes than other available models. While the QCM may not precisely predict the timing of opening and closure events, it provides a useful tool for assessing relative changes due to restoration actions.

During relatively-wet conditions, the model reproduces the observed deep scouring of the mouth and periods of strong tidal communication between the lagoon and the ocean. The timing of scouring and stronger tidal communication suggests the system is dominated by rainfall runoff

events causing peaks in streamflow entering into the lagoon. The model usually approximated flood stages to within about 1-2 feet of the observations, both during open-mouth fluvial flood conditions (peaks of 7 to 9 ft NAVD88) and during closed-mouth flooding immediately before mouth breach events (peaks of 8 to 10 ft NAVD88), although the model also misses flood peaks periodically. Small flood peaks are sometimes caused by coastal processes, like wave overwash. Although the model seems to capture most of the flooding due to trapped rainfall-runoff in the lagoon prior to breaching, it is much more difficult to approximate the exact amount of wave overwash entering the lagoon during storm events. The model approximates the progressive shallowing of the mouth (cutting off low tides in the lagoon) prior to seasonal closure events, capturing the transitional weeks of muted tides that lead up to closure events.

The model reproduced the observed seasonal closure events in 2019 (Figure 2-3a), as well as most closure events documented from 2011 to 2016 (**Figure 2-3c)** in the Lagoon Monitoring Appendix (Dagit et al 2018). The model captures a key aspect of intermittently open and closed lagoons: closures are commonly associated with heightened wave power, weaker tidal currents, or the timing and frequency of rainfall events. Sediment transport increases with wave power, so days with powerful waves are expected to deposit more sand in the inlet bed. Sediment transport also increases with higher streamflow, with high-streamflow events removing more sediment from the bed and eroding the thalweg. While Topanga Creek experiences exchange of coastal waters across the beach, the lagoon is largely perched (elevated above) ocean tide levels, meaning that streamflow plays a relatively larger role in maintaining open-mouth conditions than tidal exchange.

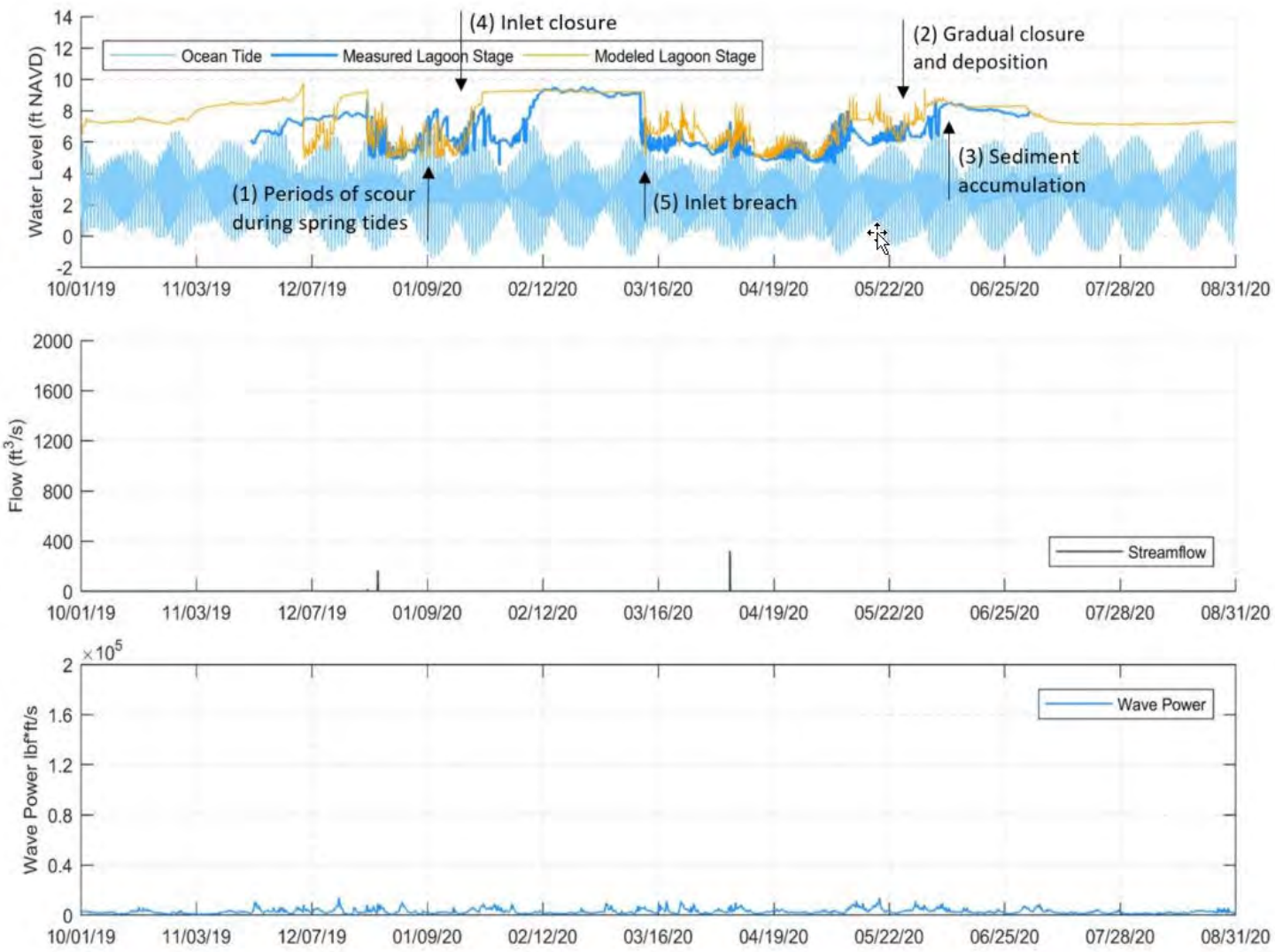
To further test model accuracy, the water level exceedance (inundation frequency) in the lagoon and the seasonal closure pattern were examined in more detail. **Figure 2-4** compares modeled and observed water level exceedance in the lagoon from October 2019 to July 2020. This is a measure of how often water levels are greater than or equal to a certain value (e.g., water levels rarely exceed 9 ft NAVD88 but are usually above 4 ft NAVD88). Overall, average modeled water levels are within a foot of observed water levels. The modeled water level exceedance curve is 0.25 to 1.2 ft higher than the exceedance curve for water levels observed over 9 months. This is within the expected range of model uncertainty given the relatively short period of available water level data. Collecting multiple years of water level data would likely result in closer agreement between observations and the model.

SOURCE: ESA 2020

Topanga Lagoon Restoration

Figure 2-3a
Time Series, Hindcast of Existing Conditions

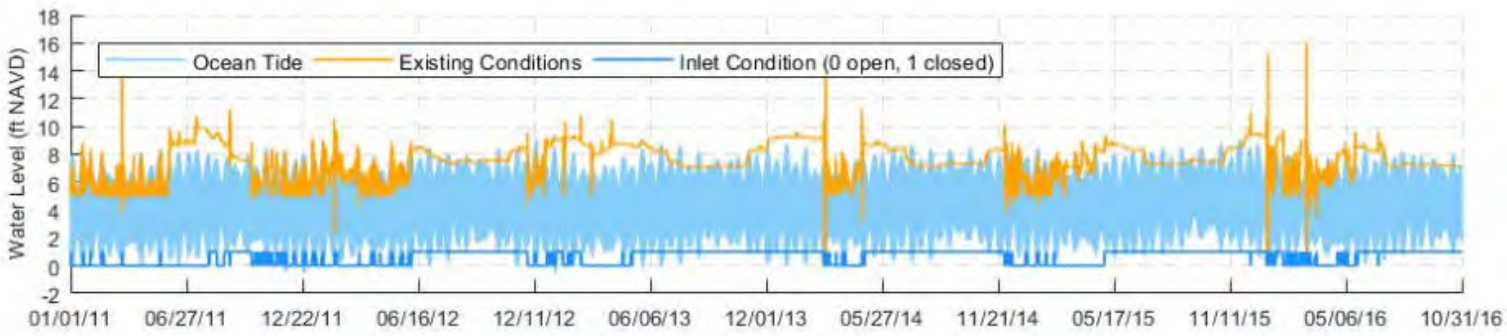
ESA



SOURCE: ESA 2020

Topanga Lagoon Restoration

Figure 2-3b
Time Series, Hindcast of Existing Conditions, Zoomed

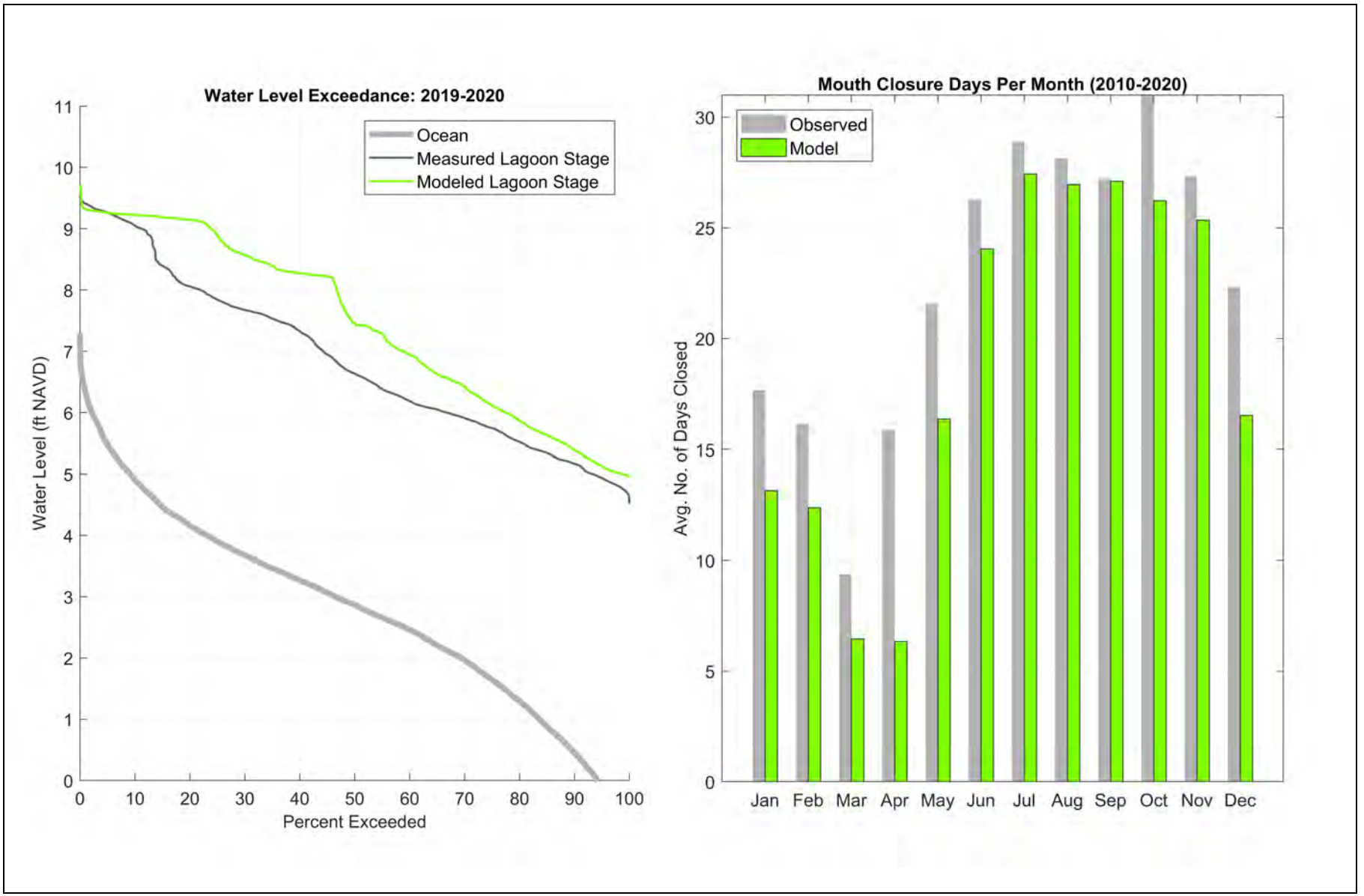


SOURCE: ESA 2020

Topanga Lagoon Restoration

Figure 2-3c
Time Series, Hindcast of Existing Conditions, Compared to Observed Inlet Conditions

ESA



SOURCE: ESA 2020

Topanga Lagoon Restoration

Figure 2-4
Water Level Exceedance Curves

ESA

The upper left panel of **Figure 2-5** compares the observed and modeled number of mouth closure days per month from 2010 to 2020. The model correctly predicts the seasonality of lagoon mouth closure, with a peak in inlet closure from spring to fall and lower closure likelihood in winter. However, the model tends to under-predict the number of closure events in April. This may suggest that the model is too sensitive to higher flows in winter (which create stronger currents to keep the mouth open), or not sensitive enough to wave deposition. If the model could be calibrated with multiple years of lagoon stage data, it is likely that the model would have estimates closer to the observed number of mouth closure days. Nevertheless, the mouth closure days are under-predicted by a few days per month on average, which is relatively small compared to the overall variability in closure days throughout the year. The QCM still provides a useful tool for representing multiple dynamic lagoon processes over a long period of time, including the seasonality of mouth closure, even with a difference between observed and modeled closure of a few days per month.

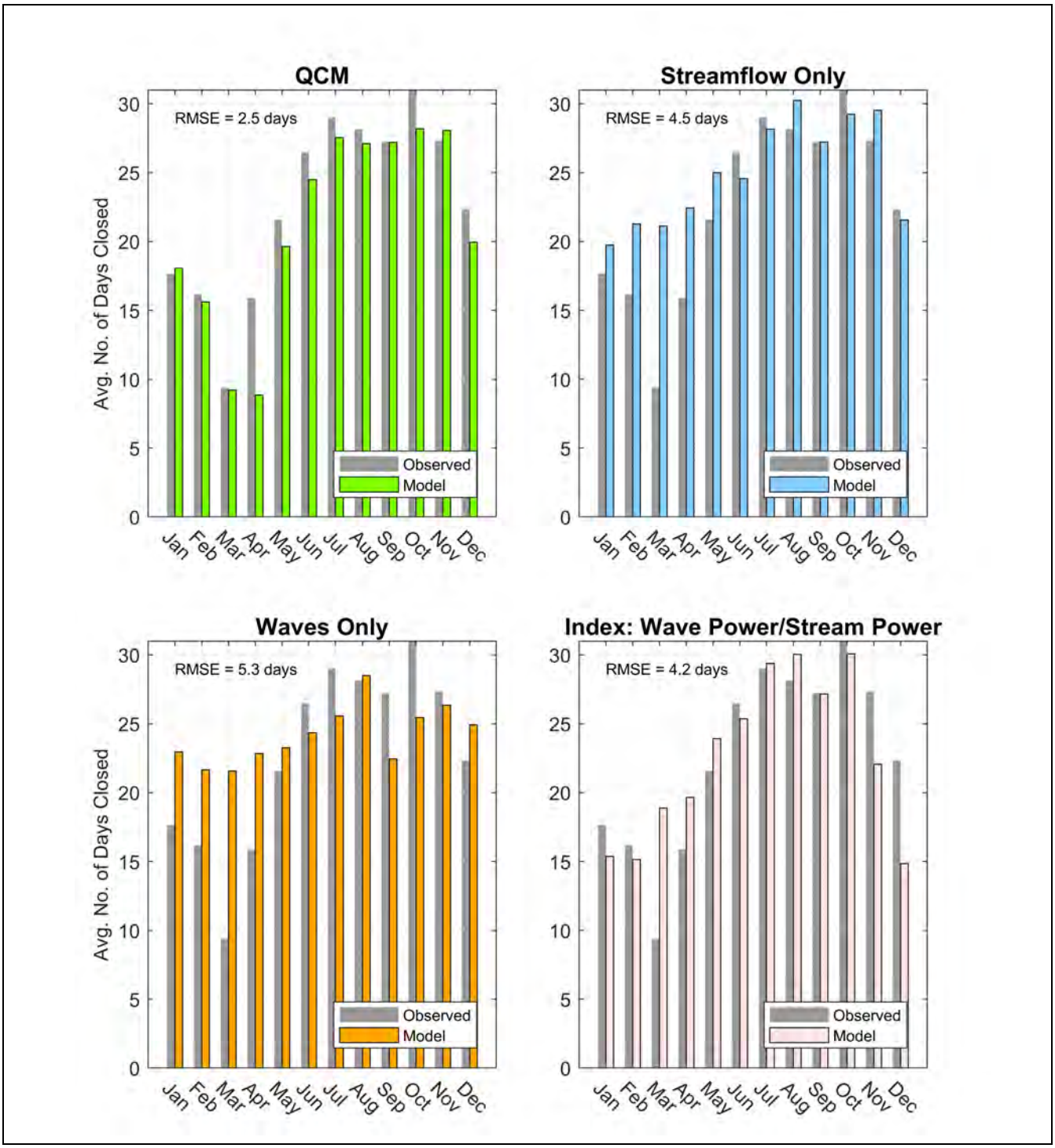
As a means of testing the utility of this modeling approach, we also examined the ability of several other parameters to predict the seasonal closure pattern observed from 2010 to 2020. Figure 2-5 shows the predictive ability of streamflow alone, wave conditions alone, and a non-dimensional index comparing wave power and stream power. The root-mean-square-error (RMSE) for monthly days closed was lowest for the QCM approach. Streamflow alone is a good predictor of the timing of breach events (which often happen during rain storms), but a poor predictor of the timing of closure events (which are caused by wave events). Waves were the poorest predictor of seasonal closure, since they are a poor predictor of breaching. A non-dimensional index of stream and wave conditions is an improvement over both individual parameters, but provides a poorer fit than the QCM, because the water balance approach embedded within the QCM provides a more accurate accounting of the root causes of breaching (streamflow accumulating to the level of the beach, which is set dynamically by waves).

The Topanga Lagoon is a small system, and thus highly sensitive to major shifts in coastal or creek conditions. The QCM could be refined further by gathering water level data from logging devices, to better capture variation in water levels when the mouth of the lagoon is open.

To determine whether the lagoon conditions were suitable for fish passage or refuge, specific output from the QCM model were analyzed and input into the passage/refuge suitability model in MATLAB. Water level, inlet width, and inlet length were used at each timestep to bin the lagoon condition into morphology types (Section 3.1) for when the lagoon mouth was open.

The morphology types included migrated and straight beach profile geometries. The range of migrated geometries chosen were based on historical aerial imagery and observations. The range of straight geometries were chosen based on the survey topography (2022a). M&N modeled each morphology type breach condition for current conditions and raised with sea level rise in their 2D model. Discharge and velocity model output were analyzed and used in the MATLAB habitat model as discussed in Section 3.1.

The QCM model results for the project alternatives and future conditions are discussed in Section 4.1 of this report.



SOURCE: ESA 2020

Topanga Lagoon Restoration

Figure 2-5
Comparing Observed and Modeled Mouth Closure Days per Month 2010-2020 for the QCM and other Parameters

2.5.1 Summary

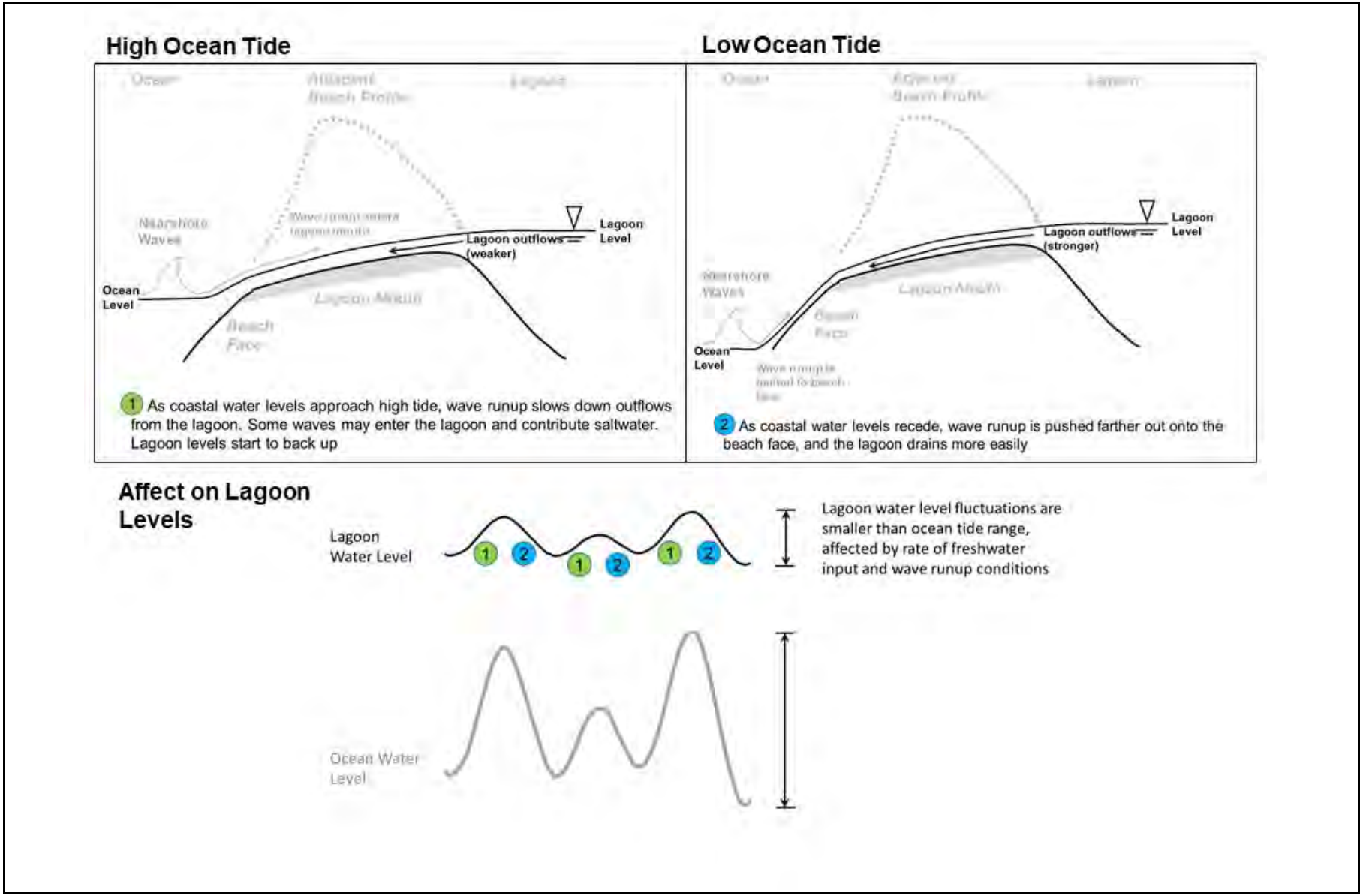
Compared to available data, ESA's QCM model adequately portrays the existing mouth dynamics of Topanga Lagoon and serves as a tool to assess relative change between existing, project, and future conditions for the Topanga Lagoon Restoration. The computed model output is used to assess suitability for fish passage and refuge, which is discussed in Section 3.1.

A summary of the existing mouth dynamics according to the model are as follows: under present conditions, the mouth closes periodically during most years, and during drought years, the mouth tends to stay closed through the wet season. During most years, the mouth is most likely to close in early summer and remain closed through fall (specifically the months of June through November).

Seasonal closure in the early summer is a result of the seasonal decline in watershed runoff and the presence of long-period swell waves, providing sand to the mouth and a declining ability of the lagoon to remove it. The lagoon remains closed through the fall since low dry-season flows are unable to fill the lagoon to a level where it would naturally overtop the beach berm that is built by waves after mouth closure. As winter storms commence, the mouth tends to open after November, as wave energy and watershed runoff increases.

An important feature of the Topanga Lagoon hydrodynamics that warrants further explanation is the tendency for tidally-influenced water level fluctuations to occur in the lagoon, with lagoon water levels elevated several feet above ocean tidal elevations. Often, the lagoon experiences what appear to be tidal fluctuations, but these only vary by a few feet (compared to about 6 feet of tide range measured at the NOAA Santa Monica gauge), and these occur despite the fact that the inlet is perched above ocean tide levels by the beach and cobble sill. These motions are the result of wave runup into the mouth of the lagoon during rising tides, which cause incoming freshwater to 'back up' in the lagoon and rise by several feet. As tides drop, the influence of wave runup is pushed farther out toward the ocean, and the lagoon is allowed to drain freshwater flows more rapidly (**Figure 2-6**). Although ocean water can be exchanged with the lagoon during very high tides or through wave runup into the lagoon, much of this daily variability in water levels is due to complex effects on freshwater drainage out of the lagoon. This has implications for the design, since enlarging the lagoon laterally may do more to provide space to collect incoming freshwater, but may not cause greater tidal exchange with the ocean, as long as the cobble sill is in place.

Lagoon mouth dynamics modeling results for project and future conditions are discussed in Section 4.1.



SOURCE: ESA 2020

Topanga Lagoon Restoration

Figure 2-6
Conceptual Diagram of Water Level Fluctuations in Topanga Lagoon

ESA

Section 3: Fish Passage & Refuge

ESA developed a fish passage model to determine whether segments of the Topanga Lagoon could provide passage to adult steelhead and refugia to juvenile steelhead and tidewater gobies at various flows and channel morphologies. The following sections discuss the criteria and methodology for this model.

3.1 Fish Passage & Refuge Criteria

ESA based fish passage and habitat suitability modeling on depth and velocity criteria for two different species and life stage combinations:

- Adult steelhead passage
- Tidewater goby and juvenile steelhead refugia

Steelhead migration between the Pacific Ocean and the upstream limit of the project reach in Topanga Creek is assumed to require the following conditions to be met:

1. Lagoon mouth breached
2. Water depth sufficient for passage (see Table 1 or Table 2) with likely bottlenecks to be the breach and the point immediately upstream of where Topanga Creek discharges into the lagoon
3. Water velocity sufficiently slow for passage (see Table 1 or Table 2) with likely bottlenecks to be the breach and the point upstream of where Topanga Creek discharges into the lagoon, and potentially the main body of the lagoon

If all three passage conditions are met simultaneously or in close succession, migration from the Ocean to lower Topanga Creek is possible. There may also be situations in which either the upstream or downstream bottleneck is open but the other one is closed, in which case steelhead may hold for a period of time in the lagoon until the closed bottleneck opens. However, the period of time that steelhead could feasibly hold in the lagoon without risk from stressors (e.g., predators, high water temperature, low dissolved oxygen etc.) may be limited.

ESA considered two potential sets of fish passage criteria: (1) salmonid passage criteria for culverts developed by National Marine Fisheries Service (NMFS) Southwest Region (NOAA 2007, **Table 3-1**), and (2) steelhead passage criteria developed by California Department of Fish and Wildlife (CDFW 2004, **Table 3-2**). The NMFS criteria are meant to be broadly relevant for salmonid passage in culverts, for both adults and juveniles. The juvenile passage criteria are intended to apply to upstream movement by young fish traveling among microhabitats and stream reaches during their riverine rearing life stage, and therefore may not be as relevant to fish emigrating through the lower Topanga Creek and lagoon.

TABLE 3-1
NOAA CRITERIA FOR SALMONID PASSAGE THROUGH CULVERTS (NOAA 2007)

Culvert Length (feet)	Velocity – Adults (feet/sec)	Velocity – Juveniles (feet/sec)
< 60	6	1
60–100	5	1
100–200	4	1
200–300	3	1
> 300	2	1
Minimum depth	Depth – Adults (inches)	Depth – Juveniles (inches)
	12	6

TABLE 3-2
STEELHEAD PASSAGE CRITERIA (CDFW 2004)

Criteria	Adult Steelhead	Juvenile Steelhead <6 Inches in Length
Minimum Flow Depth (feet)	0.8 feet	0.3 feet
Maximum flow velocity for sustained or prolonged swimming (feet per second)	6 feet/sec	1.5 feet/sec

For this analysis, ESA used the CDFW criteria in Table 3-2 since these are specific to steelhead rather than generic salmonids. For adult steelhead passage, we applied CDFW criteria for adult steelhead and evaluated passage suitability based on modeled depth and velocity compared to the criteria. These criteria are likely more conservative (i.e., underestimate actual migration potential) than natural channels where heterogeneity in flow depth and velocity and natural channel substrate allows individual fish to migrate in conditions that are classified as impassible. In addition, southern California steelhead tend to be smaller than steelhead in more northern streams, which means they can traverse shallower water, but may not be able to swim against higher velocities compared to other populations of steelhead or salmon. Use of these criteria provides a conservative but consistent way to compare existing conditions with potential project alternatives.

In response to CDFW comments on the proposed methodology for this analysis (ESA 2020a) and further discussion with the RCD, ESA did not assess juvenile steelhead passage from the lagoon back upstream because the lagoon is usually disconnected from the creek upstream by dry reaches, which none of the restoration alternatives will change.

ESA applied the velocity criteria of 1.5 feet/second from CDFW's criteria for maximum flow velocity for sustained swimming for juvenile steelhead (per Table 3-2) as the criterion for juvenile steelhead refuge in the lagoon. ESA used this criterion to assess conditions in which flow velocities higher than this criterion have the potential to sweep juvenile fish from the lagoon to the ocean. ESA selected the velocity criteria of 1 foot/second for tidewater goby refugia during mouth openings from ESA's analysis for the Scott Creek Lagoon Restoration Project (**Table 3-3**, ESA 2019).

TABLE 3-3
TIDEWATER GOBY AND JUVENILE STEELHEAD REFUGIA CRITERIA (ESA 2020B)

Criteria	Refuge During Mouth Openings
Maximum flow velocity for sustained swimming (feet per second)	1 foot/sec

3.2 Passage and Refugia Suitability Model Methods

The results of lagoon modeling from Section 2 were used to inform the next step of the analysis: determining whether the lagoon conditions were suitable for passage or refuge given each day's conditions. We created a passage/refuge suitability model in MATLAB that combines the lagoon modeling output and the passage/refuge criteria described in the previous section.

Suitability was evaluated on a daily basis for the duration of the simulation. For each day, the algorithm of the suitability model processed the following steps:

1. Predict lagoon mouth morphology based on lagoon mouth modeling results
2. Based on predicted morphology and observed river flow, ESA used flow-velocity-depth rating curves (developed by M&N from their 2-D model results) to estimate the velocity and depth at high and low tides that day.
3. For all points on all cross-sections, compare velocity and depth against passage and refuge suitability criteria
4. For a given region ("breach," "lagoon," or "upstream") at a given tide condition, if at least one point in every cross-section is passable or suitable refuge, then that region is deemed suitable for that day at that given tide condition
5. If all regions rate as suitable for a given tide condition (i.e., at least one point in every cross-section across all regions is passable or suitable refuge), then the entire system is rated as passable or suitable for that day at that given tide condition.

These steps are expanded upon in greater detail below.

Step 1. Predict channel morphology

The lagoon water levels and closure period results from the modeling described in Section 2 were used to categorize each day of the simulation into a different type of channel morphology. These morphology types are summarized in **Table 3-4** below.

The purpose of these channel morphology classifications was to create a more detailed understanding of the hydrodynamics that could be present on any particular day. These morphologies have implications for both hydrodynamics and fish passage/refuge. For instance, a sufficiently large and deep channel could potentially sweep tidewater gobies back out into the ocean.

TABLE 3-4
CHANNEL MORPHOLOGY TYPES

Type	Description	Channel Dimensions
1	Narrow Straight	10 ft by 160 ft
2	Narrow Migrated	10 ft by 200 ft
3	Medium Straight	25 ft by 160 ft
4	Medium Migrated	25 ft by 200 ft
5	Wide Straight	40 ft by 160 ft
6	Wide Migrated	40 ft by 200 ft
7	Narrow Extra-Long	9 ft by 350 ft

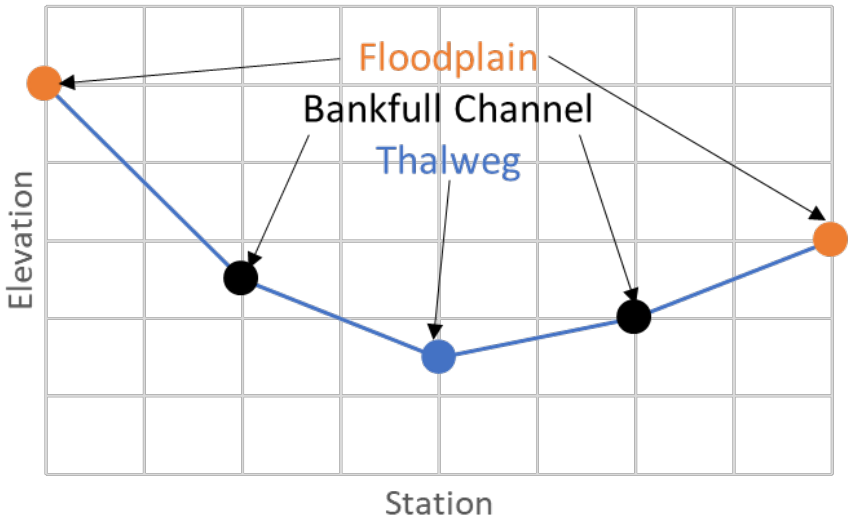
The sea level rise simulations also considered two thalweg conditions, which reflect different assumptions about the evolution of the extant erosion-resistant cobble berm with sea level rise. Details about the thalweg conditions can be found in M&N's modeling report (M&N 2022a).

Step 2. Estimate velocity and depth at high and low tides that day

The study area was categorized into three regions (breach, bridge, and upstream), each of which was represented by cross-sections. To evaluate passage at these cross-sections, we discretized each into a set of points located at the thalweg (i.e., deepest point of the channel), the sides of the bankfull channel, and if applicable on the floodplain as well.

A schematic of these points is presented below showing a sample cross-section view with the thalweg, bankfull channel, and floodplain analysis points labeled.

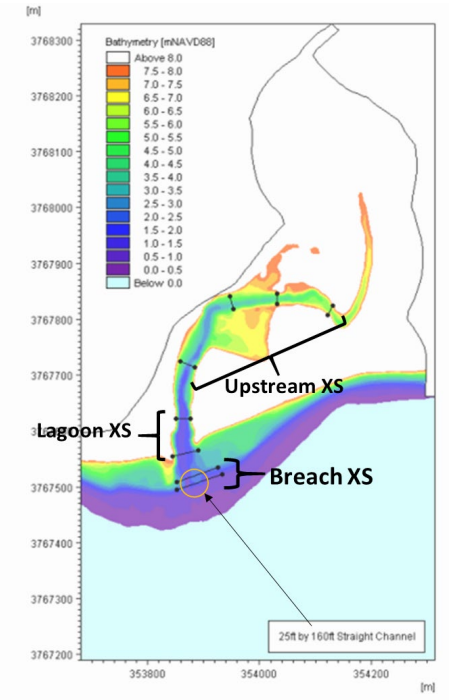
For each cross-section point and each channel morphology condition, M&N generated rating curves to relate discharge to velocity and to depth at both high and low tides from their 2-D model results. ESA loaded these rating curves into a library for the MATLAB algorithm to look up the velocity and depth resulting from each day's maximum streamflow. As an example, **Figure 3-2** shows the cross-sections and bathymetry for channel morphology types 1 & 3.



SOURCE: [insert text]

Topanga Lagoon Restoration

Figure 3-1
Model Cross-Section Schematic



SOURCE: Moffatt & Nichol

Topanga Lagoon Restoration

Figure 3-2
2D Hydraulic Model Bathymetry and Cross-Section Locations for Channel Type 3

Step 3. Compare velocity and depth to criteria

For each cross-section point, the velocity and depth found from the rating curves were compared to the criteria listed in Section 3.1. Due to limitations in the rating curves, the depth criterion for adult steelhead was not considered for cross-sections in the upstream and lagoon zones.

Step 4. Count passable cross-sections

If at least one point on every cross-section in a given region is deemed passable or suitable at a given tide condition for each criterion, then that region was deemed passable or suitable for that given tide condition.

Step 5. Count passable regions

If all regions are deemed passable at a given tide condition as outlined above, then the entire system is considered passable for that tide condition. This determination of the system's overall suitability feeds into the results figures shown in the following section.

Furthermore, note that passability or suitability at one tide condition does not necessarily indicate passability or suitability at the other tide condition. Steps 1 to 5 were conducted to evaluate passage/refuge at high tide and at low tide for each day of the simulation. The same steps were used to evaluate passability or suitability for the sea level rise scenarios.

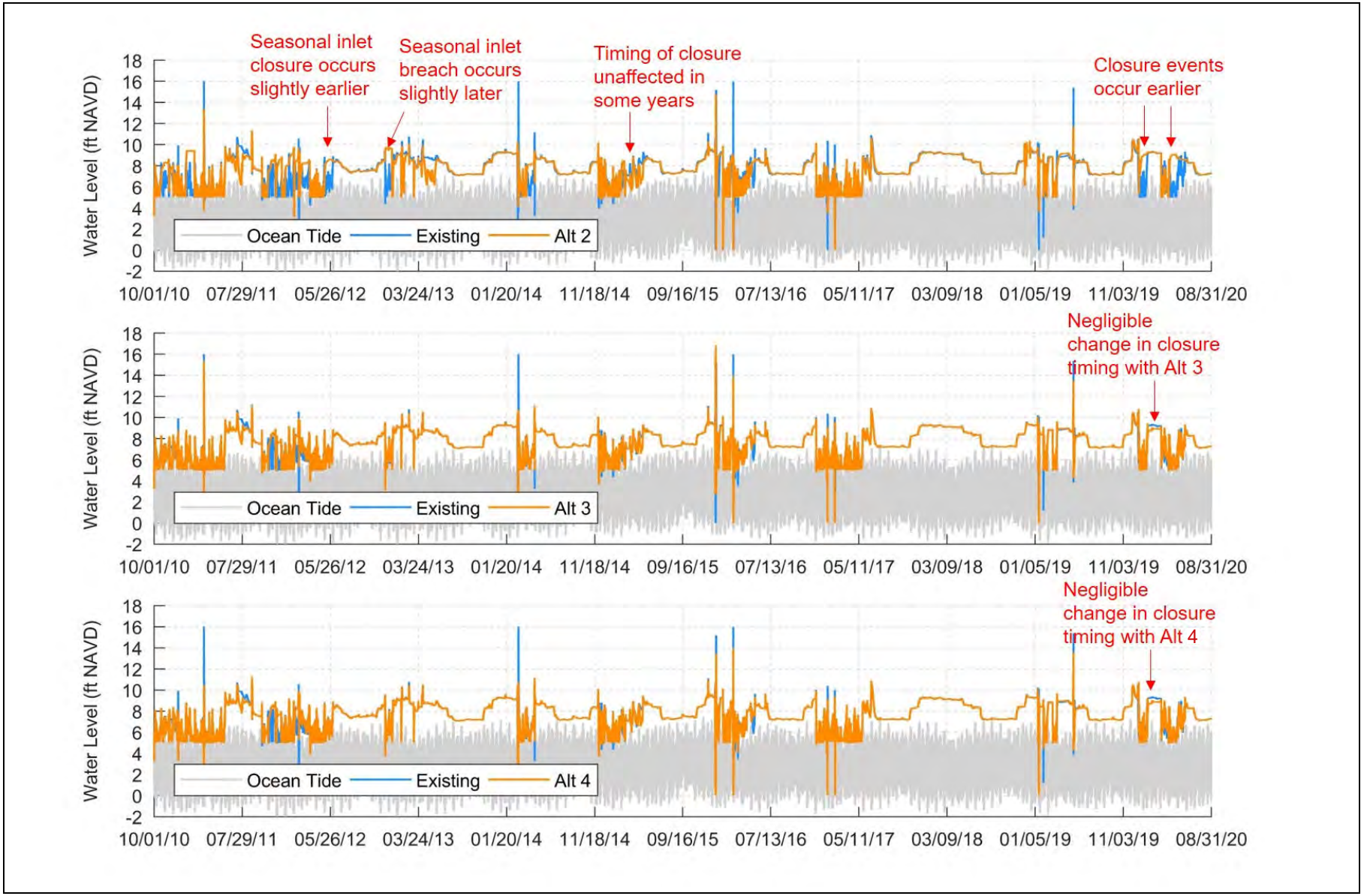
Finally, model results were compared against the RCD's monitoring and observations of adult steelhead in Topanga Creek. Note that the model results are limited by their abstraction of a complex system to discrete points within discrete cross-sections within the hydraulic modeling. By comparing modeled results against agency observations of fish passage and activity over the last decade, we fine-tuned the methodology to better calibrate this tool to observed conditions. This model is a tool to assess the relative change due to restoration actions and sea level rise as compared to existing conditions.

Section 4: Model Results

4.1 Lagoon Mouth Dynamics Modeling Results

4.1.1 Restoration Project Alternative Conditions

Compared to existing conditions, the Alternative 2 grading design increases the wetted lagoon volume perched above the tides. In this alternative, streamflow and wave overwash may take longer to fill the larger lagoon volume before breaching (see notes on **Figure 4-1** that indicate differences between Alternative 2 and Alternative 1). As a result, there is potential for some increase in the duration of mouth closure during the wet season. Despite this change, the lagoon still breached during the winter in all years when it was observed to breach under existing conditions. Further, as discussed in Section 4.2, the larger wetted area of the lagoon had the effect of reducing velocities, and thus improving fish passage conditions.



SOURCE: ESA 2020

Topanga Lagoon Restoration

Figure 4-1
Time Series, Existing vs. Project Conditions

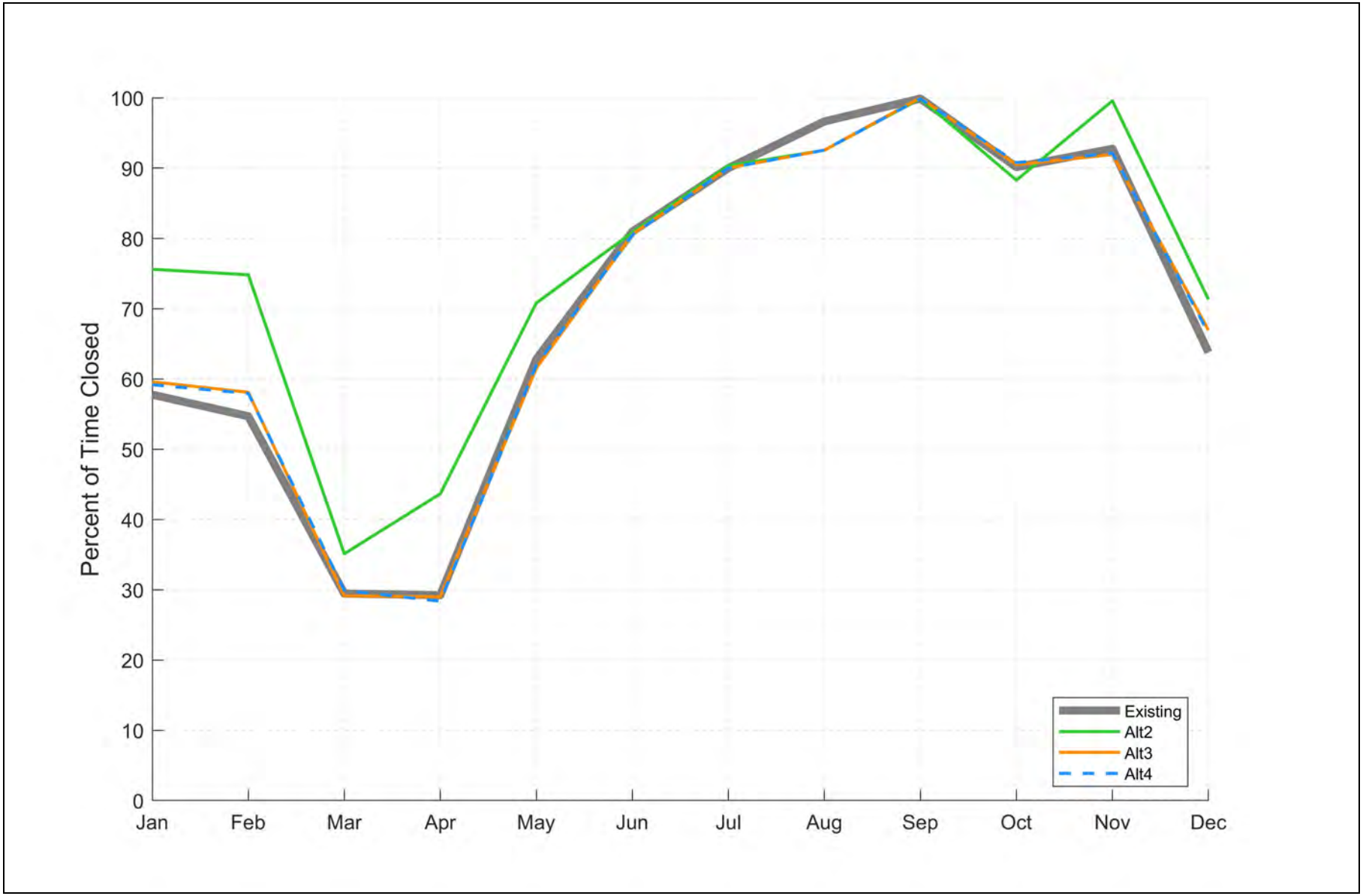
ESA

While the result that a larger lagoon with Alternative 2 may lead to slightly longer closure events may initially seem counterintuitive, it is important to note that under existing conditions the majority of the lagoon volume is above the elevation of ocean tides. Therefore, adding volume to the lagoon through lateral expansion is not expected to greatly increase the ability of the lagoon to experience tidal exchange (which would tend to keep the mouth open for longer, as observed at other lagoons in southern California). Since the existing cobble berm buried within the beach is still present with the project, this constraint on breach channel erosion would likely still prevent the lagoon from eroding to lower levels that would induce greater tidal exchange.

For Alternatives 3 and 4, the grading design also increases the wetted lagoon volume perched above the tides, though not as significantly as Alternative 2 (See Figure 4-1). In Alternatives 3 and 4, the lagoon expansion is above most lagoon water levels. Therefore, there is no significant change in lagoon volume or opening and closure compared to existing conditions.

Figure 4-2 provides more detail on the monthly change in days of closure in the lagoon. The figure shows that the lagoon is closed more often from November through May, and a negligible change from June through October. The significance of these changes is examined in more detail in Section 4.2, where we combine these results with those of the hydraulic model of the creek to look at fish passage conditions. In contrast, Alternatives 3 and 4 show little change in the closure patterns, with changes of generally less than 5% for most months. In the model, the project alternative conditions did not alter the timing of seasonal breaching for most events in late fall-early winter, when larger rainfall events typically lead to 100 to 400+ cfs storm event discharges into Topanga Lagoon. There is no change in closure expected during the dry season.

The model also shows that while the lagoon is open and nearing a closure event (as flows decline) water levels under proposed alternative conditions are lower than existing conditions (by 0.1 to 0.3 ft). The difference in water levels is most likely due to the larger volume of the lagoon associated with the alternatives, which has the effect of dampening the fluctuations in the lagoon. As discussed in Section 2.5, oscillations in the lagoon typically occur above ocean tide levels and are most likely caused by changes in the capacity of the inlet to drain freshwater flows during different phases of the ocean tide (i.e., when waves at higher tides are able to impede outflows). As the lagoon volume increases, we found that the larger area available to receive freshwater input and wave overwash caused a slight reduction in water levels. Since we have assumed that the cobble sill remains in place with the project, we did not see an increase in depth of erosion in the beach during open-mouth conditions.



SOURCE: ESA 2020

Topanga Lagoon Restoration

Figure 4-2
Closure Seasonality, Existing vs. Project Conditions

ESA

4.1.2 Future Conditions with Sea Level Rise

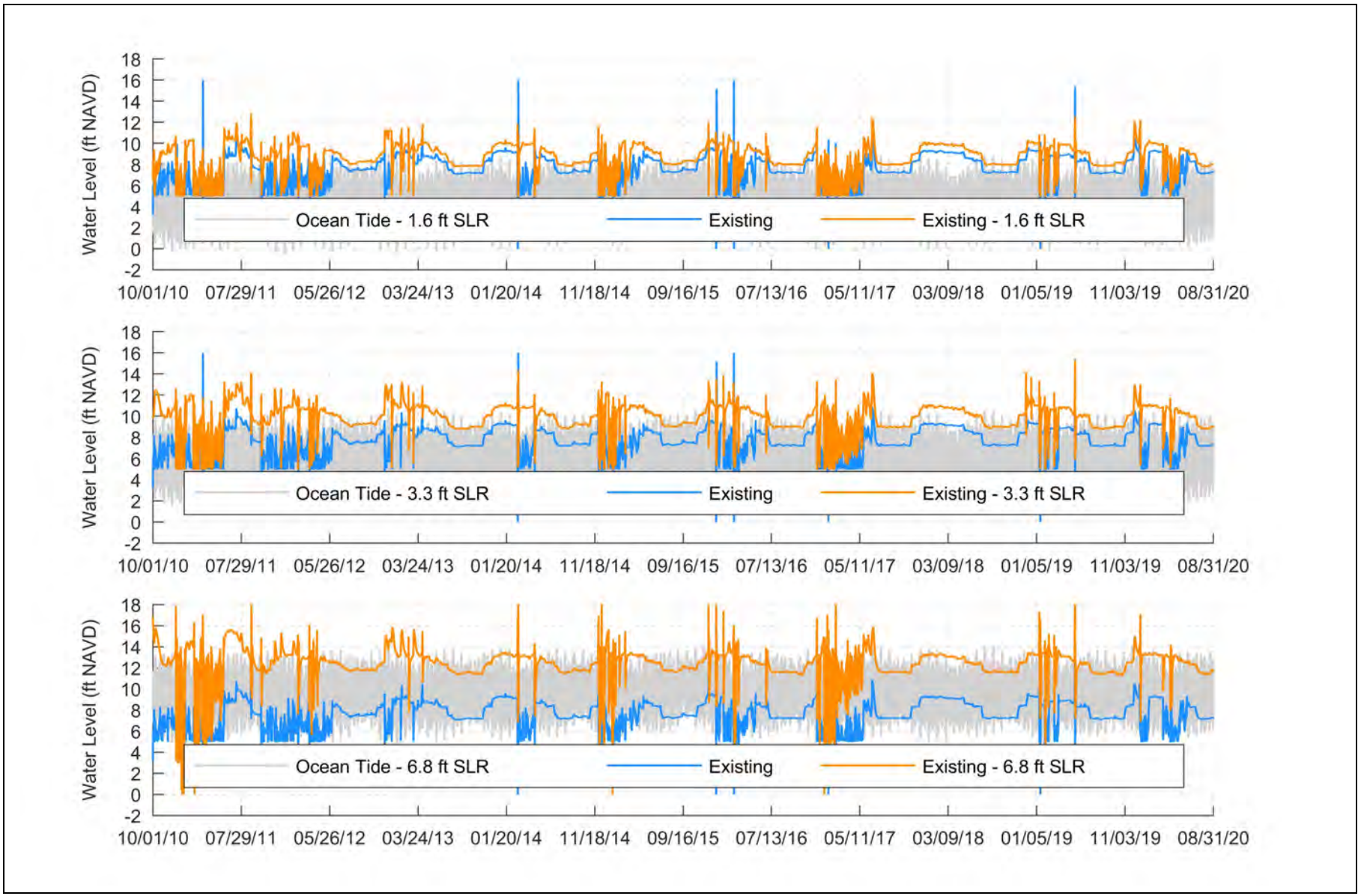
To explore how future changes in sea level could influence the behavior of the lagoon, sea level rise was added to the existing conditions' and project alternatives conditions' 2010-2020 time series. To test the sensitivity of the lagoon to these scenarios, the ocean tides were increased by the corresponding sea level rise amounts above current levels. It was assumed that the beach would remain a similar height above tides as it does presently (i.e., the beach would grow vertically to keep pace with sea level rise). This is a reasonable assumption given that the processes that form the beach (constructive building from wave action) are expected to simply shift upward with the tides. The beach width was assumed to remain the same in the future. Note that a reduction in sand supply to the beach due to beach erosion and loss of sand within the littoral cell with sea level rise could decrease beach height and width. Given uncertainties in estimating the potential change in sand supply, ESA made the simplifying assumptions above.

Figures 4-3a through **4-3d**, show the modeled lagoon water levels with sea level rise for each alternative. **Figure 4-4** summarizes the modeled lagoon mouth closure results by month for each alternative with sea level rise. As shown in Figure 4-4, the model results suggest that there is an overall trend toward more inlet closures with increased sea level rise. Increased sea level is equivalent to adding volume in the lagoon, since previously-dry areas would become inundated as the tides shift upwards. Although this expands the tidal prism and thus makes it harder for the inlet to close, this larger lagoon volume also takes longer to fill with the same creek freshwater inputs, meaning that it would also take longer for the lagoon to breach after it closes. Unlike larger and flatter systems (e.g., Los Peñasquitos Lagoon in San Diego), the shift in tidal prism of Topanga Lagoon is not big enough to incur a dramatic increase in prevalence of open-mouth conditions. The effect of sea level rise on fish passage, which considers the change in mouth closure and changes in velocities and depths, is discussed in Section 4.2.

When comparing Alternative 1 to the restoration alternatives with future sea level rise, the trend in mouth closure behavior is similar. The monthly percent of time closed for each case is shown in Figure 4-4. Sea level rise tends to cause a net shift of the lagoon mouth behavior towards being closed more often.

4.1.3 Summary

Alternative 2 is predicted to have an overall increase in duration of mouth closures because Alternative 2 increases the lagoon volume, which takes longer to fill with streamflow and wave overwash before the lagoon breaching. Despite this change, Alternative 2 is expected to reduce velocities and improve fish passage opportunities and conditions as discussed in Section 4.2. Proposed restoration Alternatives 3 and 4 do not significantly affect mouth closure behavior because they do not increase the volume of the lagoon. As discussed in Section 4.2, Alternatives 3 and 4 do not increase the opportunity for fish passage, but do reduce velocities and improve fish passage conditions at the new longer PCH bridge.

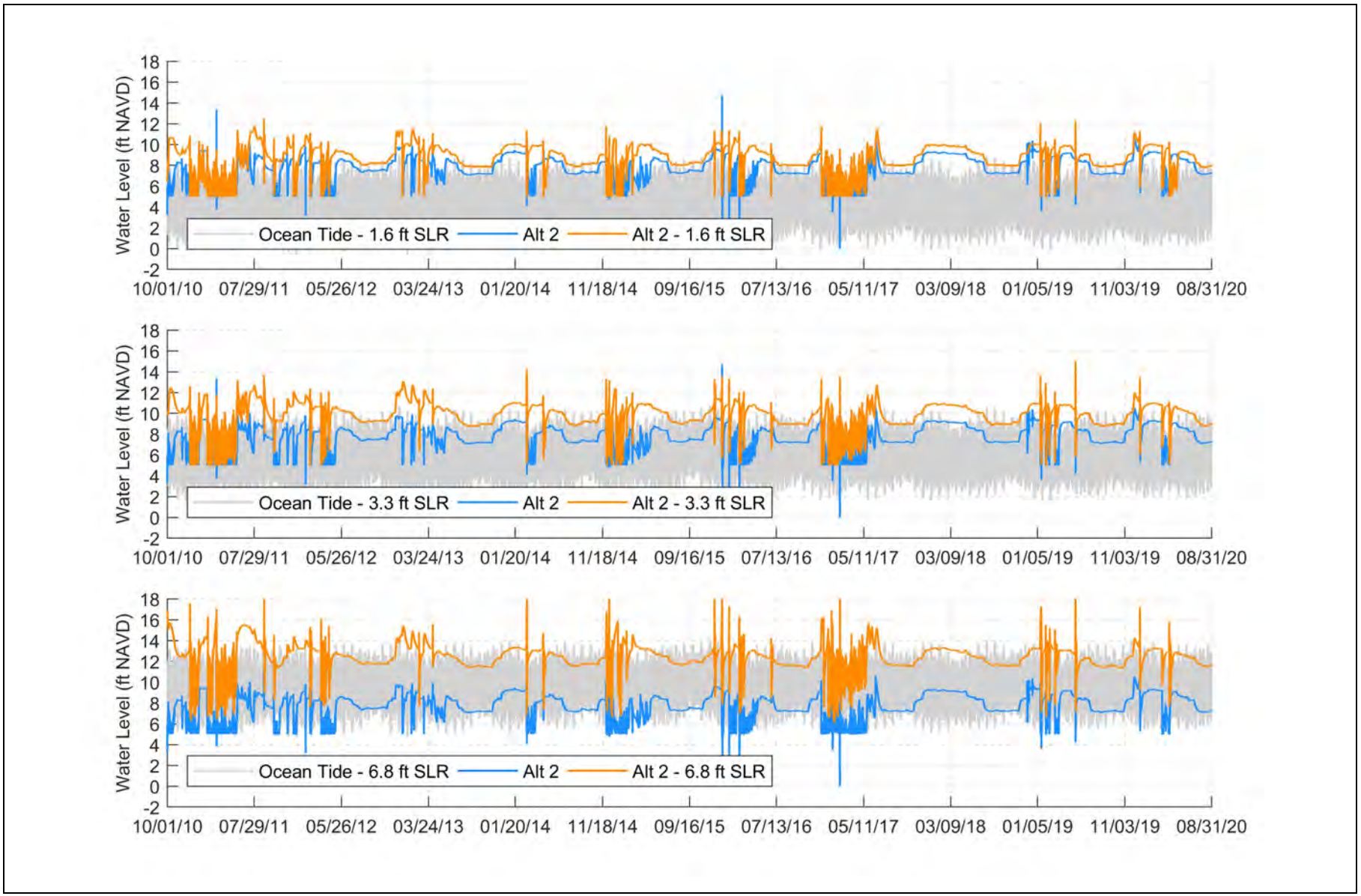


SOURCE: ESA 2020

Topanga Lagoon Restoration

Figure 4-3a
Time Series Model Results for Existing Conditions vs. Sea-Level Rise of 1.6 to 6.8 ft

ESA

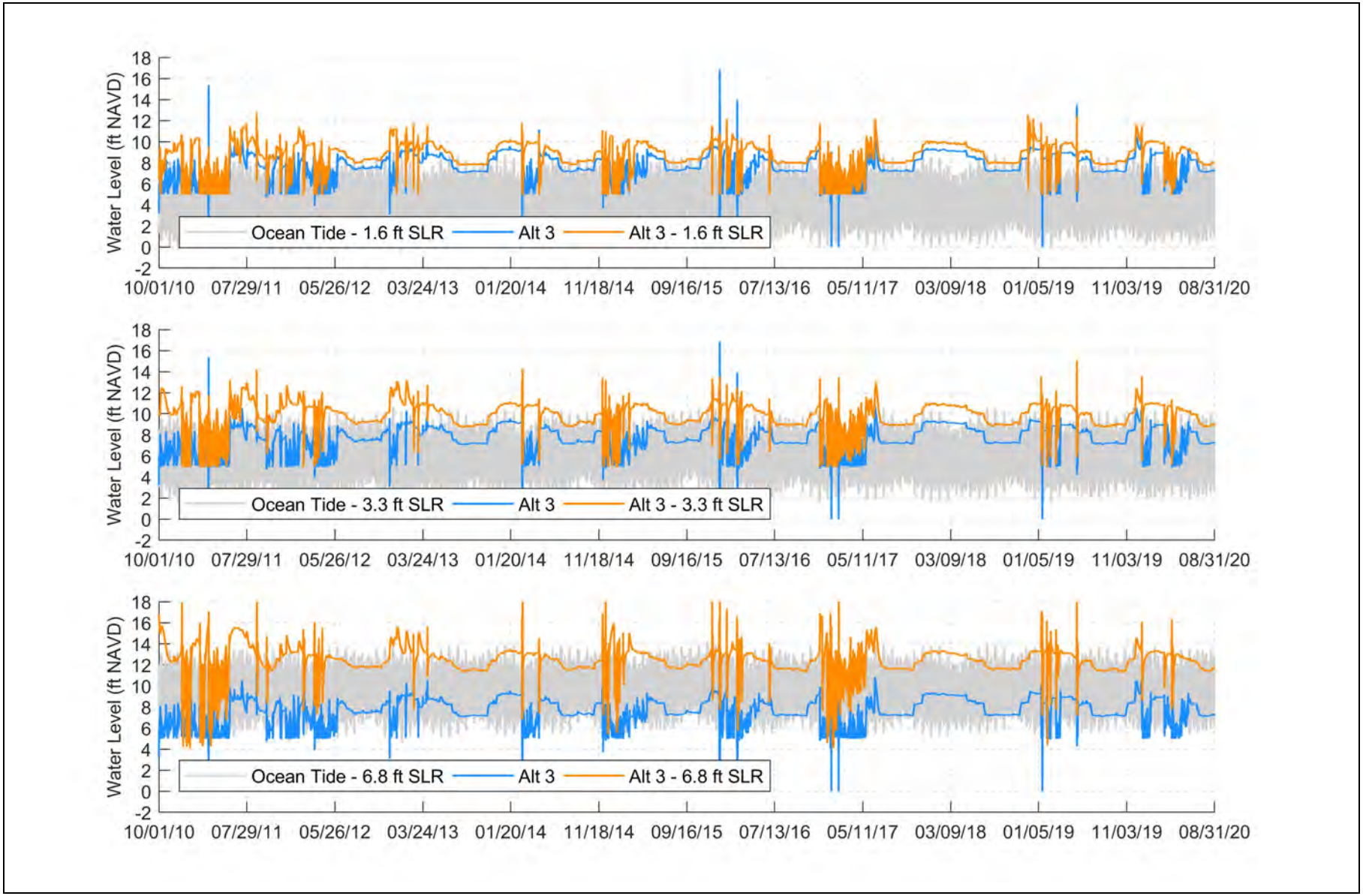


SOURCE: ESA 2020

Topanga Lagoon Restoration

Figure 4-3b
Time Series Model Results for Project Conditions Alt 2 vs. Sea-Level Rise of 1.6 to 6.8 ft

ESA

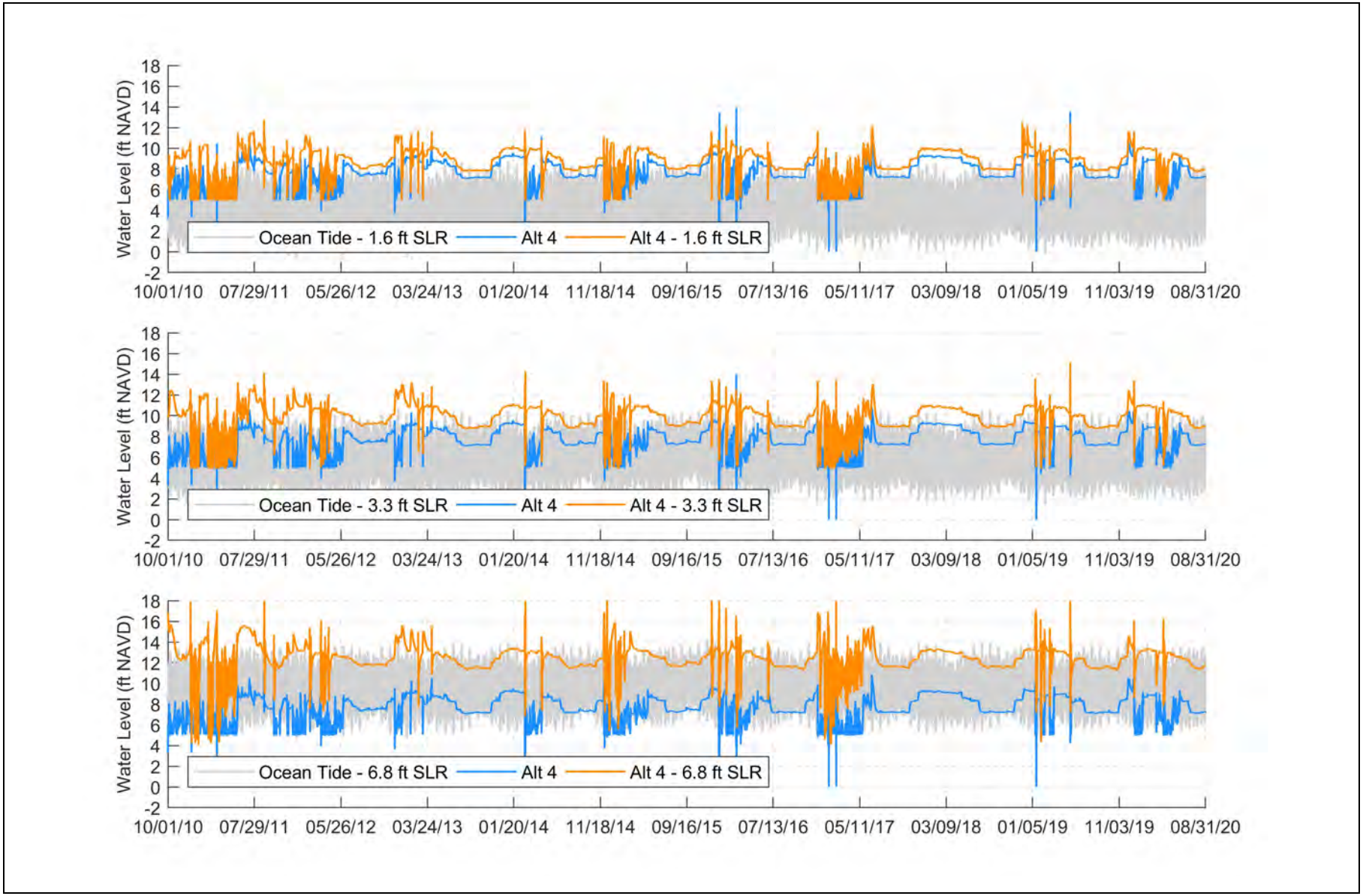


SOURCE: ESA 2020

Topanga Lagoon Restoration

Figure 4-3c
Time Series Model Results for Project Conditions Alt 3 vs. Sea-Level Rise of 1.6 to 6.8 ft

ESA



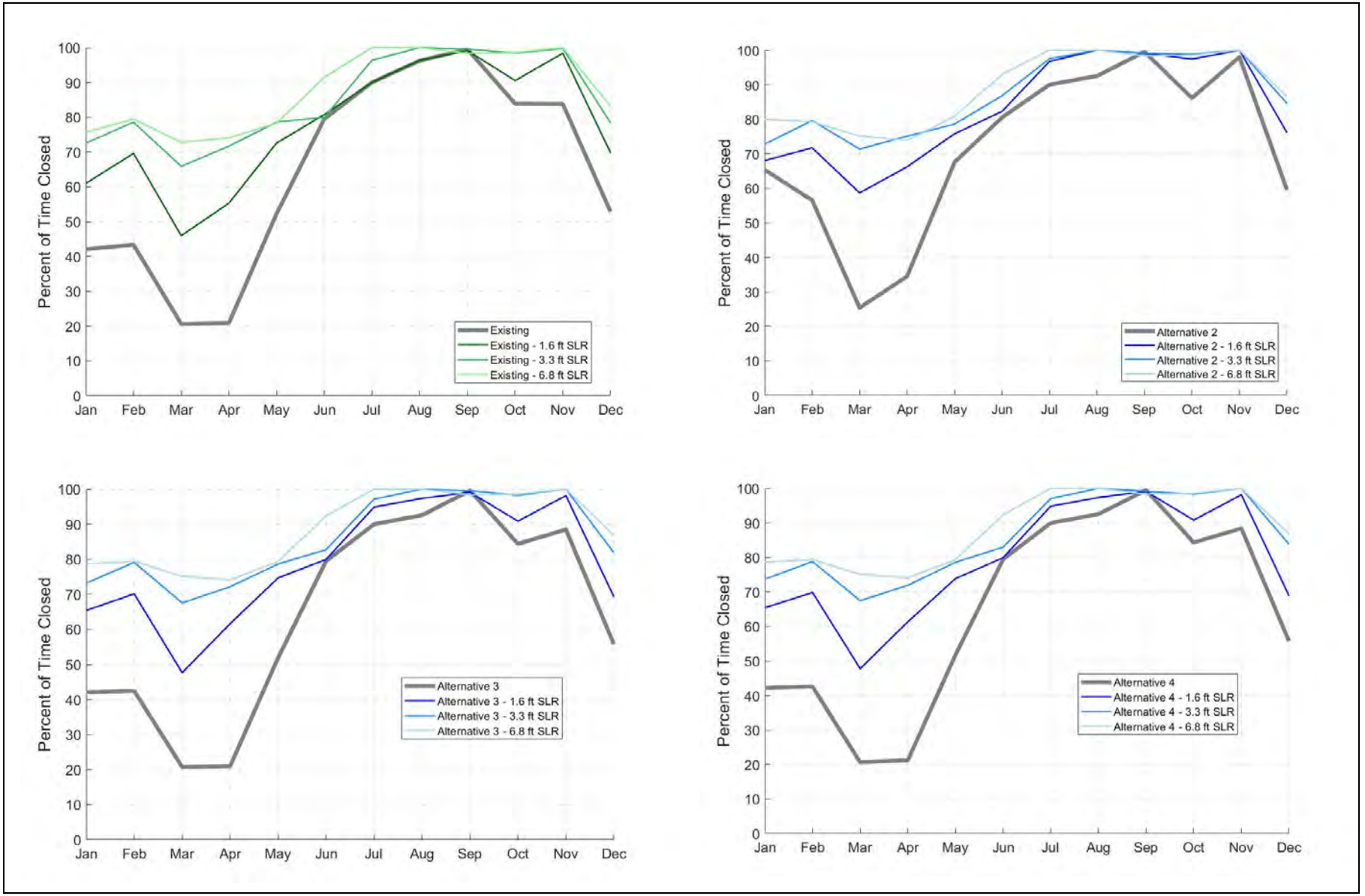
SOURCE: ESA 2020

Topanga Lagoon Restoration

Figure 4-3d

Time Series Model Results for Project Conditions Alt 4 vs. Sea-Level Rise of 1.6 to 6.8 ft

ESA



SOURCE: ESA 2020

Topanga Lagoon Restoration

Figure 4-4
Closure Seasonality, Existing vs. Project Conditions with Sea-Level Rise, 1.5 to 6.8 ft

ESA

Restoration actions are not predicted to increase mouth opening because Topanga Lagoon is perched above ocean tide levels and breaching is highly dependent on rainfall and high streamflow. This is in contract to other larger lagoons (e.g., Los Peñasquitos Lagoon in San Diego) where lagoon restoration and expansion can increase lagoon volume and tidal flows (tidal prism), which can keep the lagoon mouth open for longer periods of time.

Sea level rise is predicted to have a larger impact on mouth closure than restoration actions. Sea level rise is expected to have two effects on lagoon mouth conditions:

- As tide levels increase with sea level rise, the increasingly drowned lagoon will have a greater tidal prism when open (volume of water entering and leaving the mouth every day), which will increase the speed of currents in the mouth and possibly prevent some closure events. Seasonal closure is still predicted to occur.
- As the beach moves up with sea level rise, the increased volume of the lagoon in all alternatives behind the beach will take longer to fill with runoff and breach naturally, meaning that seasonal closure events could lengthen.

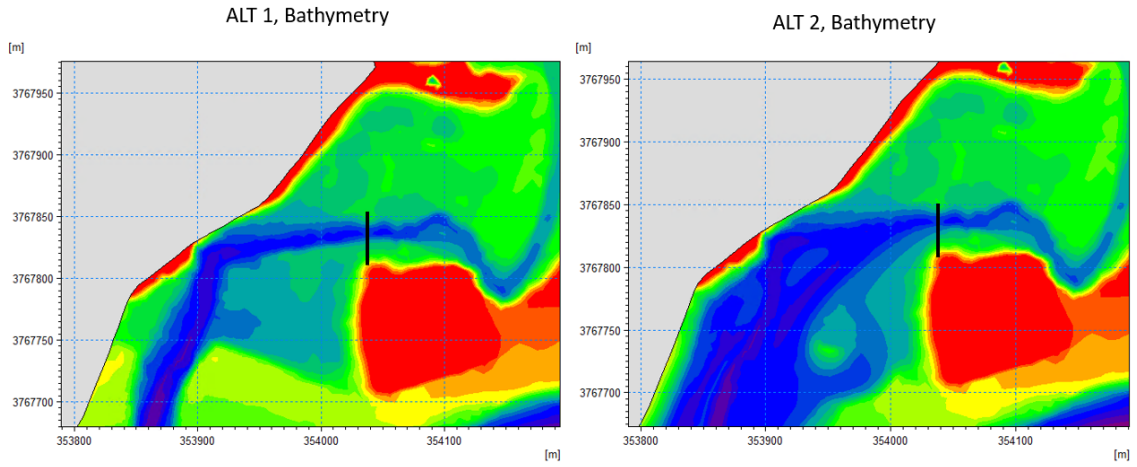
The net change of these two effects is predicted to lead to more mouth closure with sea level rise. The duration of mouth closure events is expected to increase and the total number of closure and breach events is expected to decline (as a result of longer closures).

The effect of sea level rise on fish passage, which considers the change in mouth closure and changes in velocities and depths, is discussed in Section 4.2. Per Section 4.2, with 1.6 ft of sea level rise, the time that the lagoon is passable by adult steelhead is predicted to increase in all alternatives (no project and restoration alternatives) compared to conditions with current sea level. Comparing the alternatives to each other, all alternatives are predicted to provide similar time and opportunity for passage with 1.6 ft of sea level rise. With 6.8 ft of sea level rise, Alternative 2 is expected to improve passage conditions at the PCH bridge, but Alternatives 3 and 4 do not show a clear benefit to passage conditions at PCH bridge

4.2 Adult Steelhead Passage Results

4.2.1 Initial Results and Analysis Refinement

Initial results of the adult steelhead passage analysis showed the storm events on January 17 and February 14, 2019, which are modeled as passable under existing conditions (Alternative 1), were modeled as unpassable under the restoration alternatives (Alternatives 2, 3, and 4). The restoration alternative results showed that the velocity exceeded the threshold for adult passage at one cross-section at the upstream end of the lagoon (see **Figure 4-5**).

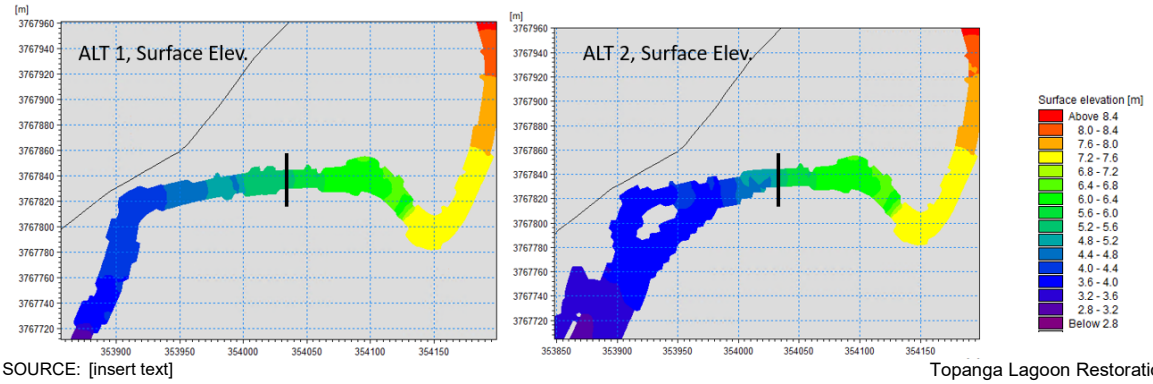


SOURCE: [insert text]

Topanga Lagoon Restoration

Figure 4-5
M&N Hydraulic Model Bathymetry for Alternatives 1 and 2 with Upstream Cross-Section Labeled

M&N hydraulic model results (**Figure 4-6**) show that downstream of this cross-section, the modeled water surface elevation is lower in the restoration alternatives than in existing conditions (e.g., see the comparison of Alternative 1 and Alternative 2 in Figure 4-6). As described below, this causes an increase in modeled velocity in the restoration alternatives that could inhibit fish passage; however, as discussed below, the velocity at this location can be reduced by refining restoration grading (e.g., once a preferred alternative is identified) to improve or benefit fish passage.



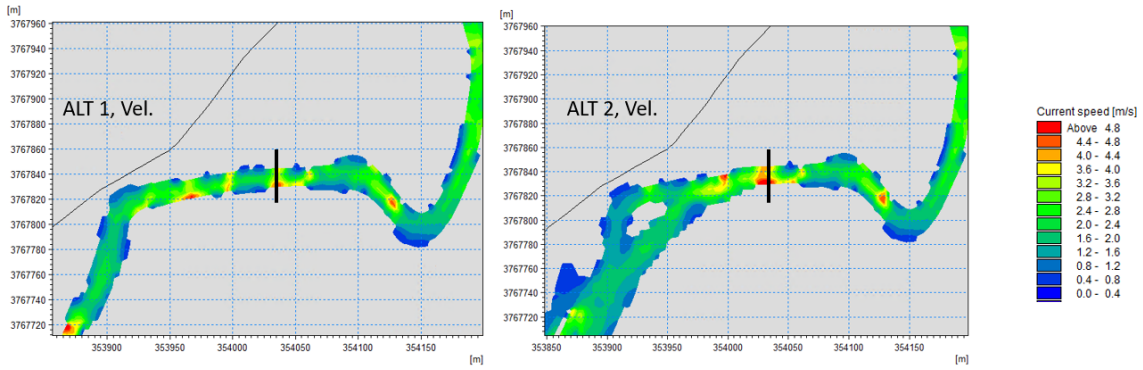
SOURCE: [insert text]

Topanga Lagoon Restoration

Figure 4-6
M&N Modeled Storm Event Water Surface Elevations for Existing Conditions (Alternative 1) and Alternative 2 Showing a Decrease in the Water Surface Elevation Downstream of the Labeled Cross-Section in Alternative 2

The restoration alternatives restore a wider lagoon and/or floodplain. Under restored conditions (e.g., Alternative 2), the modeled creek flow during storm events spreads out over the wider lagoon/floodplain area and the storm water surface elevation is therefore lower. The water level upstream of the lagoon restoration does not change. As a result, the modeled water surface slope

and velocity increases at the cross-section labeled in Figures 4-5 and 4-6 as the flow from the existing channel upstream spreads out (i.e., diverges) into the wider restored lagoon/floodplain. Model results shown in **Figure 4-7** show the increase in velocity at this cross-section location due to this drop in water surface elevation.

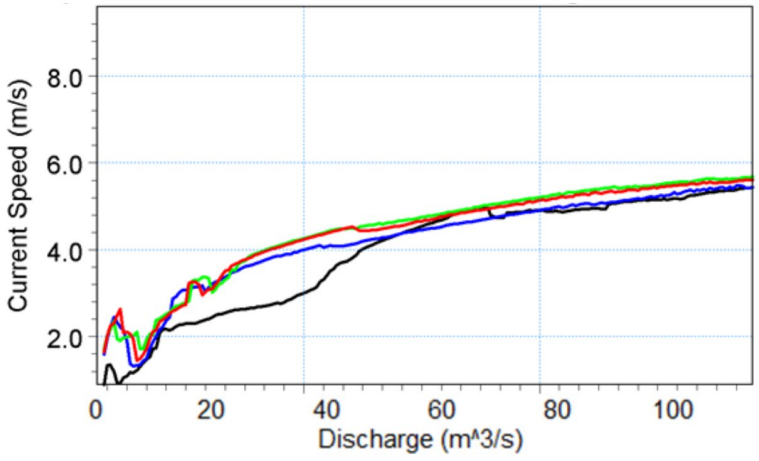


SOURCE: [insert text]

Topanga Lagoon Restoration

Figure 4-7
M&N Modeled Storm Event Velocity for Existing Conditions (Alternative 1) and Alternative 2 Showing an Increase in Velocity at the Labeled Cross-Section in Alternative 2

Figure 4-8 shows M&N's modeled discharge-velocity rating curve based at the labeled cross-section, which shows the modeled velocities for all alternatives over the full range of creek discharge. The rating curve for this cross-section shows the modeled velocity at this cross-section increases in the restoration alternatives (Alternatives 2, 3, and 4) compared to existing conditions (Alternative 1). The modeled velocity increases above the threshold for adult steelhead passage (6 feet per second or 1.8 meters per second).



SOURCE: [insert text]

Topanga Lagoon Restoration

Figure 4-8
M&N Modeled Discharge-Current Speed (i.e., velocity) Rating Curve at the Cross-Section Labeled in Figures X, Y, and Z

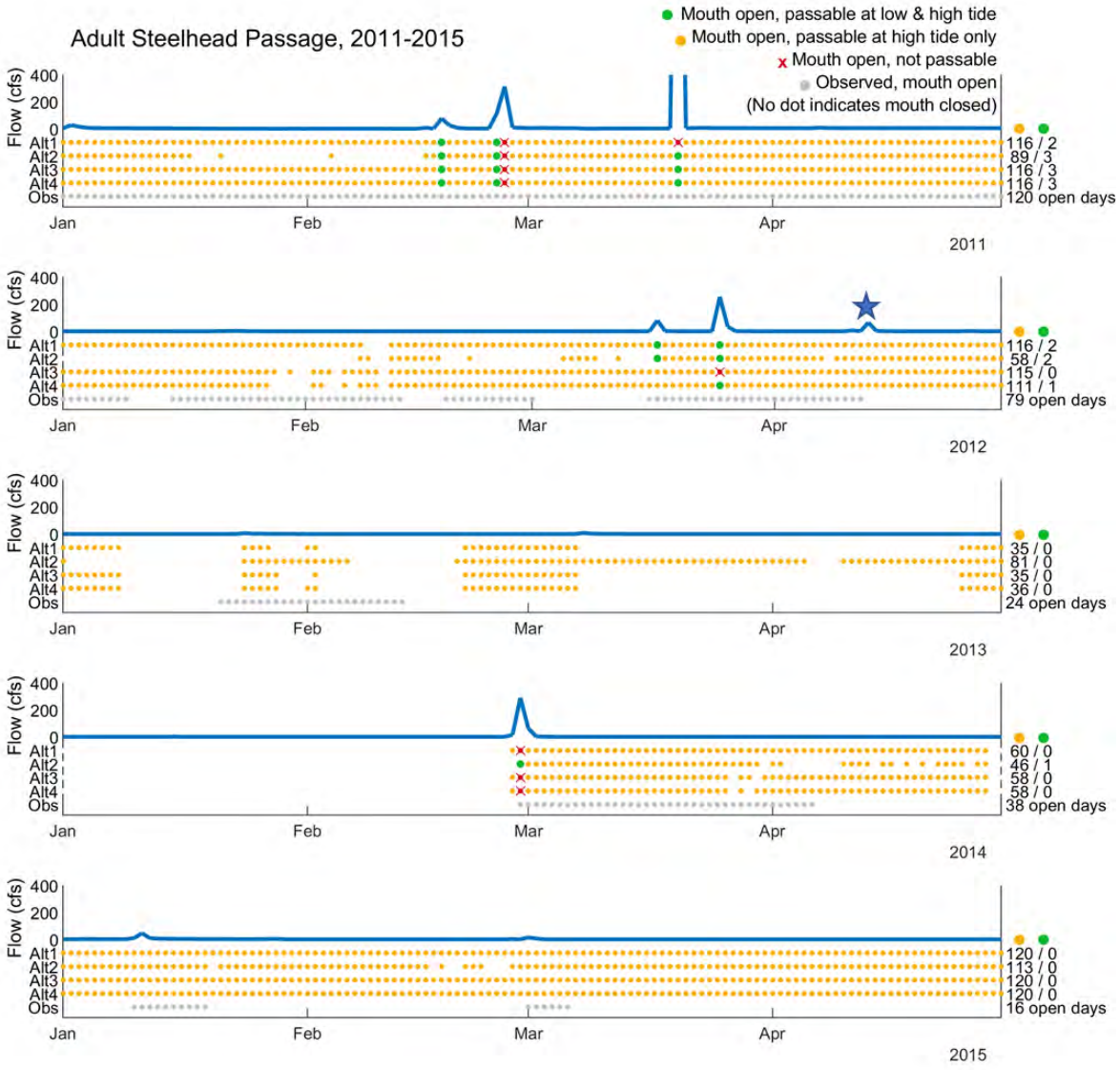
The modeled increase in velocity for restored conditions at the cross-section discussed above is what causes the January 17 and February 14, 2019 storm events to be modeled as not passable under restored conditions. M&N's two-dimensional hydraulic model is a fixed bed model. In reality, the creek bed is likely to scour and/or widen in response to an increase in velocity at this cross-section location. M&N's one-dimensional (1-D) sediment transport modeling simulates channel erosion and deposition. The 1-D sediment transport model for an extreme 1980 storm event predicted approximately 7 inches of erosion at this cross-section for existing conditions (Alternative 1) and 9 to 11 inches of erosion for restored conditions (Alternatives 2, 3, and 4) (Weixia Jin, M&N, pers. comm., 12/16/2021). This result supports the expectation that the channel may deepen and/or widen under restored conditions. If the channel bed adjusts by scouring, the velocity should decrease. Future phases of restoration alternative design will further assess the flow divergence at the upstream end of the restoration and refine the grading to reduce the increase in velocity as possible.

To account for likely channel adjustments and decrease in velocities through design and/or scour in the restoration alternatives, the one cross-section shown above was removed from the fish passage analysis. Removing this cross-section from the analysis showed that all passable storm events under existing conditions are modeled to be passable under restored conditions as discussed in the section below.

Note that for certain large storm events in both existing and restored conditions, the modeled velocities at this cross-section exceed the 10 ft/s maximum swim speed for adult steelhead in burst swimming mode (based on CDFW 2004). This suggests that this location may act as a fish passage barrier under existing conditions during large storm events. If refinements to the restoration alternative grading were to result in reducing large storm velocities at this location from above 10 ft/s to below 10 ft/s, the restoration alternatives could provide the benefit of removing or reducing this existing fish passage barrier.

4.2.2 Refined Analysis Results

Figures 4-9a and **4-9b** show the refined results of passage suitability modeling for adult steelhead from 2011 to 2020. All of the results in Sections 4.2 and 4.3 are presented in figures that contain subplots for each of the steelhead passage windows (January 1 – April 30) in 2011 to 2020. These subplots present the flow hydrograph, then five rows of color-coded dots. The first four rows of dots correspond to passage suitability for each of the four alternatives, and the last row of dots shows days when the lagoon mouth was observed to be open. See the figure legend for explanation of the color-coded dots. Blue stars indicate time/date when anadromous adults were observed during visual surveys by RCDSMM.

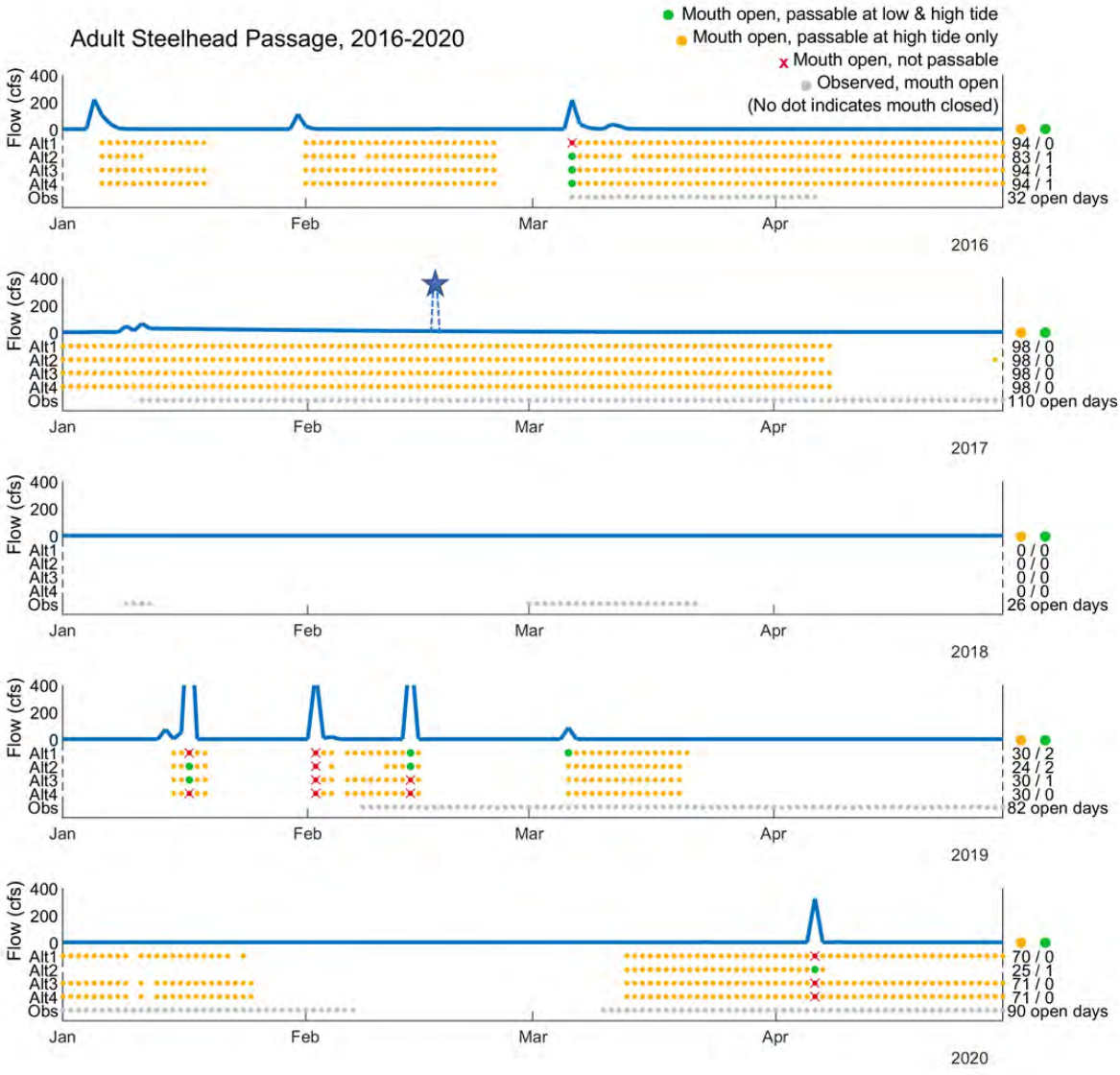


SOURCE: ESA, based on lagoon mouth opening/closure modeling by ESA, hydrodynamic modeling by Moffatt & Nichol (2020), and fish passage modeling by ESA. NOTE: blue star indicates observed passage.

D201901073

Figure 4-9a

Modeled Adult Steelhead Passage, 2011-2015



SOURCE: ESA, based on lagoon mouth opening/closure modeling by ESA, hydrodynamic modeling by Moffatt & Nichol (2020), and fish passage modeling by ESA. NOTE: blue star indicates observed passage. There was a storm event Feb. 17-18, 2017 (indicated by dashed line) but flow data were not available.

D201901073

Figure 4-9b

Modeled Adult Steelhead Passage, 2016-2020

These results suggest that, for existing conditions and all restoration alternatives, the breach channel is generally passable during high tides when the lagoon mouth is open. Passability during storms, however, depends on the magnitude of the storm. Modeling results suggest that for existing conditions and all restoration alternatives, the breach is passable during both high and low tides in high storm flows, but not passable during extreme storm flows.

Note that as shown in Figures 4-5a and 4-5b, RCDSMM monitoring and observations of adult steelhead in Topanga Creek occur in years when model results indicate passable storm events occurred, except for 2017. The creek flow gauge data record for 2017 does not capture or include a large storm event that occurred in 2017, after which RCDSMM observed anadromous adults. This storm event is labeled on the figures with a dashed blue line, but storm flow data is not available or included in the modeling. Also, RCDSMM observations of lagoon mouth opening and modeled lagoon mouth opening for existing conditions (Alternative 1) do not match perfectly. While the available data and modeling are imperfect, the model still provides a useful tool for comparing and assessing restoration alternatives relative to existing conditions.

Table 4-1 below summarizes model results for adult steelhead passage by year and cumulatively for the simulation period from 2011 to 2020. The number of passable hours in Table 4-1 is estimated by multiplying the number of days with passage at high tide only by 12 hours, multiplying the number of days with passage at high and low tide by 24 hours, and summing the estimated hours from January 1 to April 30 (i.e., the steelhead passage window). Table 4-1 shows the percent change in the estimated hours of passage from existing conditions (Alternative 1) for each of the restoration alternatives. The left half of Table 4-1 shows results for the entire window from January to April, which does not account for the fact that the creek upstream of the lagoon is only passable when flows are sufficient to connect dry reaches upstream. The upstream creek is typically only connected and passable after rain from the first storm(s) of the season have saturated soils in the watershed and subsequent storms produce baseflows that last for several days after storm events. To account for this, the results are also summarized on the right half of Table 4-1 only considering passability during five-day windows after major storm events, excluding the first storm event of the year. This is consistent with the generally accepted idea that adult steelhead passage windows are typically three to five days after storm events in Southern California.

Table 4-1. Summary of adult steelhead fish passage modeling results with current sea levels.

	Time passable from January 1 - April 30					Time passable within 5 day windows after 3 major storms				
	# of days			Estimated hours		# of days			Estimated hours	
2011	High tide only	High & low tide	Open, not passable	Hours	% change	High tide only	High & low tide	Open, not passable	Hours	% change
Alt 1	116	2	2	1,440	-	11	2	2	180	-
Alt 2	89	3	1	1,140	-21%	11	3	1	204	13%
Alt 3	117	2	1	1,452	1%	12	2	1	192	7%
Alt 4	116	2	2	1,440	0%	11	2	2	180	0%
Observed	*120*			*NA*	*NA*	*5*			*NA*	*NA*

	Time passable from January 1 - April 30					Time passable within 5 day windows after 2 major storms				
	# of days			Estimated hours		# of days			Estimated hours	
2012	High tide only	High & low tide	Open, not passable	Hours	% change	High tide only	High & low tide	Open, not passable	Hours	% change
Alt 1	117	1	0	1,428	-	10	0	0	120	-
Alt 2	59	1	0	732	-49%	10	0	0	120	0%
Alt 3	115	0	1	1,380	-3%	9	0	1	108	-10%
Alt 4	112	0	0	1,344	-6%	10	0	0	120	0%
Observed	*79*			*NA*	*NA*	*5*			*NA*	*NA*

	Time passable from January 1 - April 30					Time passable within 5 day windows after 1 major storms				
	# of days			Estimated hours		# of days			Estimated hours	
2013	High tide only	High & low tide	Open, not passable	Hours	% change	High tide only	High & low tide	Open, not passable	Hours	% change
Alt 1	35	0	0	420	-	0	0	0	-	-
Alt 2	81	0	0	972	131%	5	0	0	60	NA
Alt 3	35	0	0	420	0%	0	0	0	-	0%
Alt 4	36	0	0	432	3%	0	0	0	-	0%
Observed	*24*			*NA*	*NA*	*5*			*NA*	*NA*

	Time passable from January 1 - April 30					Time passable within 5 day window after 1 major storm				
	# of days			Estimated hours		# of days			Estimated hours	
2014	High tide only	High & low tide	Open, not passable	Hours	% change	High tide only	High & low tide	Open, not passable	Hours	% change
Alt 1	60	0	1	720	-	4	0	1	48	-
Alt 2	46	1	0	576	-20%	4	1	0	72	50%
Alt 3	58	0	1	696	-3%	4	0	1	48	0%
Alt 4	58	0	1	696	-3%	4	0	1	48	0%
Observed	*38*			*NA*	*NA*	*5*			*NA*	*NA*

	Time passable from January 1 - April 30					Time passable within 5 day window after 1 major storm				
	# of days			Estimated hours		# of days			Estimated hours	
2015	High tide only	High & low tide	Open, not passable	Hours	% change	High tide only	High & low tide	Open, not passable	Hours	% change
Alt 1	120	0	0	1,440	-	5	0		60	-
Alt 2	113	0	0	1,356	-6%	5	0		60	0%
Alt 3	120	0	0	1,440	0%	5	0		60	0%
Alt 4	120	0	0	1,440	0%	5	0		60	0%
Observed	*16*			*NA*	*NA*	*5*			*NA*	*NA*

	Time passable from January 1 - April 30					Time passable within 5 day windows after 3 major storms				
	# of days			Estimated hours		# of days			Estimated hours	
2016	High tide only	High & low tide	Open, not passable	Hours	% change	High tide only	High & low tide	Open, not passable	Hours	% change
Alt 1	94	0	1	1,128	-	14	0	1	168	-
Alt 2	83	1	0	1,020	-10%	13	1	0	180	7%
Alt 3	94	1	0	1,152	2%	14	1	0	192	14%
Alt 4	94	1	0	1,152	2%	14	1	0	192	14%
Observed	*32*			*NA*	*NA*	*5*			*NA*	*NA*

	Time passable from January 1 - April 30					Time passable within 5 day window after 1 major storm				
	# of days			Estimated hours		# of days			Estimated hours	
2017	High tide only	High & low tide	Open, not passable	Hours	% change	High tide only	High & low tide	Open, not passable	Hours	% change
Alt 1	98	0	0	1,176	-	5	0	0	60	-
Alt 2	98	0	0	1,176	0%	5	0	0	60	0%
Alt 3	98	0	0	1,176	0%	5	0	0	60	0%
Alt 4	98	0	0	1,176	0%	5	0	0	60	0%
Observed	*110*			*NA*	*NA*	*36*			*NA*	*NA*

	Time passable from January 1 - April 30					No major storms or mouth opening modeled				
	# of days			Estimated hours		# of days			Estimated hours	
2018	High tide only	High & low tide	Open, not passable	Hours	% change	High tide only	High & low tide	Open, not passable	Hours	% change
Alt 1	0	0	0	-	-	0	0	0	-	-
Alt 2	0	0	0	-	0%	0	0	0	-	0%
Alt 3	0	0	0	-	0%	0	0	0	-	0%
Alt 4	0	0	0	-	0%	0	0	0	-	0%
Observed	*26*			*NA*	*NA*	*1*			*NA*	*NA*

	Time passable from January 1 - April 30					Time passable within 5 day windows after 4 major storms				
	# of days			Estimated hours		# of days			Estimated hours	
2019	High tide only	High & low tide	Open, not passable	Hours	% change	High tide only	High & low tide	Open, not passable	Hours	% change
Alt 1	31	1	2	396	-	13	1	2	180	-
Alt 2	25	1	1	324	-18%	12	1	1	168	-7%
Alt 3	31	0	2	372	-6%	13	0	2	156	-13%
Alt 4	30	0	3	360	-9%	13	0	3	156	-13%
Observed	*82*			*NA*	*NA*	*95*			*NA*	*NA*

	Time passable from January 1 - April 30					Time passable within 5 day window after 1 major storm				
	# of days			Estimated hours		# of days			Estimated hours	
2020	High tide only	High & low tide	Open, not passable	Hours	% change	High tide only	High & low tide	Open, not passable	Hours	% change
Alt 1	70	0	1	840	-	4	0	1	48	-
Alt 2	25	1	0	324	-61%	1	1	0	36	-25%
Alt 3	71	0	1	852	1%	4	0	1	48	0%
Alt 4	71	0	1	852	1%	4	0	1	48	0%
Observed	*90*			*NA*	*NA*	*61*			*NA*	*NA*

	Time passable from January 1 - April 30					Time passable within 5 day window after major storms				
	# of days			Estimated hours		# of days			Estimated hours	
2011 - 2022	High tide only	High & low tide	Open, not passable	Hours	% change	High tide only	High & low tide	Open, not passable	Hours	% change
Alt 1	741	4	7	8,988	-	66	3	7	864	-
Alt 2	619	8	2	7,620	-15%	66	7	2	960	11.1%
Alt 3	739	3	6	8,940	-1%	66	3	6	864	0%
Alt 4	735	3	7	8,892	-1%	66	3	7	864	0%
Observed	*617*			*NA*	*NA*	*223*			*NA*	*NA*

The results in Table 4-1 show that with Alternative 2, five large storm events that are not passable in existing conditions (Alternative 1) become passable in Alternative 2 and four of those five events become passable at both high and low tide. This is because Alternative 2 increases storm flow conveyance and storage in the lagoon, which decreases modeled velocities upstream of the bridge and at the breach to below the 6 ft/s threshold for adult steelhead passage. While the lagoon mouth is closed 15% more of the time in Alternative 2 than in existing conditions, Alternative 2 results during five-day windows after major storm events show an 11% increase in the time that the lagoon is passable. Alternative 2 is closed 15% more than in existing conditions because the lagoon volume is larger, which requires more freshwater inflow and/or wave overtopping to fill up and breach the lagoon. Alternative 2 is passable 11% more than existing conditions within five-day windows after storms because more storm events are modeled as passable in Alternative 2 (for the reasons described above) in 2011, 2014, and 2016 (and also because the lagoon stays open and passable after the second small storm event in March 2013, whereas other alternatives are modeled as closed). Thus, while Alternative 2 is closed more often during the steelhead migration season, it is actually open and passable more often after storm events when adult steelhead are expected to migrate. Alternative 2 is therefore expected to benefit adult steelhead passage by increasing the time and opportunity for passage.

The results in Figures 4-9a, 4-9b, and Table 4-1 show that Alternatives 3 and 4 do not change passability (i.e., 1% decrease in total estimated hours from January to March, which is within the range of model uncertainty, and 0% change within 5-day windows after major storms). This is because the lagoon grading and expansion and habitat restoration in Alternatives 3 and 4 is above the elevation of the existing lagoon and therefore does not have much of an effect on lagoon mouth opening or modeled storm velocities. Also, the existing bridge is not modeled as a fish passage constraint and lengthening the bridge in Alternatives 3 and 4 therefore does not increase the time available for passage in the model. Lengthening the bridge is expected to provide other key benefits as discussed below, in Section 6 – Conclusions, and in the Alternatives Analysis Report (M&N 2022b).

In addition to the above fish passage analysis, M&N (2022a) modeled and analyzed velocity at the Pacific Coast Highway (PCH) bridge (see Section 7.6 of M&N 2022a) for existing conditions and the expanded bridge cross-sections in the restoration alternatives. M&N analyzed 2-D model results to calculate the passable cross-sectional area at the bridge for which velocity is less than 9 ft/s, which is close to CDFW's (2004) 10 ft/s maximum adult swim speed in burst swimming mode. M&N's results show that Alternative 2 increases the passable cross-sectional area at the bridge by about 13%. This is due to the lengthening of the bridge and widening of the lagoon in Alternative 2. Based on these model results, Alternative 2 is expected to provide additional lower velocity area for adult steelhead to swim up, allowing adults to save more energy and reduce the risk of exhaustion. These model results for Alternative 2 therefore indicate that, in addition to the benefit of increasing the time and opportunity for adult passage discussed above, Alternative 2 is also expected to have the benefit of improving conditions for adult passage at the PCH bridge. M&N's analysis shows that Alternative 3 increases the passable cross-sectional area by 3% and Alternative 4 decreases the passable cross-sectional area by about 4% or 5%. These changes may be within the range of model uncertainty. The small degree of change in Alternatives 3 and 4 is likely due to the fact that while Alternatives 3 and 4 lengthen the PCH bridge, they do not widen

the lagoon (and instead restore and widen habitat above the elevation of the existing lagoon). Alternatives 3 and 4 are therefore not expected to improve conditions for adult passage at the PCH bridge; however, lengthening the bridge is expected to have other key benefits to physical and ecological processes, including habitat connectivity, as discussed further in Section 6 – Conclusions and the Alternatives Analysis Report (M&N 2022b).

4.2.3 Steelhead Passage with Sea Level Rise

We also considered the medium (1.6 ft) and longer term (6.8 ft) sea level rise scenarios and ran the habitat suitability model to understand how future conditions would affect adult steelhead passage. **Figures 4-10a** and **4-10b** show modeling results for adult steelhead with 1.6 ft of sea level rise, and **Figures 4-11a** and **4-11b** show results with 6.8 ft sea level rise. **Tables 4-2 and 4-3** summarize the results with 1.6 ft and 6.8 ft of sea level rise, respectively.

Under the medium-term scenario of 1.6 ft sea level rise, results for all alternatives show an increase in lagoon mouth closure in comparison to model results for existing sea levels, but an increase in the time passable within 5-day windows after major storms relative to no sea level rise. The modeled increase in closure is because the lagoon volumes increase with sea level rise as discussed previously. In Alternatives 1, 3, and 4, the increase in time passable within 5 days of a storm is primary due to the lagoon staying open after the small March 2013 storm event.

Comparison of model results for the alternatives with 1.6 ft of sea level rise shows that, compared to Alternative 1, Alternative 2 increases closure by 20% and Alternatives 3 and 4 increase closure by about 10%; however, the difference in time passable within 5-day windows after major storms is only 1% to 2.5%, which is in the range of model uncertainty. All alternatives are therefore expected to provide similar passage time and opportunities with 1.6 ft of sea level rise.

Table 4-2. Summary of adult steelhead fish passage modeling results with 1.6 ft of sea level rise.

	Time passable from January 1 - April 30					Time passable within 5 day windows after 3 major storms				
	# of days			Estimated hours		# of days			Estimated hours	
2011	High tide only	High & low tide	Open, not passable	Hours	% change	High tide only	High & low tide	Open, not passable	Hours	% change
Alt 1	95	1	2	1,164	-	12	1	2	168	-
Alt 2	115	2	0	1,428	23%	13	2	0	204	21%
Alt 3	93	2	1	1,164	0%	12	2	1	192	14%
Alt 4	96	2	1	1,200	3%	12	2	1	192	14%

	Time passable from January 1 - April 30					Time passable within 5 day windows after 2 major storms				
	# of days			Estimated hours		# of days			Estimated hours	
2012	High tide only	High & low tide	Open, not passable	Hours	% change	High tide only	High & low tide	Open, not passable	Hours	% change
Alt 1	49	1	0	612	-	9	1	0	132	-
Alt 2	21	0	0	252	-59%	10	0	0	120	-9%
Alt 3	45	0	1	540	-12%	9	0	1	108	-18%
Alt 4	45	1	0	564	-8%	9	1	0	132	0%

	Time passable from January 1 - April 30					Time passable within 5 day windows after 1 major storm				
	# of days			Estimated hours		# of days			Estimated hours	
2013	High tide only	High & low tide	Open, not passable	Hours	% change	High tide only	High & low tide	Open, not passable	Hours	% change
Alt 1	28	0	0	336	-	5	0	0	60	-
Alt 2	18	0	0	216	-36%	5	0	0	60	0%
Alt 3	26	0	0	312	-7%	5	0	0	60	0%
Alt 4	27	0	0	324	-4%	5	0	0	60	0%

	Time passable from January 1 - April 30					Time passable within 5 day window after 1 major storm				
	# of days			Estimated hours		# of days			Estimated hours	
2014	High tide only	High & low tide	Open, not passable	Hours	% change	High tide only	High & low tide	Open, not passable	Hours	% change
Alt 1	8	0	1	96	-	4	0	1	48	-
Alt 2	7	1	0	108	13%	3	1	0	60	25%
Alt 3	8	0	1	96	0%	4	0	1	48	0%
Alt 4	8	0	0	96	0%	4	1	0	72	50%

	Time passable from January 1 - April 30					Time passable within 5 day windows after 1 major storm				
	# of days			Estimated hours		# of days			Estimated hours	
2015	High tide only	High & low tide	Open, not passable	Hours	% change	High tide only	High & low tide	Open, not passable	Hours	% change
Alt 1	62	0	0	744	-	5	0	0	60	-
Alt 2	42	0	0	504	-32%	3	0	0	36	-40%
Alt 3	57	0	0	684	-8%	5	0	0	60	0%
Alt 4	57	0	0	684	-8%	5	0	0	60	0%

	Time passable from January 1 - April 30					Time passable within 5 day windows after 3 major storms				
	# of days			Estimated hours		# of days			Estimated hours	
2016	High tide only	High & low tide	Open, not passable	Hours	% change	High tide only	High & low tide	Open, not passable	Hours	% change
Alt 1	53	1	0	660	-	14	1	0	192	-
Alt 2	25	1	0	324	-51%	13	1	0	180	-6%
Alt 3	33	1	0	420	-36%	14	1	0	192	0%
Alt 4	32	1	0	408	-38%	14	1	0	192	0%

	Time passable from January 1 - April 30					Time passable within 5 day window after 1 major storm				
	# of days			Estimated hours		# of days			Estimated hours	
2017	High tide only	High & low tide	Open, not passable	Hours	% change	High tide only	High & low tide	Open, not passable	Hours	% change
Alt 1	94	0	0	1,128	-	5	0	0	60	-
Alt 2	90	0	0	1,080	0%	5	0	0	60	0%
Alt 3	94	0	0	1,128	0%	5	0	0	60	0%
Alt 4	94	0	0	1,128	0%	5	0	0	60	0%

	Time passable from January 1 - April 30					No major storms or mouth opening modeled				
	# of days			Estimated hours		# of days			Estimated hours	
2018	High tide only	High & low tide	Open, not passable	Hours	% change	High tide only	High & low tide	Open, not passable	Hours	% change
Alt 1	0	0	0	-	-	0	0	0	-	-
Alt 2	0	0	0	-	0%	0	0	0	-	0%
Alt 3	0	0	0	-	0%	0	0	0	-	0%
Alt 4	0	0	0	-	0%	0	0	0	-	0%

	Time passable from January 1 - April 30					Time passable within 5 day windows after 4 major storms				
	# of days			Estimated hours		# of days			Estimated hours	
2019	High tide only	High & low tide	Open, not passable	Hours	% change	High tide only	High & low tide	Open, not passable	Hours	% change
Alt 1	23	1	2	300	-	14	1	2	192	-
Alt 2	20	0	0	240	-20%	15	0	0	180	-6%
Alt 3	24	0	2	288	-4%	15	0	2	180	-6%
Alt 4	23	0	3	276	-8%	14	0	3	168	-13%

	Time passable from January 1 - April 30					Time passable within 5 day window after 1 major storm				
	# of days			Estimated hours		# of days			Estimated hours	
2020	High tide only	High & low tide	Open, not passable	Hours	% change	High tide only	High & low tide	Open, not passable	Hours	% change
Alt 1	55	0	1	660	-	4	0	1	48	-
Alt 2	30	1	0	384	-42%	4	1	0	72	50%
Alt 3	39	0	1	468	-29%	4	0	1	48	0%
Alt 4	39	0	1	468	-29%	4	0	1	48	0%

	Time passable from January 1 - April 30					Time passable within 5 day windows after major storms				
2011 -	# of days			Estimated hours		# of days			Estimated hours	
2022	High tide only	High & low tide	Open, not passable	Hours	% change	High tide only	High & low tide	Open, not passable	Hours	% change
Alt 1	467	4	6	5,700	-	72	4	6	960	-
Alt 2	368	5	0	4,536	-20%	71	5	0	972	1.3%
Alt 3	419	3	6	5,100	-11%	73	3	6	948	-1.3%
Alt 4	421	4	5	5,148	-10%	72	5	5	984	2.5%

Table 4-3. Summary of adult steelhead fish passage modeling results with 6.8 ft of sea level rise.

	Time passable from January 1 - April 30					Time passable within 5 day windows after 3 major storms				
	# of days			Estimated hours		# of days			Estimated hours	
2011	High tide only	High & low tide	Open, not passable	Hours	% change	High tide only	High & low tide	Open, not passable	Hours	% change
Alt 1	16	67	1	1,800	-	1	13	1	324	-
Alt 2	61	15	0	1,092	-39%	8	7	0	264	-19%
Alt 3	32	46	0	1,488	-17%	3	12	0	324	0%
Alt 4	33	46	0	1,500	-17%	3	12	0	324	0%

	Time passable from January 1 - April 30					Time passable within 5 day windows after 2 major storms				
	# of days			Estimated hours		# of days			Estimated hours	
2012	High tide only	High & low tide	Open, not passable	Hours	% change	High tide only	High & low tide	Open, not passable	Hours	% change
Alt 1	11	7	0	300	-	5	3	0	132	-
Alt 2	11	7	0	300	0%	5	3	0	132	0%
Alt 3	10	7		288	-4%	5	3	0	132	0%
Alt 4	11	7	0	300	0%	4	3	0	120	-9%

	Time passable from January 1 - April 30					Time passable within 5 day windows after 1 major storm				
	# of days			Estimated hours		# of days			Estimated hours	
2013	High tide only	High & low tide	Open, not passable	Hours	% change	High tide only	High & low tide	Open, not passable	Hours	% change
Alt 1	1	2	0	60	-	1	2	0	60	-
Alt 2	2	2	0	72	20%	2	2	0	72	20%
Alt 3	1	2	0	60	0%	1	2	0	60	0%
Alt 4	0	2	0	48	-20%	0	2	0	48	-20%

	Time passable from January 1 - April 30					Time passable within 5 day window after 1 major storm				
	# of days			Estimated hours		# of days			Estimated hours	
2014	High tide only	High & low tide	Open, not passable	Hours	% change	High tide only	High & low tide	Open, not passable	Hours	% change
Alt 1	4	4		144	-	2	2		72	-
Alt 2	2	5		144	0%	1	3		84	17%
Alt 3	4	4		144	0%	2	2		72	0%
Alt 4	3	5		156	8%	0	3		72	0%

	Time passable from January 1 - April 30					Time passable within 5 day windows after 1 major storm				
	# of days			Estimated hours		# of days			Estimated hours	
2015	High tide only	High & low tide	Open, not passable	Hours	% change	High tide only	High & low tide	Open, not passable	Hours	% change
Alt 1	21	6	0	396	-	2	0	0	24	-
Alt 2	14	1	0	192	-52%	0	0	0	-	-100%
Alt 3	15	4	0	276	-30%	0	0	0	-	-100%
Alt 4	15	4	0	276	-30%	0	0	0	-	-100%

	Time passable from January 1 - April 30					Time passable within 5 day windows after 3 major storms				
	# of days			Estimated hours		# of days			Estimated hours	
2016	High tide only	High & low tide	Open, not passable	Hours	% change	High tide only	High & low tide	Open, not passable	Hours	% change
Alt 1	9	11	0	372	-	5	7		228	-
Alt 2	10	11	0	384	3%	6	7		240	5%
Alt 3	9	11	0	372	0%	5	7		228	0%
Alt 4	6	13	0	384	3%	4	7		216	-5%

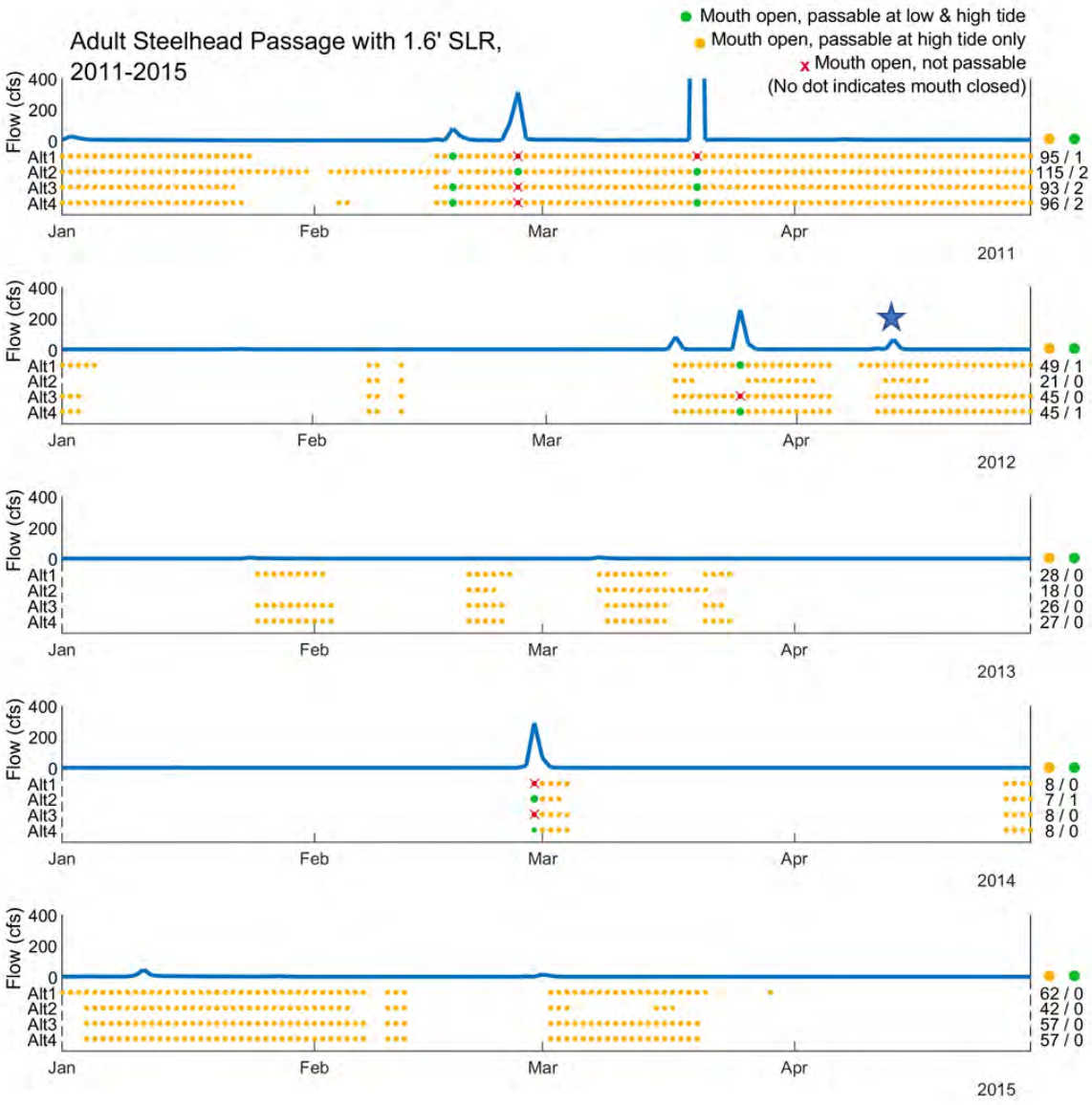
	Time passable from January 1 - April 30					Time passable within 5 day window after 1 major storm				
	# of days			Estimated hours		# of days			Estimated hours	
2017	High tide only	High & low tide	Open, not passable	Hours	% change	High tide only	High & low tide	Open, not passable	Hours	% change
Alt 1	42	44	0	1,560	-		5		120	-
Alt 2	65	21	0	1,284	-18%	4	1		72	-40%
Alt 3	51	35	0	1,452	-7%		5		120	0%
Alt 4	52	34	0	1,440	-8%		5		120	0%

	Time passable from January 1 - April 30					No major storms or mouth opening modeled				
	# of days			Estimated hours		# of days			Estimated hours	
2018	High tide only	High & low tide	Open, not passable	Hours	% change	High tide only	High & low tide	Open, not passable	Hours	% change
Alt 1	0	0	0	-	-	0	0	0	-	-
Alt 2	0	0	0	-	0%	0	0	0	-	0%
Alt 3	0	0	0	-	0%	0	0	0	-	0%
Alt 4	0	0	0	-	0%	0	0	0	-	0%

	Time passable from January 1 - April 30					Time passable within 5 day windows after 4 major storms				
	# of days			Estimated hours		# of days			Estimated hours	
2019	High tide only	High & low tide	Open, not passable	Hours	% change	High tide only	High & low tide	Open, not passable	Hours	% change
Alt 1	8	5	2	216	-	5	4	2	156	-
Alt 2	9	5		228	6%	6	5		192	23%
Alt 3	9	4		204	-6%	7	4		180	15%
Alt 4	10	5		240	11%	5	5		180	15%

	Time passable from January 1 - April 30					Time passable within 5 day window after 1 major storm				
	# of days			Estimated hours		# of days			Estimated hours	
2020	High tide only	High & low tide	Open, not passable	Hours	% change	High tide only	High & low tide	Open, not passable	Hours	% change
Alt 1	6	1		96	-	4	1		72	-
Alt 2	6	1		96	0%	4	1		72	0%
Alt 3	6	1		96	0%	4	1		72	0%
Alt 4	7	1		108	13%	4	1		72	0%

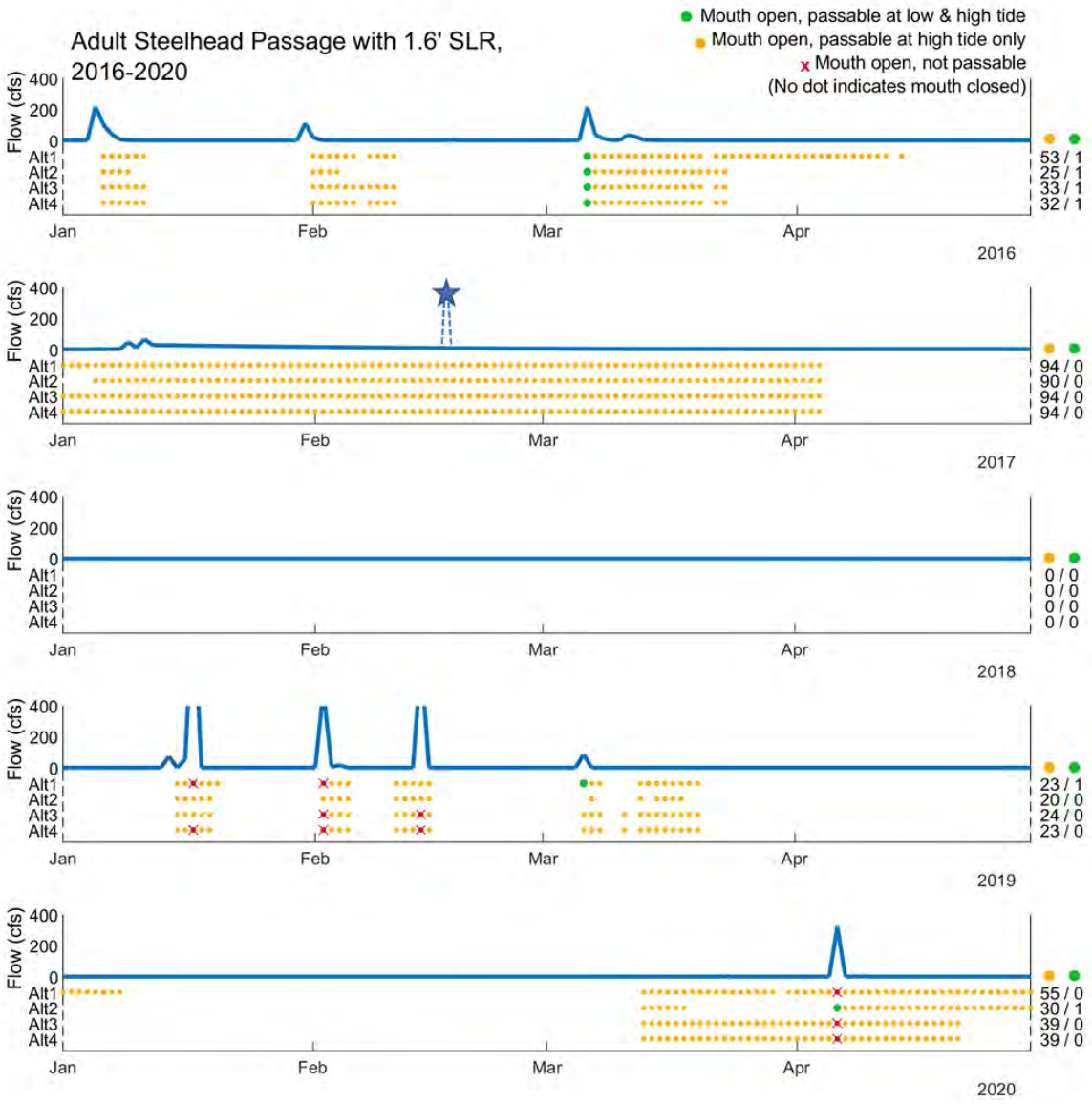
	Time passable from January 1 - April 30					Time passable within 5 day windows after major storms				
2011 -	# of days			Estimated hours		# of days			Estimated hours	
2022	High tide only	High & low tide	Open, not passable	Hours	% change	High tide only	High & low tide	Open, not passable	Hours	% change
Alt 1	118	147	3	4,944	-	25	37	3	1,188	-
Alt 2	180	68	0	3,792	-23%	36	29	0	1,128	-5.1%
Alt 3	137	114	0	4,380	-11%	27	36	0	1,188	0.0%
Alt 4	137	117	0	4,452	-10%	20	38	0	1,152	-3.0%



SOURCE: ESA, based on lagoon mouth opening/closure modeling by ESA, hydrodynamic modeling by Moffatt & Nichol (2020), and fish passage modeling by ESA. NOTE: blue star indicates observed passage under existing (i.e., no sea level rise) conditions.

D201901073

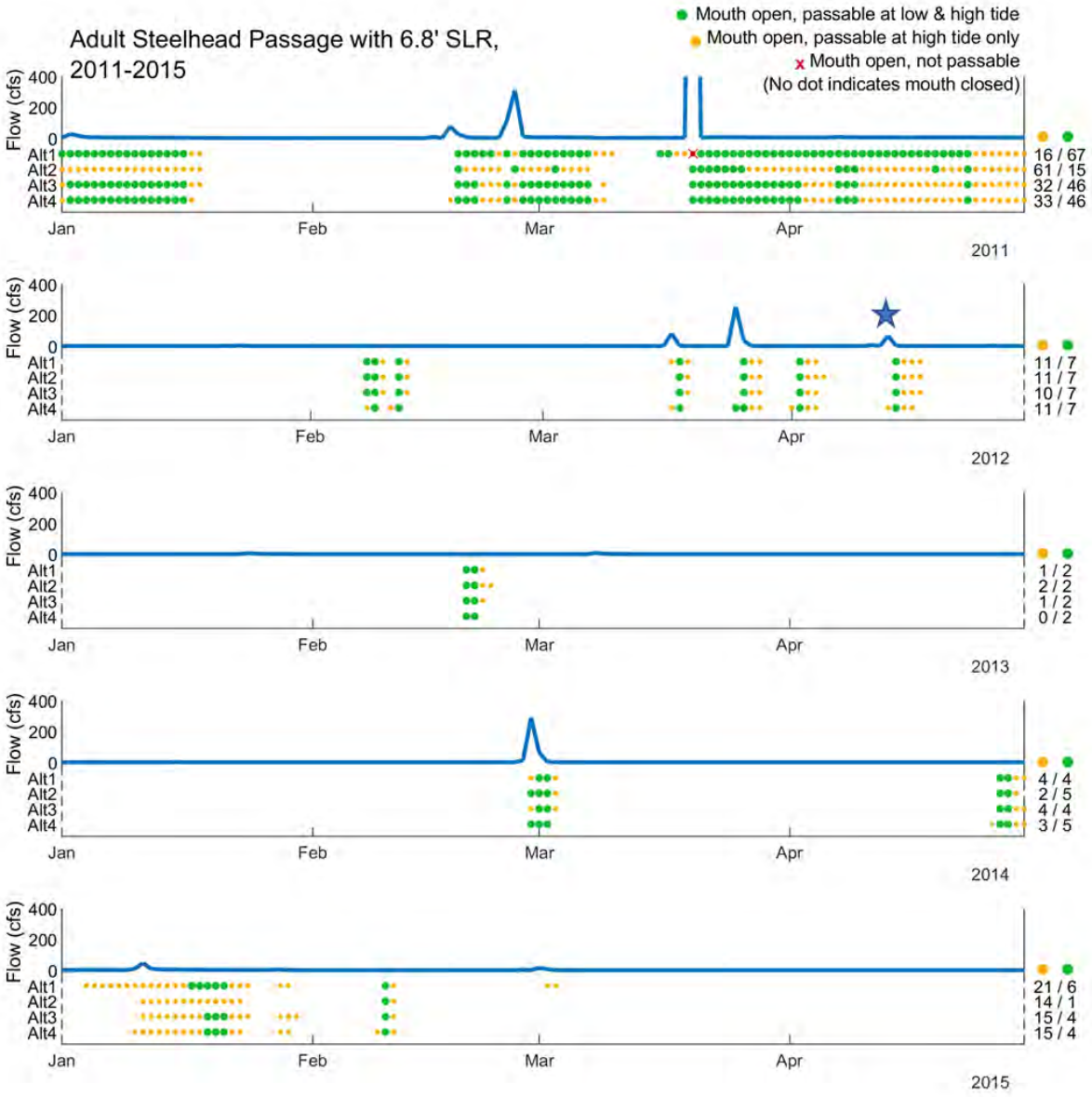
Figure 4-10a
Modeled Adult Steelhead Passage with 1.6' Sea Level Rise, 2011-2015



SOURCE: ESA, based on lagoon mouth opening/closure modeling by ESA, hydrodynamic modeling by Moffatt & Nichol (2020), and fish passage modeling by ESA. NOTE: blue star indicates observed passage under existing (i.e., no sea level rise) conditions. There was a storm event Feb. 17-18, 2017 (indicated by dashed line) but flow data were not available.

D201901073

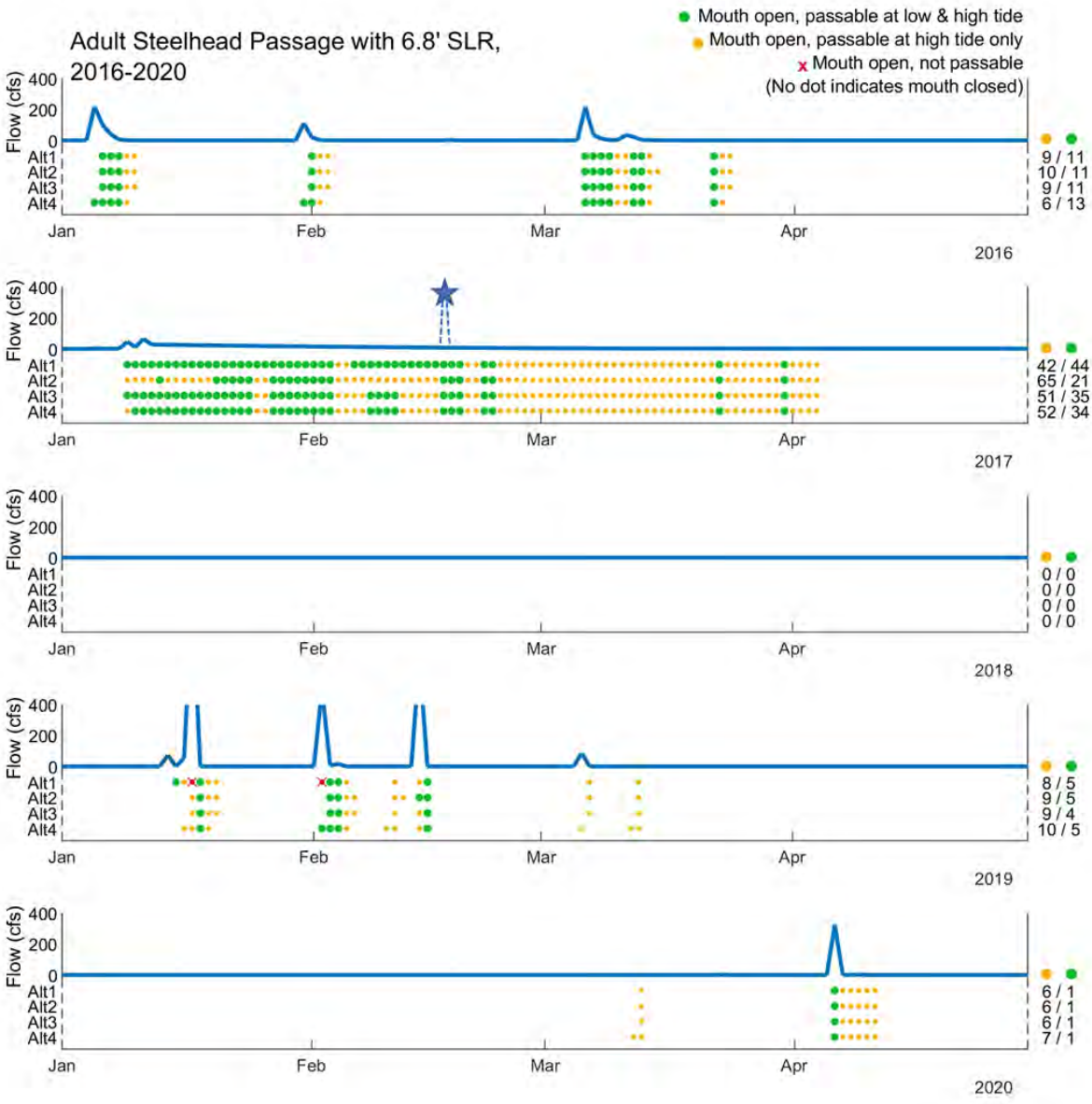
Figure 4-10b
Modeled Adult Steelhead Passage with 1.6' Sea Level Rise, 2016-2020



SOURCE: ESA, based on lagoon mouth opening/closure modeling by ESA, hydrodynamic modeling by Moffatt & Nichol (2020), and fish passage modeling by ESA. NOTE: blue star indicates observed passage under existing (i.e., no sea level rise) conditions.

D201901073

Figure 4-11a
Modeled Adult Steelhead Passage with 6.8' Sea Level Rise, 2011-2015



SOURCE: ESA, based on lagoon mouth opening/closure modeling by ESA, hydrodynamic modeling by Moffatt & Nichol (2020), and fish passage modeling by ESA. NOTE: blue star indicates observed passage under existing (i.e., no sea level rise) conditions. There was a storm event Feb. 17-18, 2017 (indicated by dashed line) but flow data were not available.

D201901073

Figure 4-11b
Modeled Adult Steelhead Passage with 6.8' Sea Level Rise, 2016-2020

Model results for passage conditions in the longer term with 6.8 ft of sea level rise are significantly different than under existing conditions (no sea level rise) and the medium-term sea level rise scenario with 1.6 ft of sea level rise. The overall decrease in number of passable days in Figures 4-11a and 4-11b and Table 4-3 indicate more days of mouth closure than under existing conditions and 1.6 ft sea level rise. However, the number of days passable at both high and low tides when the mouth is open is projected to increase for all alternatives. This may be due to sea levels rising sufficiently high that on days when the lagoon mouth is open, passage can happen even at low tide. Comparing the alternatives, the restoration alternatives (Alternatives 2, 3, and 4) increase mouth closure compared to Alternative 1 (no project) due to the increase in lagoon volume. Alternative 3 is modeled to provide the same time passable within 5 day windows after major storms as Alternative 1, while Alternative 2 and 4 are modeled to provide 5% and 3% less time passable within these windows, respectively. Note that there is considerable uncertainty in projecting future conditions with 6.8 ft of sea level rise and the modeled changes are within the range of model uncertainty. The modeling provides a tool that suggests all alternatives are expected to provide passage opportunities with 6.8 ft of sea level rise. Also note that 6.8 ft of sea level rise is most likely to occur after 2150 per the Ocean Protection Council (2018).

M&N (2022a) separately modeled and analyzed velocity at the PCH bridge (see Section 7.6 of M&N 2022a) as discussed in Section 4.2.2 above with 1.6 and 6.8 ft of sea level rise. With 1.6 ft of sea level rise, during certain storm events, in Alternative 2 the lagoon is modeled as closed and other alternatives are modeled as open as shown in M&N (2022a) Tables 7-13 and 7-14; however, these tables do not account for the fact that several of these storm events are passable in Alternative 2, but not in other alternatives due to high velocities at the breach and/or upstream. Accounting for the both increased closure and increased passability in Alternative 2, Alternative 2 provides the greatest cumulative passable area at the PCH bridge with 1.6 ft of sea level rise. This finding suggests that Alternative 2 is likely to have the benefit of improving conditions for adult passage at the PCH bridge with sea level rise. For Alternatives 3 and 4, cumulative passable area at the PCH bridge is more similar to existing conditions, even when accounting for passable storm events only. With 6.8 ft of sea level rise, Alternative 2 shows an increase in cumulative passable area at the PCH bridge even without accounting for which storm events are passable. Alternative 2 therefore is expected to improve passage conditions at the PCH bridge with 6.8 ft of sea level rise. Alternatives 3 and 4 do not show a clear benefit to passage conditions at PCH bridge.

4.3 Tidewater Goby & Juvenile Steelhead Refugia Results

Figures 4-12a and **4-12b** show the results of refugia suitability modeling for tidewater goby refugia using a maximum velocity criteria of 1 ft/s to define portions of lagoon cross-sections that provide refugia. Note that the discharge data for 2017 includes suspect data with a consistently high baseflow, which is uncharacteristic of the rest of the discharge data record and general observations of streamflow in Topanga Creek. This suspect high baseflow data results in an extended period of time when the lagoon is modeled to not provide goby refuge for all alternatives. Model results from 2017 are excluded from the analysis and discussion below due to the suspect high baseflow data. The results for juvenile steelhead refugia using a maximum

velocity criteria of 1.5 ft/s are shown in **Figures 4-13a** and **4-13b**. **Table 4-4** summarizes the refugia results for both species during storm flow events.

TABLE 4-4
SUMMARY OF REFUGIA RESULTS FOR STORM FLOW EVENTS, 2011-2020 (EXCLUDING 2017*)

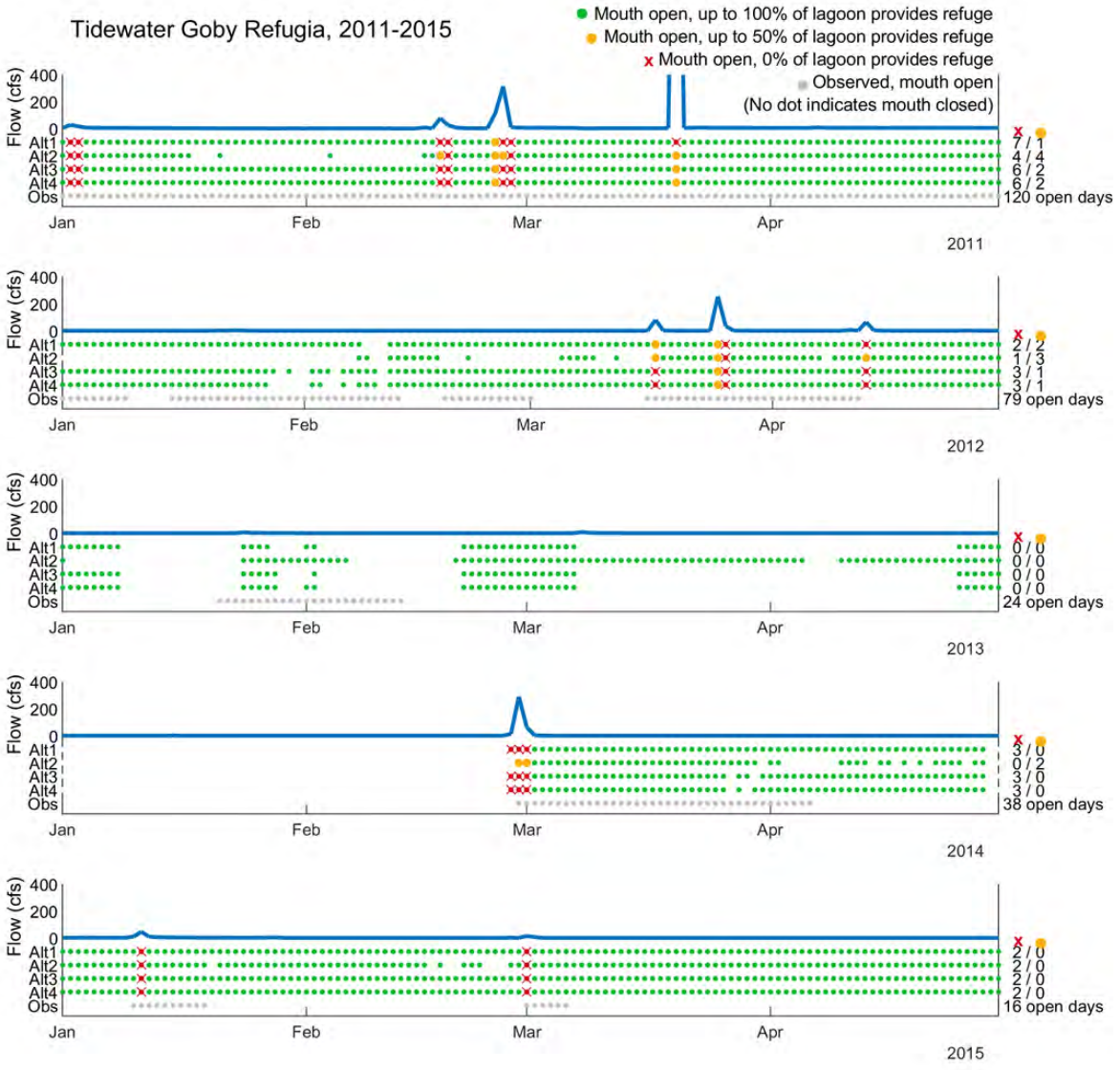
	Tidewater Goby (1 ft/s max velocity)		Juvenile Steelhead (1.5 ft/s max velocity)	
	# Storm Flow Days with No Refuge in Lagoon	# Storm Flow Days with up to 50% Refuge in Lagoon	# Storm Flow Days with No Refuge in Lagoon	# Storm Flow Days with up to 50% Refuge in Lagoon
Alternative 1	28	4	20	8
Alternative 2	15	17	12	16
Alternative 3	27	5	13	15
Alternative 4	28	4	13	15

NOTE: * 2017 is excluded from this table due to suspect high baseflow data as described above.

The model results suggest that the lagoon generally provides suitable refugia during low flow conditions when the mouth is open, but storm flows reduce the amount of suitable refugia (i.e., reduces the portion of the lagoon that has slack water). As shown in Figures 4-12a and 4-12b and summarized in Table 4-4, under existing conditions (Alternative 1), modeling indicates there are typically one or more storm events per year in which velocities throughout the lagoon exceed 1 ft/s and the lagoon is modeled to not provide refuge for tidewater gobies. For current sea levels, model results suggest that compared to existing conditions (Alternative 1), Alternative 2 significantly improves refugia during storm flows. These results are due to the restoration of a larger lagoon in Alternative 2, which provides lagoon areas with low velocities during storm events that do not exist in the modeling of current conditions. Per Figures 4-12a and 4-12b and Table 4-4, model results using the 1 ft/s velocity criteria for tidewater goby show that Alternatives 3 and 4 do not significantly improve refuge during storm conditions compared to existing conditions (Alternative 1). Model results using the higher velocity criteria of 1.5 ft/s for juvenile steelhead, which are shown in Figures 4-13a and 4-13b and summarized in Table 4-4, show that Alternatives 2, 3, and 4 all improve refuge for juvenile steelhead during storm conditions compared to existing conditions (Alternative 1).

Furthermore, Alternative 2 increases the amount of adjoining marsh habitat, which is expected to benefit tidewater goby by increasing habitat complexity, providing velocity refugia over a range of water elevations and flows, and providing high-quality foraging habitat, which is associated with larger size/greater survival of individual fish (Swenson 1999).

Tidewater goby and juvenile steelhead refugia was not modeled with sea level rise for this study; however, sea level rise is expected to expand the lagoon area in all alternatives (no project and restoration alternatives). Lagoon expansion with sea level rise is expected to improve refugia by providing lower velocity areas that provide refugia that is not present under existing conditions.

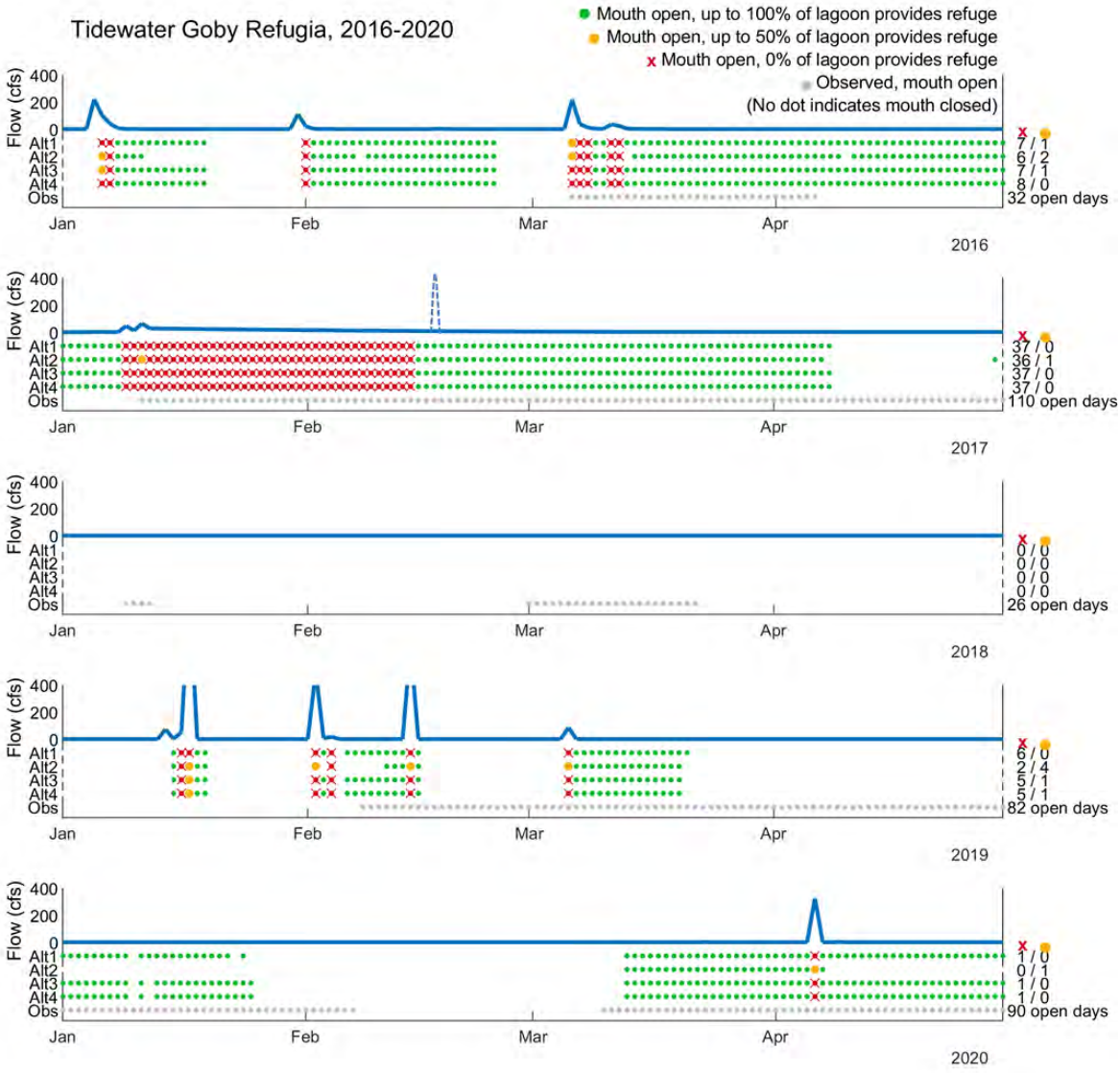


SOURCE: ESA, based on lagoon mouth opening/closure modeling by ESA, hydrodynamic modeling by Moffatt & Nichol (2020), and fish passage modeling by ESA.

D201901073

Figure 4-12a

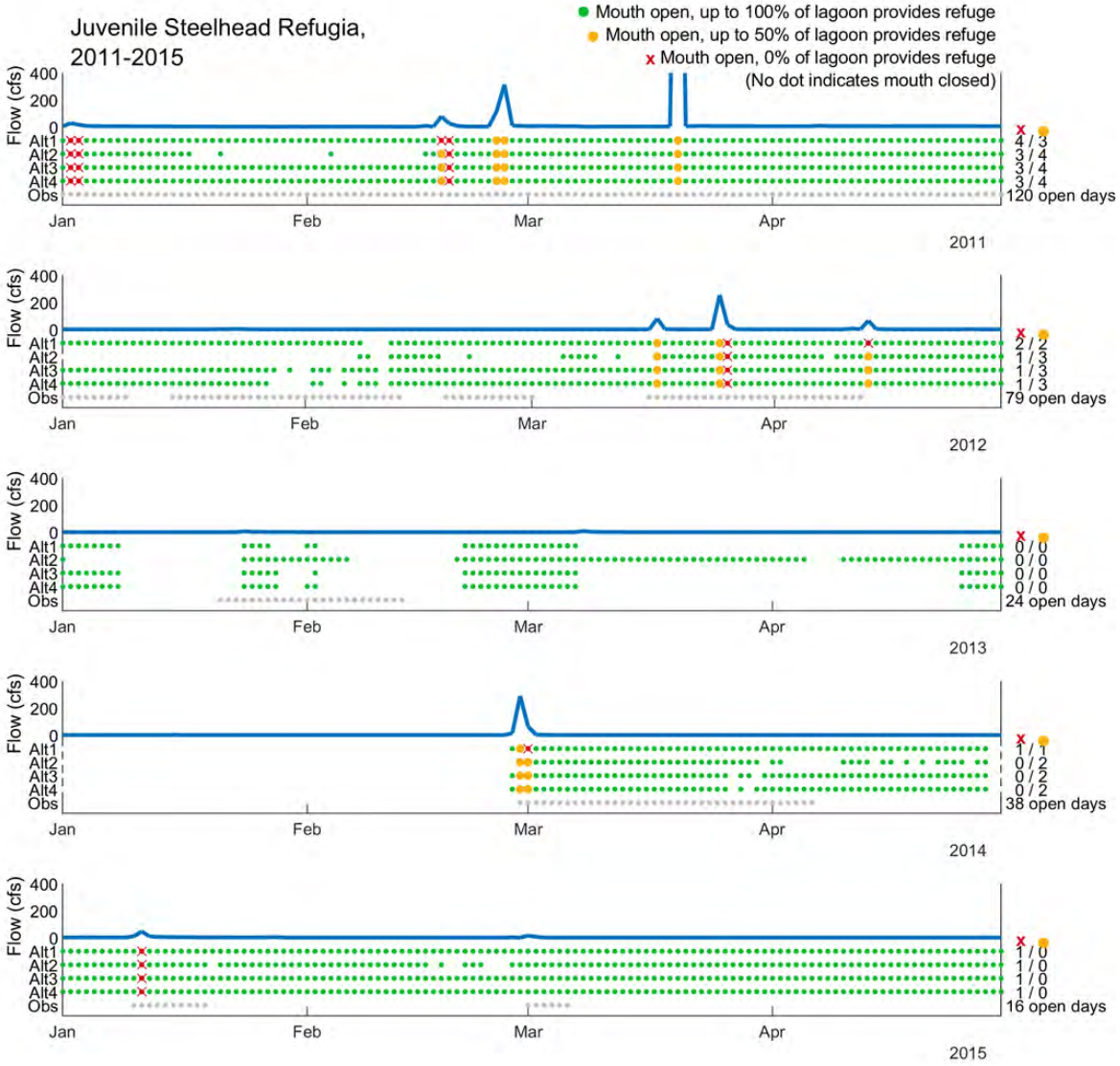
Modeled Tidewater Goby Refugia, 2011-2015



SOURCE: ESA, based on lagoon mouth opening/closure modeling by ESA, hydrodynamic modeling by Moffatt & Nichol (2020), and fish passage modeling by ESA. NOTE: There was a storm event Feb. 17-18, 2017 (indicated by dashed line) but flow data were not available.

D201901073

Figure 4-12b
Modeled Tidewater Goby Refugia, 2016-2020

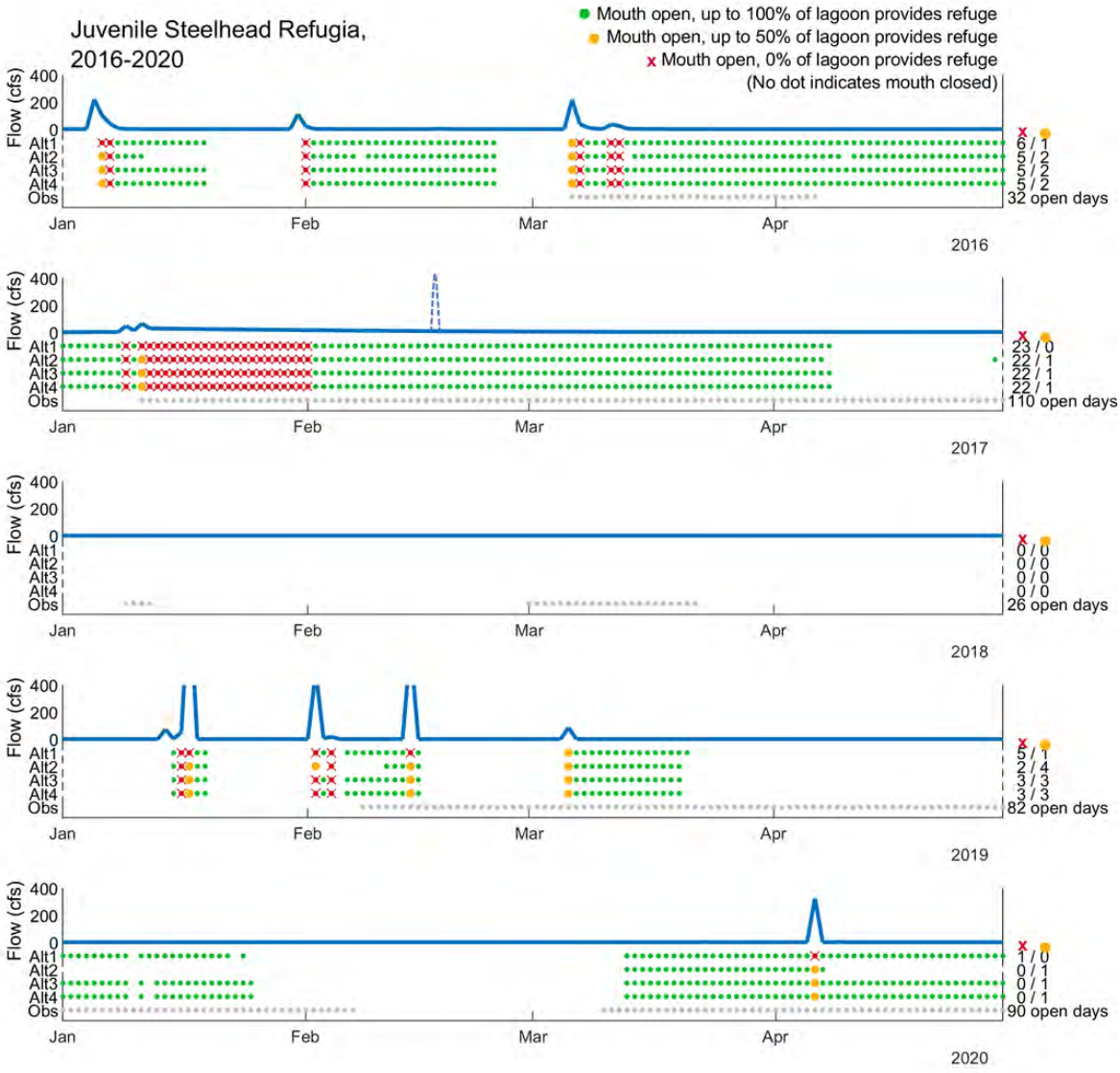


SOURCE: ESA, based on lagoon mouth opening/closure modeling by ESA, hydrodynamic modeling by Moffatt & Nichol (2020), and fish passage modeling by ESA.

D201901073

Figure 4-13a

Modeled Juvenile Steelhead Refugia, 2011-2015



SOURCE: ESA, based on lagoon mouth opening/closure modeling by ESA, hydrodynamic modeling by Moffatt & Nichol (2020), and fish passage modeling by ESA. NOTE: There was a storm event Feb. 17-18, 2017 (indicated by dashed line) but flow data were not available.

D201901073

Figure 4-13b

Modeled Juvenile Steelhead Refugia, 2016-2020

Section 5: Habitat Elevations

ESA estimated habitat elevations for the Topanga Lagoon Restoration for M&N's use in mapping projected habitat zones for the restoration alternatives. ESA provided habitat elevations for current conditions and the restoration alternatives for existing sea level and sea level rise scenarios. The M&N (2022b) Alternatives Analysis Report includes habitat maps and acreages for the restoration alternatives, as well as an analysis and comparison of alternatives relative to the project goals and objectives. This section only includes and documents the development of the habitat elevations that M&N applied for the Alternatives Analysis Report. This section includes technical analysis and discussion of habitat elevations for each alternative, but does not evaluate benefits of alternatives because the habitat elevations are only one step in the analysis to map, estimate, evaluate, and compare habitat areas and benefits for the alternatives.

The habitat elevations represent an average of habitat elevations for low salinity and moderate salinity lagoon wetland habitats. These are based on ESA's modeling of the Topanga Lagoon Restoration mouth opening and closure and lagoon water level exceedance curves (i.e., inundation frequency distributions) and habitat zone inundation frequency criteria for low salinity (0 to 7 ppt) and moderate salinity (7 to 15 ppt) habitats. Actual elevations will vary based on a number of factors, with ecotone transitions between habitat zones. The emergent marsh zone includes the potential for salt marsh (e.g., near the mouth), tule marsh, and cattail marsh. The establishment and distribution of these marsh habitats is expected to depend on soil salinity and to vary over time in response to wet and dry years and other factors.

Note that our lagoon modeling indicates Topanga Lagoon is expected to be closed for longer periods of time with moderate amounts of sea level rise and restoration actions that increase wetland area, which is consistent with analyses ESA has performed for other small lagoons with small floodplains (ESA 2020c, ESA 2018) . Our sea level rise analysis assumes that there is adequate sand supply for the beach berm elevation to increase with sea level rise. Due to the increasing berm elevation in our modeling, there is an increase in the area of inundation in the lagoon and the lagoon volume. A larger volume of creek inflow is needed to fill the lagoon to a level high enough to overtop the lagoon mouth for a breach to occur. The modeled decrease in mouth opening and "tidal" fluctuations in the lagoon means there is a longer period of inundation in the lagoon at higher water levels. This in turn means that the estimated elevation range for emergent marsh is narrower with sea level rise and in Alternative 2, compared to existing conditions. Historic photos showing a relatively flat wide salt marsh surface appear to be consistent with this result. Note that Alternative 2 is still expected to restore a large area of emergent marsh compared to other alternatives. The purpose of this habitat elevation analysis and the discussion above is to account for changes in lagoon mouth closure and water levels in order to more accurately design and estimate the acreage of restored habitat. As discussed above, the habitat elevations developed in this section are applied to map, estimate, evaluate, and compare habitat areas and benefits for the alternatives in the M&N (2022b) Alternatives Analysis Report.

Also note that our modeling does not include lagoon accretion (other than the beach berm as described above), which could be considered in projected habitat mapping with sea level rise (i.e., by including or accounting for lagoon wetland sedimentation and organic accretion).

5.1 Existing Habitats

Habitat zones can be defined for different areas based on the elevation of the area relative to tidal datums (i.e., as a surrogate for the frequency of tidal inundation) and representative water levels. ESA calculated estimated habitat elevation ranges at the Topanga project site based on vegetation-inundation relationships measured at other reference sites, observations at Topanga Lagoon (see Section 5.1.1, Elevations, below), and similar analyses from other similar sites.

5.1.1 Elevations

The existing lagoon site includes a narrow band of emergent marsh and an area of salt grass. Upstream of the lagoon, the site is riparian and upland dominant. The mapped locations of each habitat were compared to the project topography to first estimate the elevation ranges for each habitat type. Under existing conditions downstream of the bridge, the upper end of the delineated jurisdictional wetlands[1] occurs around 9.6 feet NAVD, transitioning to upland habitat above this elevation.

The salt grass (*Distichlis spicata*) on-site occurs on the south side of the lagoon mouth close to where the inlet begins, in the range of 6.2 to 8.7 feet NAVD according to the available topography. Bulrush (*Schoenoplectus californicus*) and cattails (*Typha* sp.) are found in the lagoon mouth on the south side of the lagoon mouth near the bridge. These emergent marsh species are found in the elevation range of 5.2 to 6.2 feet NAVD according to the available topography.

5.1.2 Inundation Frequencies

The elevations at which different wetland vegetation establishes are related to inundation frequency, as certain plants tolerate different amounts and timing of inundation. The existing inundation frequency at the site (Figure 2-4) was calculated (Section 2.5) and related to the elevations of existing habitats to understand the inundation frequency preference of the different species in this system. As discussed in Section 2.2, the measured water level data in Topanga Lagoon was collected only for 2019 and 2020, so it does not capture the variation year to year. Therefore, the water levels output by the QCM were also analyzed to determine inundation frequency. Figure 4-2 shows how the modeled results capture some of the lower water levels that the measured data does not capture.

5.1.3 Salinity

Salinity also influences the type of vegetation that will establish on site. There was one water quality study at Topanga that involved collecting salinity data at the site. The Topanga Source Identification Study included 12 days of salinity measurements along the east wing wall in the lagoon during 2013 (Dagit et al. 2014). The lagoon mouth was open for three of these twelve

[1] Wetlands, as defined by the Environmental Protection Agency and U.S. Army Corps of Engineers for the purpose of implementing the Clean Water Act, are areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands are generally expected to exhibit hydrophytic vegetation, hydric soils, and wetland hydrology and are determined based on the procedures in the 1987 *Corps of Engineers Wetlands Delineation Manual and 2016 Regional Supplement to the Corps of Engineers Delineation Manual: Arid West Region (Version 2.0)*.

collection days. The salinity measurement for each of these collection days was very low, at 0 to 5 ppt. The low salinity values for 2013 are most likely because the lagoon mouth was closed for most of that year, lending to brackish conditions. Additional spot grab sampling data confirms that the lagoon is dominated by fresh to very low salinity conditions without stratification (RCDSMM pers. communication).

Vegetation at the site is a mixture of the salt-tolerant species like saltgrass, which is limited to a small area on the south east bank of the lagoon, and the more brackish and freshwater species like bulrush, also primarily downstream of the PCH bridge along the south east bank. Looking at historical photos and imagery, this vegetation fluctuates between more of one or the other. This is likely partially due to the timing of storm events in the spring and how this impacts salinity when vegetation is establishing. Lillebo and others (2003) found that the *Scirpus maritimus,* analogous to the tule found at Topanga Lagoon, were not killed by salinity of 15 ppt, but also did not grow. At 10 ppt, the species grew, but at 20 ppt, the vegetation would die within 40 days. During wet years, storm events are expected to open up the lagoon mouth, so after an initial flush of freshwater, the lagoon would be expected to be more brackish side. During dry years, when fewer large pulses of freshwater would enter the lagoon, the lagoon would also not open to the ocean and the dry-weather flow into the lagoon would keep it fresher. Depending on the timing of storms and breaching events during vegetation establishment, different vegetation types are expected to occur.

These salinity measurements and onsite vegetation observations, along with historical imagery and photos, inform the selection of a low (0 to 7 ppt) to moderate salinity (7 to 15 ppt) regime for habitat mapping of the Topanga restoration site.

5.1.4 Habitats

Table 5-1 provides the range of elevations for each habitat type estimated through the analysis of habitat elevations, inundation frequency curves, and salinity onsite. **Figure 5-1** provides a schematic sketch of the habitat elevation zones developed for the purposes of mapping restored habitats with current sea level. Habitat types were chosen based on site evaluation, a review of the literature, and input from ecologists. Figure 5-2 compares existing vegetation (i.e., biological communities) from the WRA (2020) Jurisdictional Delineation Report, Topanga Lagoon Restoration Project, to habitat zones mapped by M&N (2022b) by applying the habitat elevations to existing topography. **Figure 5-2** is useful for comparing the elevation-based riparian, riparian transition zone, and upland habitats to the existing willow forest vegetation. The elevation-based riparian habitat zone is mapped within the existing willow forest, as are portions of elevation-based riparian/upland transition and upland habitat zones. The elevation-based riparian/upland transition habitat zone extends beyond the existing will forest. These differences between existing willow forest and elevation-based habitat mapping are to be expected given existing willow forest doesn't depend solely on elevation and surface water inundation; rather, it depends on groundwater levels, soils, competition with other species, and a number of other factors. The elevation-based habitat zones are still useful for mapping habitats and comparing restoration alternatives.

TABLE 5-1
CURRENT CONDITIONS HABITAT ELEVATIONS (FEET NAVD)

Habitat Type	Bottom Elevation	Top Elevation
Upland/Coastal Sage Scrub	10-year WL, 17.2 min**	>10-year WL, 17.2 min**
Riparian/Upland Transition	16.2 or thalweg +7*	10-year WL, 17.2 min**
Riparian	9.6	16.2 or thalweg +7*
Emergent Marsh	6.1	9.6
Seasonally Exposed Unvegetated Flat	4.9	6.1
Seasonally Shallow Open Water	3.9	4.9
Open Water	Channel thalweg	3.9

The following habitat types or categories are described briefly below: upland/coastal sage scrub, riparian/upland transition, riparian, emergent marsh, seasonally exposed unvegetated flat, seasonally shallow open water, and open water.

Upland/coastal sage scrub: In existing conditions, this habitat is a mixture of non-native and native plants. A restored native upland/coastal sage scrub would include plants like California sage, buckwheat, and California sunflower. This area may be affected by salty sea spray and seasonal drought, but rarely inundated.

Riparian/Upland Transition: In existing conditions, this habitat is a mixture of non-native and native plants. It is similar to the upland category, however there are riparian plants and it is closer to water level. In existing conditions, the invasive species include castor bean, cape ivy, carnation spurge, and arundo. In restored conditions, a mix of native riparian and upland plants will dominate. This category includes areas that are only inundated during infrequent high water events. The upper limit of the riparian/upland transition is defined for this analysis as the 10-year storm flow event in Topanga Creek or a height of 8 ft above the typical lagoon water level, (whichever is higher moving upstream).

Riparian: In existing conditions, this habitat is dominated by non-native species including arundo. A restored riparian habitat would include plants like willow and mulefat. This category includes areas that are inundated during high water events occurring in most wet years. The upper limit of riparian is defined as 7 ft above the typical lagoon water level or the creek channel bed (thalweg) (whichever is higher moving upstream), which accounts for root depth to groundwater for riparian species.

Emergent marsh: This habitat includes vegetated wetland areas, such as salt marsh and cattail marsh. In existing conditions, there are two small populations of native marsh species including salt grass and cattail. There are also non-native species such as arundo. The restored emergent marsh would be a mixture of native salt marsh plants like salt grass, pickleweed, and alkali heath, and/or brackish marsh plants like bulrush. This category includes areas that are shallowly inundated or saturated during typical closed mouth conditions. The upper limit of emergent marsh is defined as 9.6 ft NAVD based on modeled inundation frequency, the average of the modeled exceedance curve values for tule marsh in low salinity and salt marsh in moderate salinity, plus

0.5 ft, acknowledging that marshes exceed the mean water level by about 0.5 ft. This is 0.4 ft above the typical lagoon water level of 9.2 ft NAVD.

Seasonally exposed unvegetated flat: This habitat includes unvegetated wetland areas, such as mudflat or sand bar. This habitat category includes inundated or saturated soils during typical closed mouth conditions.

Seasonally shallow open water: This habitat includes unvegetated open water areas that could support emergent vegetation during dry and low-water years. This habitat supports aquatic vascular plants like ditch grass (i.e., *Ruppia maritima*).

Open water: This habitat includes the typically inundated areas. This habitat can support aquatic vascular plants like ditch-grass.

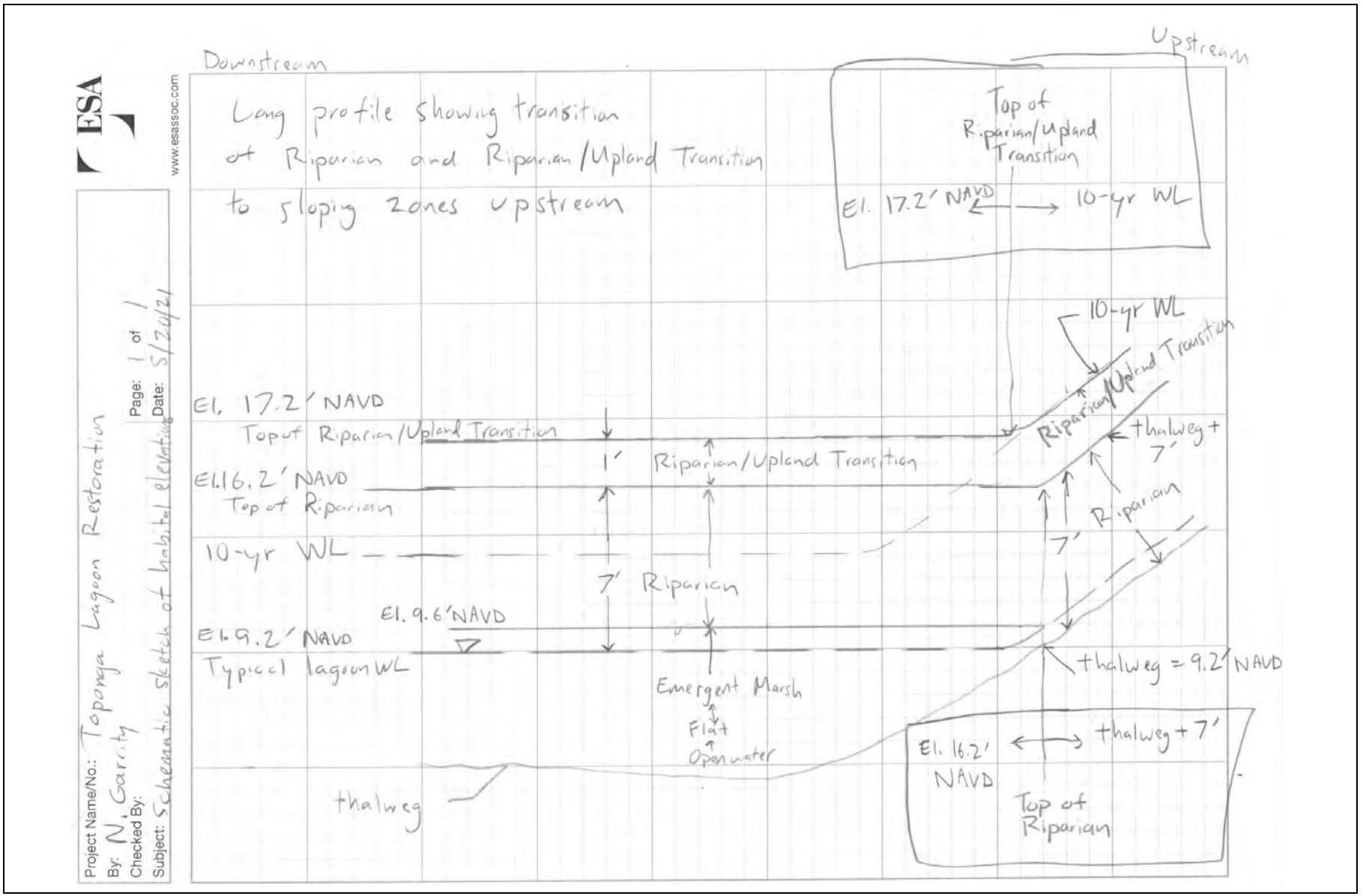
Note that even though dune strand habitat is proposed as part of the project alternatives, beach/dune strand habitat is not included in the computed habitat ranges because beach/dune habitat location depends more on coastal processes and sand soils than elevation relative to water levels and inundation frequency. See Section 5.2 below for further discussion.

5.2 Project Alternative Habitats

Inundation frequency curves for Alternatives 2, 3, and 4 at the site were developed to determine the elevations of different wetland habitat types. The modeled 2010-2020 water levels output by the QCM for project alternatives was used to develop the curves and shows differences to the existing conditions inundation frequency curve (**Figure 5-3**). Because the inundation frequency curves are created using the QCM output, they represent dynamic or changing conditions over time, not specific events or when the inlet is open or closed. The flatter exceedance curve of the project alternatives, more predominant in Alternative 2, suggests a more steady water level than in existing conditions. This means narrower habitat ranges than in existing conditions, more similar to historical conditions at Topanga Lagoon.

These habitat elevation exceedance frequencies were used to develop habitat elevations at the site. **Figure 5-4** provides the expected habitat elevations for each alternative. Note that the elevation of coastal sage scrub extends beyond 23 ft NAVD in every alternative. These categories were developed based on the actual vegetation existing on the site (Section 4.1.1), a review of the literature (ESA PWA 2015, James and Zedler 2000, Josselyn and Welchel 1999, Zedler 1982, and Zedler 2000), and input from ecologists.

In existing conditions, the riparian and riparian/upland transition ecotones contain invasive and non-native species such as *Arundo donax*. In each of the design alternatives, the riparian zone will benefit from expansion, revegetation, and removal of invasive species. Each restoration alternative expands the existing riparian habitat and ecotone. Existing high quality riparian habitat and species will be preserved and protected as much as possible in the restoration design.



SOURCE: ESA 2020

Topanga Lagoon Restoration

Figure 5-1
Schematic Sketch of Current Habitat Elevations

ESA

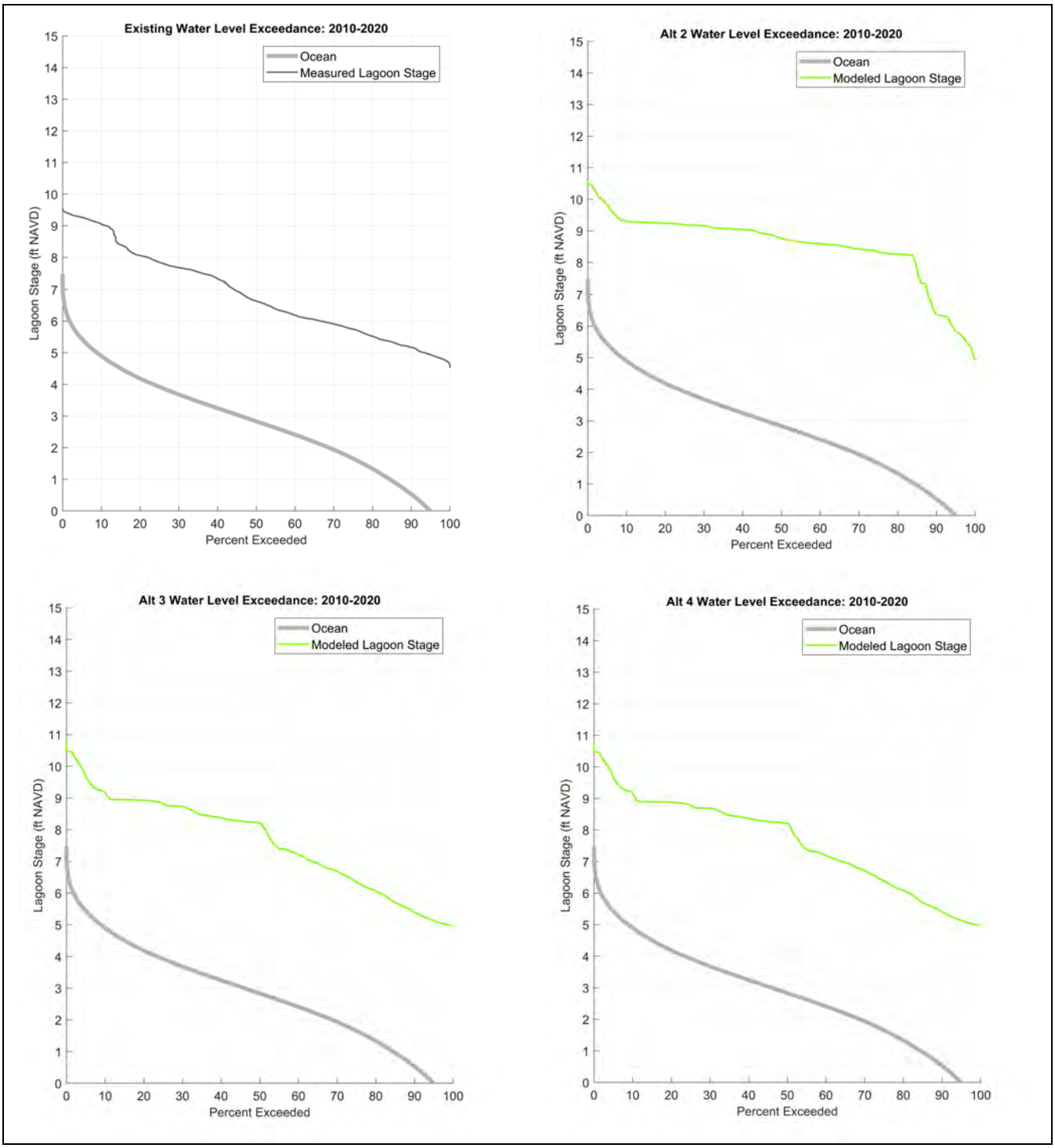
SOURCE: ESRI (background imagery), M&N (elevation-based habitat mapping for existing conditions)

* Habitat elevations were estimated to map habitats for the proposed restoration alternatives. In this figure, the habitat elevations are applied to existing topography to compare the elevation-based habitat mapping to existing biological communities.

Topanga Lagoon Restoration

Figure 5-2

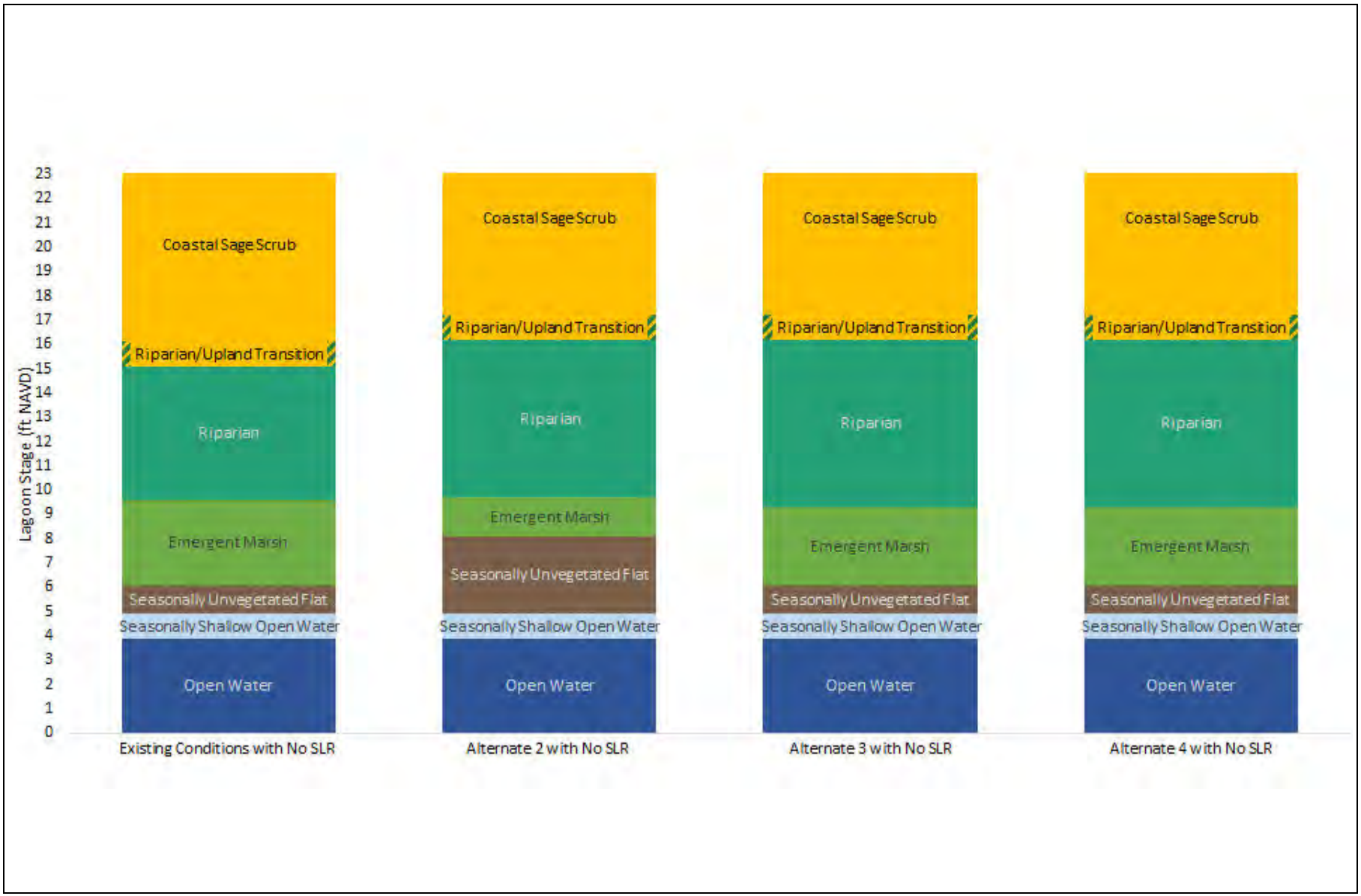
Comparison of Existing Biological Communities from Wetland Delineation and Elevation-based Habitat Mapping for Existing Conditions



SOURCE: ESA 2020

Topanga Lagoon Restoration

Figure 5-3
Comparing Modeled Inundation Frequency Curves



SOURCE: ESA 2020

Topanga Lagoon Restoration

Figure 5-4
Project Alternatives Habitat Elevation Zones Comparison

ESA

Based on this analysis and the estimated habitat elevations, the elevation range for emergent marsh in Alternative 2 has the potential to be narrower, narrowing by almost 2 feet (3.5 feet to 1.6 feet) compared to existing conditions (Figure 5-4). However, even though the elevation range narrows in Alternative 2, the emergent marsh extent in Alternative 2 is still expected to be greater than other alternatives due to the expansion of the lagoon in Alternative 2. Furthermore, the emergent marsh in restoration alternatives, albeit potentially within a narrower elevation band, will benefit from planting and establishment of various native species. Each project alternative's wetland vegetation is expected to vary from salt marsh species (salt grass) to brackish and even freshwater marsh species (cattails and tules) seasonally and from year-to-year depending on the timing of rain events with seed germination.

5.3 Future Habitats

With sea-level rise up to 6.8 feet, as discussed in Section 4.1.2, the mouth of the lagoon is expected to be closed slightly more often than under existing conditions without restoration (Section 2.5). This could lead to more brackish and freshwater species establishing, since less salt water would be entering the lagoon. Water levels in the lagoon would also increase, in proportion to the increase in the beach berm at the mouth of the lagoon. This could result in "drowning" of some of the vegetation at lower elevations and establishment higher up along the slopes, as the marsh migrates upward. However, this assumes that there would be sufficient sand to build the beach berm and the beach and berm in front of the lagoon erodes, water levels could be lower in the lagoon.

Since the restoration alternatives designs include shallower transition zone slopes than existing conditions, the restoration alternatives provide more space for habitat to shift upward in response to sea-level rise. These benefits of the restoration alternatives are quantified and discussed further in the Alternatives Analysis Report (M&N 2022b). The habitat bar graph figures show the progression of the habitats upward in elevation in the lagoon. The lower and upper elevation boundaries of each habitat type are projected to adjust upward as the sea level rises, however it is not a linear increase (i.e., the habitat ranges do not adjust upward by an amount equal to sea level rise). With each alternative, including existing conditions, the habitat range of emergent marsh is projected to narrow and move upward. With sea level rise, emergent marsh is expected to convert to seasonally exposed unvegetated flat as riparian habitat converts to emergent marsh. The lower elevations of coastal sage scrub are expected to convert to riparian habitat.

Note that Alternative 1 provides less space for habitats to adjust or transgress with sea level rise compared to the restoration alternatives. Alternative 1 does not provide as much area for the lagoon to adjust laterally with the sea level rise and vertical habitat adjustment or transgression, since the hillsides and bank slopes remain steep in Alternative 1. Each restoration alternative provides an increase in habitat adaptability to sea level rise. Alternative 2 provides the most variability in topography and area for habitats to adjust or transgress to with sea-level rise.

Tables 5-2, 5-3, and 5-4 and **Figures 5-5** through **5-8** are included below to compare future habitat elevations to existing habitat elevations. Please note that the coastal sage scrub boundary extends above 23 ft NAVD in every alternative. These future habitat elevations with sea level rise are applied to map and estimate habitat areas for the alternatives in the

Alternatives Analysis Report (M&N 2022b). The Alternatives Analysis Report assesses habitat benefits of the restoration alternatives with future sea level rise based on the habitat elevations developed in this report.

TABLE 5-2
CURRENT AND FUTURE CONDITIONS HABITAT ELEVATIONS (FEET NAVD)

	No Sea Level Rise		1.6 ft Sea Level Rise		3.3 ft Sea Level Rise		6.8 ft Sea Level Rise	
Habitat Type	**Bottom Elevation**	**Top Elevation**	**Bottom Elevation**	**Top Elevation**	**Bottom Elevation**	**Top Elevation**	**Bottom Elevation**	**Top Elevation**
Upland/Coastal Sage Scrub	10-year WL, 17.2 min**	>10-year WL, 17.2 min**	10-year WL, 17.2 min**	>10-year WL, 17.2 min**	10-year WL, 17.2 min**	>10-year WL, 17.2 min**	10-year WL, 17.2 min**	>10-year WL, 17.2 min**
Riparian/Upland Transition	16.2 or thalweg +7*	10-year WL, 17.2 min**	16.2 or thalweg +7*	10-year WL, 17.2 min**	16.2 or thalweg +7*	10-year WL, 17.2 min**	*16.2 or thalweg +7	10-year WL, 17.2 min**
Riparian	9.6	16.2 or thalweg +7*	10.4	16.2 or thalweg +7*	11.5	16.2 or thalweg +7*	13.8	16.2 or thalweg +7*
Emergent Marsh	6.1	9.6	8	10.4	10.1	11.5	12.5	13.8
Seasonally Exposed Unvegetated Flat	4.9	6.1	4.9	8	5.3	10.1	6.9	12.5
Seasonally Shallow Open Water	3.9	4.9	3.9	4.9	4.3	5.3	5.9	6.9
Open Water	Channel thalweg	3.9	Channel thalweg	3.9	Channel thalweg	4.3	Channel thalweg	5.9

NOTES:

* Riparian top elevation and Riparian/Upland Transition bottom elevation is 16.2 at the downstream end of the lagoon up to the point where the thalweg elevation is above 9.2. Upstream of where the thalweg elevation is 9.2, the riparian zone top elevation transitions to a zone that slopes upstream with the thalweg profile and is 7 ft above the thalweg.

** Top elevation of Riparian/Upland Transition is 17.2 or the 10-year water level, whichever is higher, i.e., 17.2 at the downstream end of the lagoon, transitioning upstream to a Riparian/Upland Transition zone that slopes upstream with the 10-year water surface profile.

TABLE 5-3
ALTERNATIVE 2 HABITAT ELEVATIONS (FEET NAVD)

	No Sea Level Rise		1.6 ft Sea Level Rise		3.3 ft Sea Level Rise		6.8 ft Sea Level Rise	
Habitat	**Bottom Elevation**	**Top Elevation**	**Bottom Elevation**	**Top Elevation**	**Bottom Elevation**	**Top Elevation**	**Bottom Elevation**	**Top Elevation**
Upland/Coastal Sage Scrub	10-year WL, 17.2 min**	>10-year WL, 17.2 min**	10-year WL, 17.2 min**	>10-year WL, 17.2 min**	10-year WL, 17.2 min**	>10-year WL, 17.2 min**	10-year WL, 17.2 min**	>10-year WL, 17.2 min**
Riparian/Upland Transition	16.2 or thalweg +7*	10-year WL, 17.2 min**	16.2 or thalweg +7*	10-year WL, 17.2 min**	16.2 or thalweg +7*	10-year WL, 17.2 min**	*16.2 or thalweg +7	10-year WL, 17.2 min**
Riparian	9.7	16.2 or thalweg +7*	10.4	16.2 or thalweg +7*	11.4	16.2 or thalweg +7*	13.6	16.2 or thalweg +7*
Emergent Marsh	8.1	9.7	8.5	10.4	10.1	11.4	12.4	13.6
Seasonally Exposed Unvegetated Flat	4.9	8.1	4.9	8.5	5.1	10.1	7.7	12.4

Habitat	No Sea Level Rise		1.6 ft Sea Level Rise		3.3 ft Sea Level Rise		6.8 ft Sea Level Rise	
	Bottom Elevation	Top Elevation	Bottom Elevation	Top Elevation	Bottom Elevation	Top Elevation	Bottom Elevation	Top Elevation
Seasonally Shallow Open Water	3.9	4.9	3.9	4.9	4.1	5.1	6.7	7.7
Open Water	channel thalweg	3.9	channel thalweg	3.9	channel thalweg	4.1	channel thalweg	6.7

NOTES:

* Riparian top elevation and Riparian/Upland Transition bottom elevation is 16.2 at the downstream end of the lagoon up to the point where the thalweg elevation is above 9.2. Upstream of where the thalweg elevation is 9.2, the riparian zone top elevation transitions to a zone that slopes upstream with the thalweg profile and is 7 ft above the thalweg.

** Top elevation of Riparian/Upland Transition is 17.2 or the 10-year water level, whichever is higher, i.e., 17.2 at the downstream end of the lagoon, transitioning upstream to a Riparian/Upland Transition zone that slopes upstream with the 10-year water surface profile.

TABLE 5-4
ALTERNATIVE 3 HABITAT ELEVATIONS (FEET NAVD)

Habitat	No Sea Level Rise		1.6 ft Sea Level Rise		3.3 ft Sea Level Rise		6.8 ft Sea Level Rise	
	Bottom Elevation	Top Elevation	Bottom Elevation	Top Elevation	Bottom Elevation	Top Elevation	Bottom Elevation	Top Elevation
Upland/Coastal Sage Scrub	10-year WL, 17.2 min**	>10-year WL, 17.2 min**	10-year WL, 17.2 min**	>10-year WL, 17.2 min**	10-year WL, 17.2 min**	>10-year WL, 17.2 min**	10-year WL, 17.2 min**	>10-year WL, 17.2 min**
Riparian/Upland Transition	16.2 or thalweg +7*	10-year WL, 17.2 min**	16.2 or thalweg +7*	10-year WL, 17.2 min**	16.2 or thalweg +7*	10-year WL, 17.2 min**	*16.2 or thalweg +7	10-year WL, 17.2 min**
Riparian	9.3	16.2 or thalweg +7*	10.4	16.2 or thalweg +7*	11.4	16.2 or thalweg +7*	13.6	16.2 or thalweg +7*
Emergent Marsh	6.1	9.3	8.3	10.4	10	11.4	12.4	13.6
Seasonally Exposed Unvegetated Flat	4.9	6.1	4.9	8.3	5.2	10	7.8	12.4
Seasonally Shallow Open Water	3.9	4.9	3.9	4.9	4.2	5.2	6.8	7.8
Open Water	Channel thalweg	3.9	Channel thalweg	3.9	Channel thalweg	4.2	Channel thalweg	6.8

NOTES:

* Riparian top elevation and Riparian/Upland Transition bottom elevation is 16.2 at the downstream end of the lagoon up to the point where the thalweg elevation is above 9.2. Upstream of where the thalweg elevation is 9.2, the riparian zone top elevation transitions to a zone that slopes upstream with the thalweg profile and is 7 ft above the thalweg.

** Top elevation of Riparian/Upland Transition is 17.2 or the 10-year water level, whichever is higher, i.e., 17.2 at the downstream end of the lagoon, transitioning upstream to a Riparian/Upland Transition zone that slopes upstream with the 10-year water surface profile.

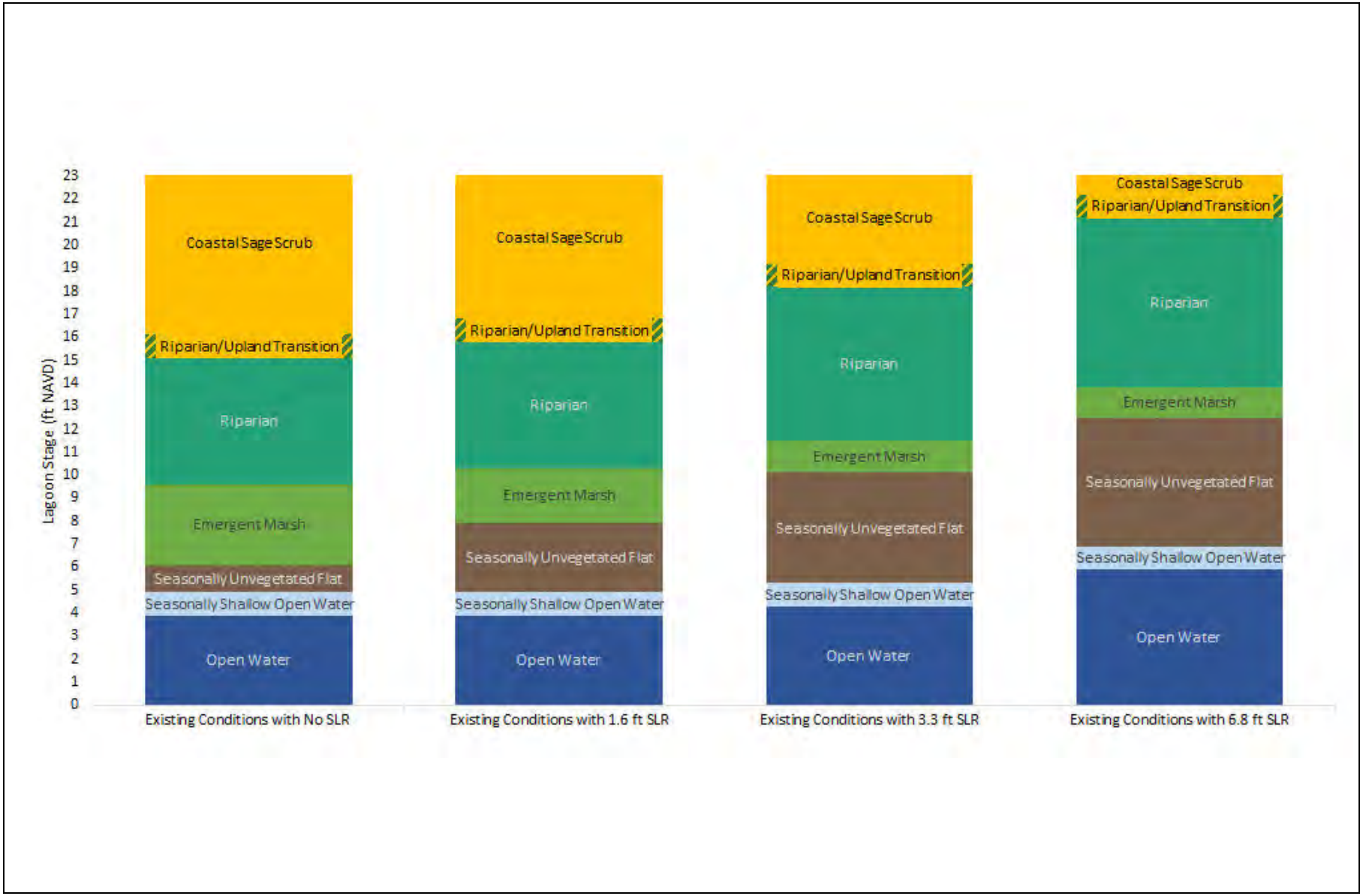
TABLE 5-5
ALTERNATIVE 4 HABITAT ELEVATIONS (FEET NAVD)

	No Sea Level Rise		1.6 ft Sea Level Rise		3.3 ft Sea Level Rise		6.8 ft Sea Level Rise	
Habitat	**Bottom Elevation**	**Top Elevation**	**Bottom Elevation**	**Top Elevation**	**Bottom Elevation**	**Top Elevation**	**Bottom Elevation**	**Top Elevation**
Upland/Coastal Sage Scrub	10-year WL, 17.2 min**	>10-year WL, 17.2 min**	10-year WL, 17.2 min**	>10-year WL, 17.2 min**	10-year WL, 17.2 min**	>10-year WL, 17.2 min**	10-year WL, 17.2 min**	>10-year WL, 17.2 min**
Riparian/Upland Transition	16.2 or thalweg +7*	10-year WL, 17.2 min**	16.2 or thalweg +7*	10-year WL, 17.2 min**	16.2 or thalweg +7*	10-year WL, 17.2 min**	*16.2 or thalweg +7	10-year WL, 17.2 min**
Riparian	9.3	16.2 or thalweg +7*	10.4	16.2 or thalweg +7*	11.4	16.2 or thalweg +7*	13.6	16.2 or thalweg +7*
Emergent Marsh	6.1	9.3	8.3	10.4	10	11.4	12.4	13.6
Seasonally Exposed Unvegetated Flat	4.9	6.1	4.9	8.3	5.2	10	7.8	12.4
Seasonally Shallow Open Water	3.9	4.9	3.9	4.9	4.2	5.2	6.8	7.8
Open Water	Channel thalweg	3.9	Channel thalweg	3.9	Channel thalweg	4.2	Channel thalweg	6.8

NOTES:

* Riparian top elevation and Riparian/Upland Transition bottom elevation is 16.2 at the downstream end of the lagoon up to the point where the thalweg elevation is above 9.2. Upstream of where the thalweg elevation is 9.2, the riparian zone top elevation transitions to a zone that slopes upstream with the thalweg profile and is 7 ft above the thalweg.

** Top elevation of Riparian/Upland Transition is 17.2 or the 10-year water level, whichever is higher, i.e., 17.2 at the downstream end of the lagoon, transitioning upstream to a Riparian/Upland Transition zone that slopes upstream with the 10-year water surface profile.

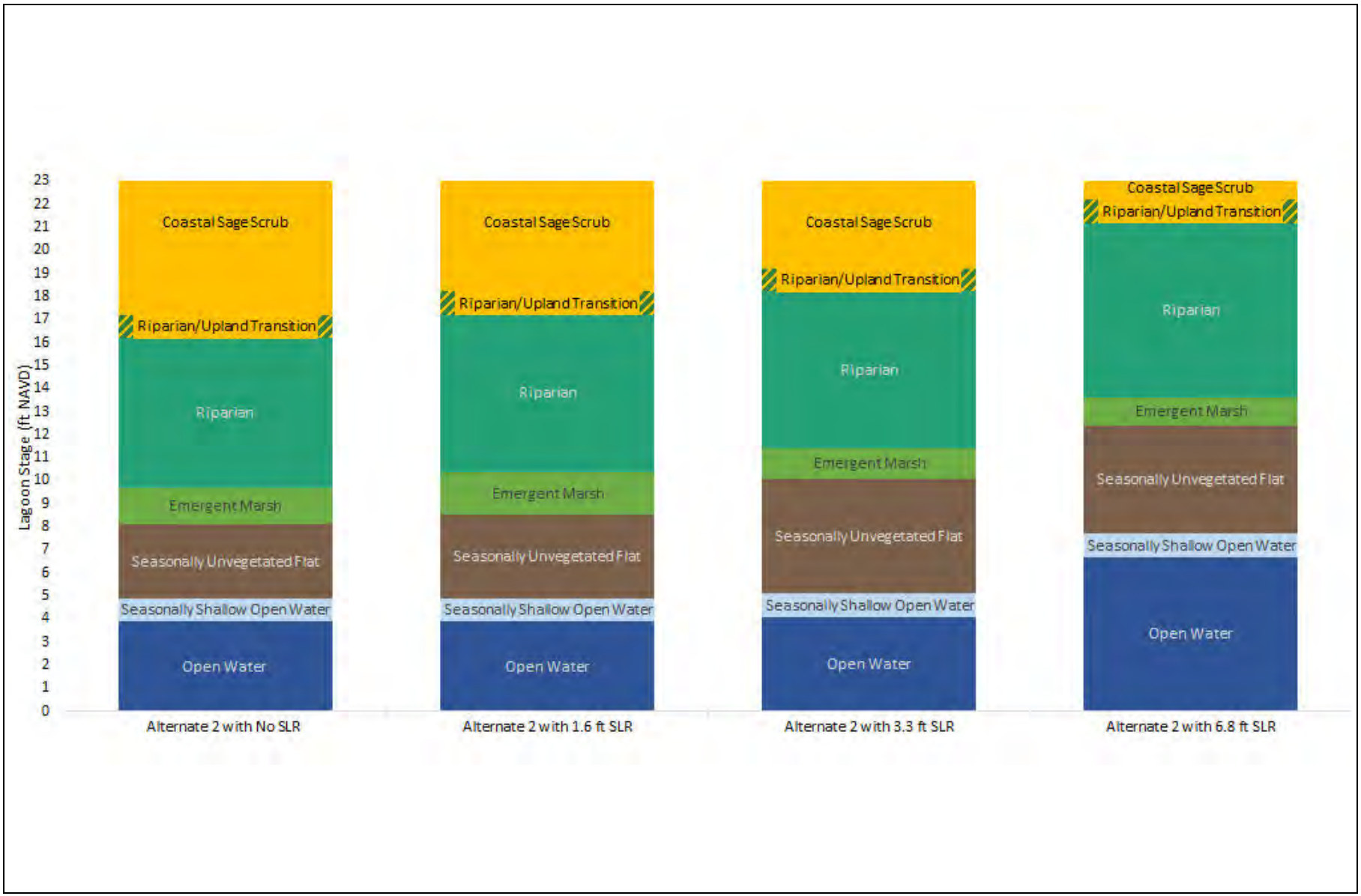


SOURCE: ESA 2020

Topanga Lagoon Restoration

Figure 5-5
Future Habitat Elevations for Alternative 1

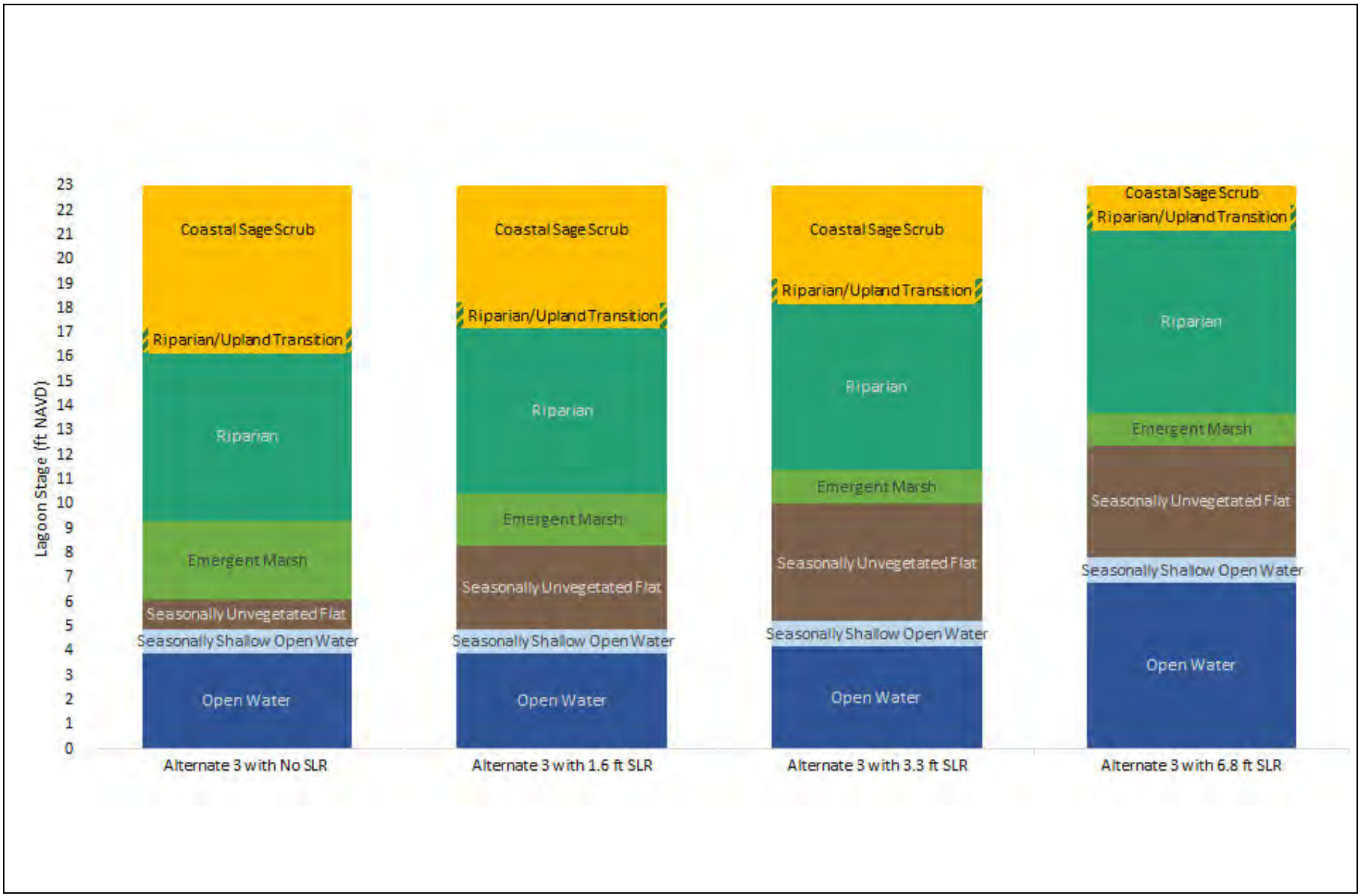
ESA



SOURCE: ESA 2020

Topanga Lagoon Restoration

Figure 5-6
Future Habitat Elevations for Alternative 2

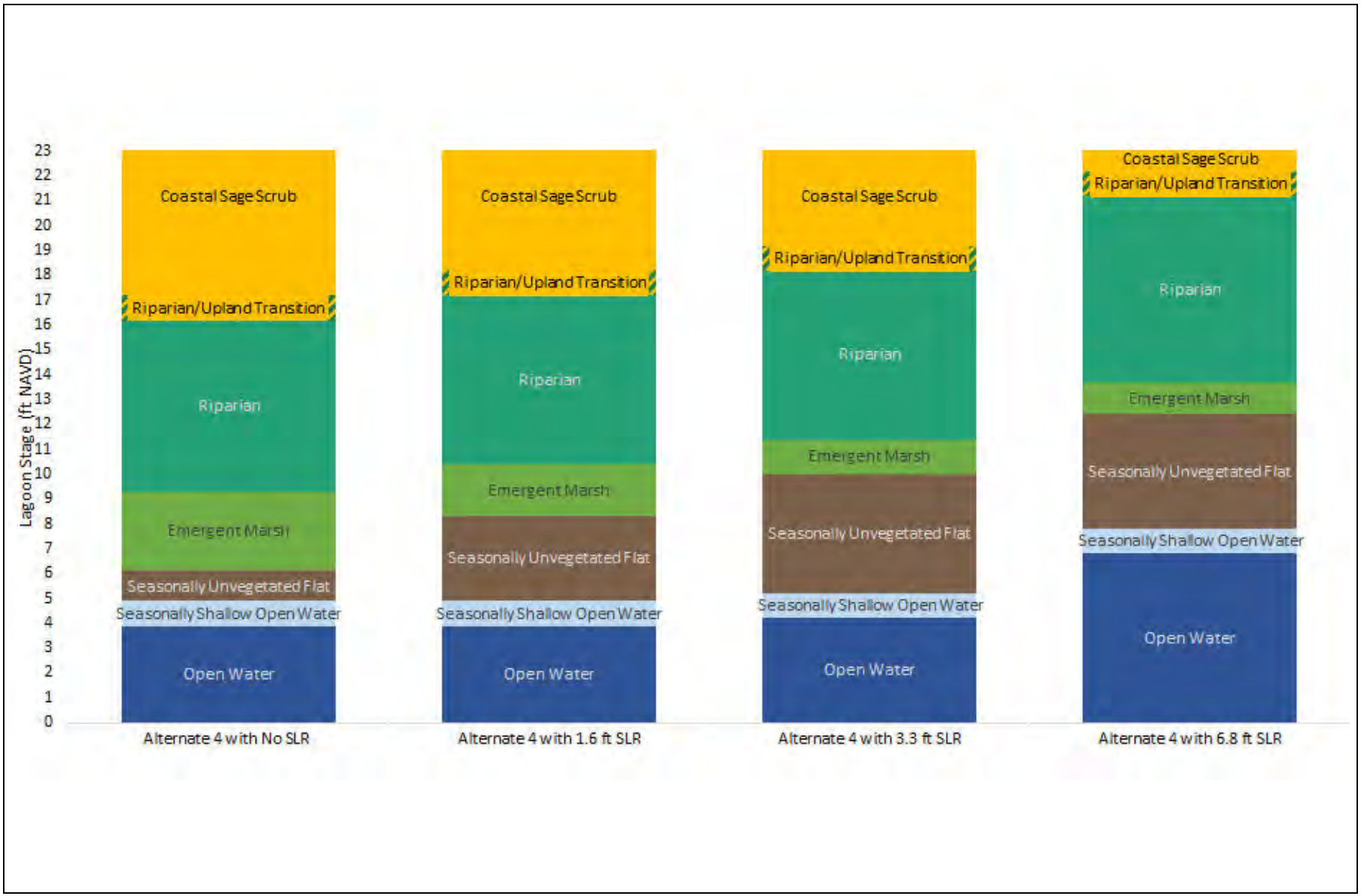


SOURCE: ESA 2020

Topanga Lagoon Restoration

Figure 5-7
Future Habitat Elevations for Alternative 3

ESA



SOURCE: ESA 2020

Topanga Lagoon Restoration

Figure 5-8
Future Habitat Elevations for Alternative 4

ESA

Section 6: Conclusions

The fish passage and refuge habitat suitability model developed in this study combined the results of hydrodynamic modeling, lagoon mouth modeling, and biological criteria to provide insight into how the proposed Topanga Lagoon restoration alternatives would potentially affect adult steelhead passage as well as refugia for tidewater goby and juvenile steelhead.

Adult steelhead passage. The upstream end of the lagoon may act as a fish passage barrier under existing conditions during large storm events. The restoration alternatives widen the lagoon corridor and increase velocity at the upstream end of the lagoon where flows "drop" into the wider lagoon corridor. This increased velocity in restored conditions may deepen and/or widen the channel over time, thereby reducing the velocity under restored conditions. Future phases of restoration alternative design will further assess the flow divergence at the upstream end of the restoration and refine the grading to reduce the increase in velocity as possible. Refinements to the restoration alternative grading at this location could provide the benefit of removing or reducing this existing fish passage barrier.

Alternative 2 is expected to benefit adult steelhead passage by increasing the time and opportunity for passage. While Alternative 2 is closed more often during the steelhead migration season, it is actually open and passable more often after storm events when adult steelhead are expected to migrate. This is because Alternative 2 increases storm flow conveyance and storage in the lagoon, which decreases modeled velocities upstream of the bridge and at the breach.

Alternatives 3 and 4 do not change the time and opportunity for passage. This is because the lagoon grading and expansion and habitat restoration in Alternatives 3 and 4 is above the elevation of the existing lagoon and therefore does not have much of an effect on lagoon mouth opening or modeled storm velocities. Also, the existing bridge is not modeled as a fish passage constraint and lengthening the bridge in Alternatives 3 and 4 therefore does not increase the time available for passage in the model. Lengthening the bridge is expected to provide other key benefits as discussed below and in the Alternatives Analysis Report (M&N 2022b).

A separate hydrodynamic modeling analysis of velocity at the PCH bridge by M&N (2022a) shows that Alternative 2 increases the passable cross-sectional area at the bridge. This is due to the lengthening of the bridge and widening of the lagoon in Alternative 2. Based on these model results, Alternative 2 is expected to provide additional lower velocity area for adult steelhead to swim up, allowing adults to save more energy and reduce the risk of exhaustion. These model results for Alternative 2 therefore indicate that, in addition to the benefit of increasing the time and opportunity for adult passage discussed above, Alternative 2 is also expected to have the benefit of improving conditions for adult passage at the PCH bridge. M&N's analysis shows that Alternatives 3 and 4 are not expected to improve conditions for adult passage at the PCH bridge because, while Alternatives 3 and 4 lengthen the PCH bridge, they do not widen the lagoon (and instead restore and widen habitat above the elevation of the existing lagoon). Lengthening the bridge is, however, expected to have other key benefits to physical and ecological processes, including habitat connectivity.

Under the medium-term scenario of 1.6 ft sea level rise, results for all alternatives show an increase in lagoon mouth closure in comparison to model results for existing sea levels, but an increase in the time passable after major storms relative to no sea level rise. The modeled increase in closure is because the lagoon volumes increase with sea level rise. All alternatives are expected to provide similar passage time and opportunities with 1.6 ft of sea level rise.

Model results for passage conditions in the longer term with 6.8 ft of sea level rise show more days of mouth closure than under existing conditions and 1.6 ft sea level rise. However, the number of days passable at both high and low tides when the mouth is open is projected to increase for all alternatives. This may be due to sea levels rising sufficiently high that on days when the lagoon mouth is open, passage can happen even at low tide. Comparing the alternatives, the restoration alternatives (Alternatives 2, 3, and 4) increase mouth closure compared to Alternative 1 (no project) due to the increase in lagoon volume. The results show some potential for the restoration alternatives to decrease the time and opportunity for passage; however, there is considerable uncertainty in projecting future conditions with 6.8 ft of sea level rise and the modeled changes are within the range of model uncertainty. Rather, the modeling with 6.8 ft of sea level rise provides a tool that suggests all alternatives are expected to provide passage opportunities with 6.8 ft of sea level rise. Also note that 6.8 ft of sea level rise is most likely to occur after 2150 per the Ocean Protection Council (2018).

M&N's (2022a) modeling analysis of velocity at the PCH bridge with 6.8 ft of sea level rise suggests that Alternative 2 is likely to have the benefit of improving conditions for adult passage at the PCH bridge with sea level rise. Alternatives 3 and 4 do not show a clear benefit to passage conditions at PCH bridge with sea level rise compared to Alternative 1 (no project).

In summary, relative to Alternative 1, Alternative 2 is expected to benefit adult steelhead passage by increasing the time and opportunity for passage and improving conditions for passage at the PCH bridge. With future sea level rise of between 1.6 ft and 6.8 ft, Alternative 2 is not expected to improve the time and opportunity for passage, but is expected to improve conditions for passage at the PCH bridge. Alternatives 3 and 4 are not expected to benefit adult steelhead passage opportunity or conditions for passage at the PCH bridge relative to Alternative 1.

Tidewater goby and juvenile steelhead refugia. ESA's model results for tidewater goby and juvenile steelhead refugia in the lagoon show that the lagoon provides refugia when the lagoon is closed and during low flow conditions when mouth is open. During storm flows, flow velocities in the lagoon increase and can exceed criteria for refugia, indicating that the portion of the lagoon that provides refugia reduces during storm flows. Compared to existing conditions (Alternative 1), model results show that Alternative 2 improves refugia for tidewater goby and juvenile steelhead during storm flows because the expanded lagoon areas provide lower velocity areas that provide refugia that is not present under existing conditions. Model results indicate that Alternatives 3 and 4 improve refugia for juvenile steelhead, using a slightly higher velocity criteria (1.5 ft/s), but do not improve refugia for tidewater gobies (lower velocity criteria of 1 ft/s).

Table 6-1 below summarizes the results and conclusions of this study. In conclusion, Alternative 2 will create new expanded lagoon and transitional habitat that is expected to benefit fish and other species. Alternatives 3 and 4 will expand and restore transition habitat above the existing lagoon only and thereby provide juvenile steelhead refugia. The restored transition zone habitat in Alternatives 2, 3 and 4 is expected to enhance the existing lagoon habitat and allow the lagoon to expand with future sea level rise, thereby creating lagoon habitat and likely improving refugia.

TABLE 6-1
FISH PASSAGE & REFUGIA MODELING RESULTS SUMMARY

	Description	**Adult Steelhead Passage**	**Tidewater Goby & Juvenile Steelhead Refugia**
Alternative 1	*Existing conditions* *(baseline for comparison to restoration Alternatives 2, 3, and 4)*	*-Time and opportunity for passage limited by high velocities at breach and upstream end of lagoon during storm events* *-With sea level rise, mouth closure may increase, but lower velocities through larger lagoon may increase time and opportunity for passage*	*-High velocities during storm events reduce the portion of the lagoon that provides refugia for tidewater gobies and juvenile steelhead* *-With sea level rise, the lagoon is expected to increase in size and increase areas of refugia*
Alternative 2	Expands lagoon and transition zone, includes new longer PCH bridge	-Increases mouth closure, but lower velocities through expanded lagoon increase time and opportunity for passage with current sea level -Is not expected to increase the time and opportunity for fish passage with sea level rise compared to Alternative 1 -Reduces velocities and Improves conditions for passage at Pacific Coast Highway bridge with current sea level and future sea level rise	-Creates new lagoon habitat for fish -Improves refugia for tidewater gobies and juvenile steelhead during storm flows with current sea levels -With sea level rise, allows lagoon to expand, creates habitat, and likely improves refugia
Alternative 3	Expands transition zone, includes new longer PCH bridge	-Does not improve time and opportunity for passage or conditions for passage at Pacific Coast Highway bridge with current sea level or future sea level rise	-Improves refugia for juvenile steelhead during storm flows with current sea levels -With sea level rise, allows lagoon to expand, creates habitat & likely improves refugia
Alternative 4	Expands transition zone, realigns PCH north for managed retreat from sea level rise and includes new longer PCH bridge	-Does not improve time and opportunity for passage or conditions for passage at Pacific Coast Highway bridge with current sea level or future sea level rise	-Improves refugia for juvenile steelhead during storm flows with current sea levels -With sea level rise, allows lagoon to expand, creates habitat & likely improves refugia

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Appendix N

Air Quality, Greenhouse Gas Emissions, and Energy Data, Modeling, and Noise Calculations (ESA 2023)

The Appendices herein contain supporting information. These Appendices contain highly detailed figures and other graphic information, which are difficult to translate for screen reading software; therefore, the Appendices have not been translated into an auditory format. If you have a disability and/or have difficulty accessing any material in this document, please contact us by mail, email, or telephone, and we will work with you to make all reasonable accommodations. Please indicate 1) the nature of the accessibility need; 2) your preferred format; 3) the material you are trying to access and its location within this document; and 4) how to reach you if questions arise while fulfilling your request. You can direct your requests to:

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Appendix P
Air Quality Calculations and Modeling

ESA

P.1-1 Construction Assumptions

Topanga Lagoon Restoration

Construction Equipment/Worker/Vendor Truck Schedule and Assumptions

Project Land Uses

Land Use Type	CalEEMod LandUse Type	CalEEMod LandUse Subtype	Amount	Unit	Land Use SF	Notes
Temporary Bridge	Other Asphalt Surfaces		0.31	acres	13,500	Temp bridge is 180 ft long * 75 ft width
Topanga Bridge/Roadway NB	Other Asphalt Surfaces		1.80	acres	78,408	This includes bridge construction (460 ft*75 ft) + roadway improvements. Total acreage of impervious surfaces is 3.6 acres split between NB and SB directions evenly
Topanga Bridge/Roadway SB	Other Asphalt Surfaces		1.80	acres	78,408	
Lifeguard HQ	Office	General Office Building	1.5	KSF	1,500	Estimated on Google Earth
Helipad	Other Nonasphalt Surfaces		2.3	KSF	2,300	Estimated on Google Earth
Visitor Services						
Ranger Office	Office	General Office Building	5.5	KSF	5,500	From PD
Parking Lot	Parking Lot		75	Spaces	29,403	

Added 1 day to end to include end date

	Construction Phase	CalEEMod Phase Type	Start Date	End Date	Workdays (7 days/week)	Worker Vehicles/Day	Workers Trips (In/Out)/Day	Vendor Trips/Day (In/Out)
A	Demolition & Temp Parking Provisions	Demolition	1/1/2027	3/1/2027	60	20	40	
A	Unsuitable Material Replacement	Grading/Excavation	1/1/2027	3/1/2027	60	20	40	
A	Relocate Utilities	Trenching	2/1/2027	8/1/2027	182	20	40	
A	Construct Temporary Road/ Bridge	Grading/Excavation	6/1/2027	6/30/2027	30	20	40	
A	Construct Temporary Road/ Bridge	Building Construction	7/1/2027	11/1/2027	124	20	40	
A	Construct Temporary Road/ Bridge	Paving	11/2/2027	12/31/2027	60	20	40	
B	Demolition NB Road/Bridge	Demolition	1/1/2028	2/29/2028	60	20	40	
B	Construct NB Road/Bridge	Grading/Excavation	3/1/2028	4/30/2028	61	20	40	
B	Construct NB Road/Bridge	Building Construction	5/1/2028	11/30/2028	214	20	40	
B	Construct NB Road/Bridge	Paving	12/1/2028	12/31/2028	31	20	40	
B	Demolition SB Road/Bridge	Demolition	1/1/2029	2/28/2029	59	20	40	
B	Construct SB Road/Bridge	Grading/Excavation	3/1/2029	4/30/2029	61	20	40	
B	Construct SB Road/Bridge	Building Construction	5/1/2029	11/30/2029	214	20	40	
B	Construct SB Road/Bridge	Paving	12/1/2029	12/31/2029	31	20	40	
A	Demolition Temporary Bridge	Demolition	1/1/2030	2/28/2030	59	20	40	
A	Construct DBH Facilities (Lifeguard HQ/Helipad)	Building Construction	3/1/2030	3/31/2030	31	20	40	
A	Lagoon Grading	Grading/Excavation	4/1/2030	10/31/2030	214	20	40	
A	Restore Beach Area	Site Preparation	11/1/2030	12/31/2030	61	20	40	
	Visitor Services							
C	Site Preparation		1/1/2027	1/1/2027	1	5	10	
C	Grading		1/2/2027	1/5/2027	4	8	16	
C	Building Construction		1/6/2027	5/25/2027	140	7	14	6
C	Paving		5/19/2027	5/25/2027	7	18	36	
C	Architectural Coating		5/19/2027	5/25/2027	7	1	2	

Topanga Lagoon Restoration

Construction Haul and Concrete Truck Schedule and Assumptions

Project Land Uses

Land Use Type	CalEEMod LandUse Type	CalEEMod LandUse	Amount	Unit	Land Use SF	Notes
Temporary Bridge	Other Asphalt Surfaces		0.31	acres	13,500	Temp bridge is 180 ft long * 75 ft width
Topanga Bridge/Roadway NB	Other Asphalt Surfaces		1.80	acres	78,408	This includes bridge construction (460 ft*75 ft) + roadway improvements. Total acreage of impervious surfaces is 3.6 acres split between NB and SB directions evenly
Topanga Bridge/Roadway SB	Other Asphalt Surfaces		1.80	acres	78,408	
Lifeguard HQ	Office	General Office	1.5	KSF	1,500	Estimated on Google Earth
Helipad	Other Nonasphalt Surfaces		2.3	KSF	2,300	Estimated on Google Earth
Visitor Services						
Ranger Office	Office	General Office	5.5	KSF	5,500	From PD
Parking Lot	Parking Lot		75	Spaces	29,403	

	Construction Phase	CalEEMod Phase Type	Start Date	End Date	Workdays (5 days/week)		Total Haul (or Concrete) Trips (In/Out)	Total Haul (or Concrete) Trucks/Day	Haul (or Concrete) Trips/Day (In/Out)
A	Demolition & Temp Parking Provisions	Demolition	1/1/2027	3/1/2027	42		2,162	26	52
A	Unsuitable Material Replacement	Grading/Excavation	1/1/2027	3/1/2027	42		7,720	92	184
A	Relocate Utilities	Trenching	2/1/2027	8/1/2027	130		260	1	2
A	Construct Temporary Road/ Bridge	Grading/Excavation	6/1/2027	6/30/2027	22		320	8	16
A	Construct Temporary Road/ Bridge	Building Construction	7/1/2027	11/1/2027	88		208	2	4
A	Construct Temporary Road/ Bridge	Paving	11/2/2027	12/31/2027	44				
B	Demolition NB Road/Bridge	Demolition	1/1/2028	2/29/2028	42		270	4	8
B	Construct NB Road/Bridge	Grading/Excavation	3/1/2028	4/30/2028	43		6,100	71	142
B	Construct NB Road/Bridge	Building Construction	5/1/2028	11/30/2028	154		834	3	6
B	Construct NB Road/Bridge	Paving	12/1/2028	12/31/2028	21				
B	Demolition SB Road/Bridge	Demolition	1/1/2029	2/28/2029	43		270	4	8
B	Construct SB Road/Bridge	Grading/Excavation	3/1/2029	4/30/2029	43		5,860	69	138
B	Construct SB Road/Bridge	Building Construction	5/1/2029	11/30/2029	154		834	3	6
B	Construct SB Road/Bridge	Paving	12/1/2029	12/31/2029	21				
A	Demolition Temporary Bridge	Demolition	1/1/2030	2/28/2030	43				
A	Construct DBH Facilities (Lifeguard HQ/Helipad)	Building Construction	3/1/2030	3/31/2030	21				
A	Lagoon Grading	Grading/Excavation	4/1/2030	10/31/2030	154		51,200	251	502
A	Restore Beach Area	Site Preparation	11/1/2030	12/31/2030	43				
	Visitor Services								
C	Site Preparation		1/1/2027	1/1/2027	1				
C	Grading		1/2/2027	1/5/2027	2				
C	Building Construction		1/6/2027	5/25/2027	100				
C	Paving		5/19/2027	5/25/2027	5				
C	Architectural Coating		5/19/2027	5/25/2027	5				

Demolition Quantities - Structures

Buildings	Amount
Total Demolition Debris (CY)	**10,810**
Haul Truck Capacity (CY)	10
Total Haul Trucks Required	1,081
Total Haul Truck Trips (In/Out)	**2,162**
Total Haul Truck Trips (In/Out) per day	52
Tons of Debris	5,405

Demolition Quantities - NB Bridge

Buildings	Amount
Total Demolition Debris (CY)	**1,350**
Haul Truck Capacity (CY)	10
Total Haul Trucks Required	135
Total Haul Truck Trips (In/Out)	**270**
Total Haul Truck Trips (In/Out) per day	8
Tons of Debris	675

Demolition Quantities - SB Bridge

Buildings	Amount
Total Demolition Debris (	**1,350**
Haul Truck Capacity (CY)	10
Total Haul Trucks Require	135
Total Haul Truck Trips (In	**270**
Total Haul Truck Trips (In/Out) per day	8
Tons of Debris	675

Lagoon Excavation Quantities

Parameters	Amount
Excavation Volume (Export) (CY)	**256,000**
Haul Truck Capacity (CY)	10
Total Haul Trucks Required	25,600
Total Haul Truck Trips (In/Out)	**51,200**
Haul Days	**102**
Daily Haul Amount (CY)	**2,510**
Total Haul Truck Trips (In/Out) per day	502

Sediment Beneficial Reuse Study

8/2/2022

Excavation Quantities - ADL Contaminated Soil

Parameters	Amount		
Excavation Volume (Import) (CY)	**12,600**	2,520	Total Import Truck Trips
Excavation Volume (Export) (CY)	**26,000**	5,200	Total Export Truck Trips
Haul Truck Capacity (CY)	10	60	Daily Import Truck Trips
Total Haul Trucks Required	3,860	124	Daily Export Truck Trips
Total Haul Truck Trips (In/Out)	**7,720**		
Daily Haul Amount (CY)	**920**		
Total Haul Truck Trips (In/Out) per day	184		

Foundations/Concrete Quantities - Temporary Bridge

Foundations	Amount
Total Concrete Volume (C	930
Concrete Truck Capacity (	9
Total Concrete Trucks Rec	104
Total Concrete Truck Trips	208
Daily Max Concrete Amou	**11**
Max Concrete Truck Trips	4
Days Needed	52
Tons of Debris	465

Excavation Quantities - NB Road/Bridge and Roadway Excavation

Parameters	Amount		
Excavation Volume (Import) (CY)	12,000	2,400	Total Import Truck Trips
Excavation Volume (Export) (CY)	18,500	3,700	Total Export Truck Trips
Total Quantity	**30,500**	56	Daily Import Truck Trips
Haul Truck Capacity (CY)	10	86	Daily Export Truck Trips
Total Haul Trucks Required	3,050		
Total Haul Truck Trips (In/Out)	**6,100**		
Daily Haul Amount (CY)	**710**		
Total Haul Truck Trips (In/Out) per day	142		

Excavation Quantities - Temporary Bridge Abutments

Parameters	Amount
Excavation Volume (Import) (CY)	1,600
Excavation Volume (Export) (CY)	0
Total Quantity	**1,600**
Haul Truck Capacity (CY)	10
Total Haul Trucks Required	160
Total Haul Truck Trips (In/Out)	**320**
Daily Haul Amount (CY)	**73**
Total Haul Truck Trips (In/Out) per day	16

Excavation Quantities - SB Road/Bridge

Parameters	Amount		
Excavation Volume (Import) (CY)	12,000	2,400	Total Import Truck Trips
Excavation Volume (Export) (CY)	17,300	3,460	Total Export Truck Trips
Total Quantity	**29,300**	56	Daily Import Truck Trips
Haul Truck Capacity (CY)	10	82	Daily Export Truck Trips
Total Haul Trucks Required	2,930		
Total Haul Truck Trips (In/Out)	**5,860**		
Daily Haul Amount (CY)	**682**		
Total Haul Truck Trips (In/Out) per day	138		

Foundations/Concrete Quantities - NB Bridge

Foundations	Amount
Total Concrete Volume (CY)	3,750
Concrete Truck Capacity (CY)	9
Total Concrete Trucks Required	417
Total Concrete Truck Trips (In/Out	834
Daily Max Concrete Amount (CY)	**25**
Max Concrete Truck Trips (In/Out)	6
Days Needed	139

Foundations/Concrete Quantities - SB Bridge

Foundations	Amount
Total Concrete Volume (CY)	3,750
Concrete Truck Capacity (CY)	9
Total Concrete Trucks Required	417
Total Concrete Truck Trips (In/Out)	834
Daily Max Concrete Amount (CY)	**25**
Max Concrete Truck Trips (In/Out) per Day	6
Days Needed	139

Topanga Lagoon Restoration
Air Quality and Greenhouse Gas Assessment - Construction Assumptions
Off-Road Heavy-Duty Construction Equipment - Maximum

Construction Phase	CalEEMod Phase Type	Heavy-Duty Equipment	No. of Heavy-Duty Equipment	No. of hours/day	Hours of Operation/Week Per Equipment	Emissions Tier Rating (After Mitigation if needed) >100	Notes/Comments
Bridge Construction							
Demolition &Temp Parking Provisions	**Demolition**	Excavator	1	8	40		From Sequencing Report (bridge demo + roadway paving)
		Excavator w/ Hoe Ram	1	8	40		
		Loader	1	8	40		
		Dozer	1	8	40	Tier 4 Final	
		Grader	1	8	40	Tier 4 Final	
		Paver	1	8	40		
		Roller	2	8	40		
Unsuitable Material Replacement	**Grading/Excavation**	Excavator	1	8	40		From Sequencing Report (earthwork)
		Water Truck	1	8	40	Tier 4 Final	
		Loader	1	8	40		
		Dozer	1	8	40	Tier 4 Final	
		Grader	1	8	40	Tier 4 Final	
Relocate Utilities	**Trenching**	Excavator	1	8	40		Assumptions based on previous like-sized project
		Dump Truck	1	8	40		modeled as haul trip outside of CalEEMod
		Loader	1	8	40		
Construct Temporary Road/Bridge	**Grading/Excavation**	Excavator	1	8	40		From Sequencing Report (earthwork)
		Water Truck	1	8	40	Tier 4 Final	
		Loader	1	8	40		
		Dozer	1	8	40	Tier 4 Final	
		Grader	1	8	40	Tier 4 Final	
Construct Temporary Road/Bridge	**Building Construction**	Jackhammer	1	8	40		From Sequencing Report (bridge construction) - modeled as generator
		Heavy Duty Forklift	1	8	40		
		Crane	1	8	40	Tier 4 Final	
		Crawler Tractor	1	8	40		
		Generator	1	8	40		for Jackhammer above
Construct Temporary Road/Bridge	**Paving**	Dozer	1	8	40	Tier 4 Final	From Sequencing Report (roadway paving)
		Grader	1	8	40	Tier 4 Final	
		Paver	1	8	40		
		Roller	1	8	40		
Demolition NB Road/Bridge	**Demolition**	Excavator	1	8	40		From Sequencing Report (bridge demo)
		Excavator w/ Hoe Ram	1	8	40		
		Loader	1	8	40		
Construct NB Road/Bridge	**Grading/Excavation**	Excavator	1	8	40		From Sequencing Report (earthwork)
		Water Truck	1	8	40	Tier 4 Final	
		Loader	1	8	40		
		Dozer	1	8	40	Tier 4 Final	
		Grader	1	8	40	Tier 4 Final	
Construct NB Road/Bridge	**Building Construction**	Jackhammer	1	8	40		From Sequencing Report (bridge construction) - modeled as generator
		Heavy Duty Forklift	1	8	40		
		Crane	1	8	40	Tier 4 Final	
		Crawler Tractor	1	8	40		
		Generator	1	8	40		for Jackhammer above
Construct NB Road/Bridge	**Paving**	Dozer	1	8	40	Tier 4 Final	From Sequencing Report (roadway paving)
		Grader	1	8	40	Tier 4 Final	
		Paver	1	8	40		
		Roller	1	8	40		
Demolition SB Road/Bridge	**Demolition**	Excavator	1	8	40		From Sequencing Report (bridge demo)
		Excavator w/ Hoe Ram	1	8	40		
		Loader	1	8	40		
Construct SB Road/Bridge	**Grading/Excavation**	Excavator	1	8	40		From Sequencing Report (earthwork)
		Water Truck	1	8	40	Tier 4 Final	
		Loader	1	8	40		
		Dozer	1	8	40	Yes	
		Grader	1	8	40	Yes	
Construct SB Road/Bridge	**Building Construction**	Jackhammer	1	8	40		From Sequencing Report (bridge construction) - modeled as generator
		Heavy Duty Forklift	1	8	40		
		Crane	1	8	40	Yes	
		Crawler Tractor	1	8	40		
		Generator	1	8	40		for Jackhammer above
Construct SB Road/Bridge	**Paving**						
		Dozer	1	8	40	Yes	From Sequencing Report (roadway paving)
		Grader	1	8	40	Yes	
		Paver	1	8	40		
		Roller	1	8	40		
Demolition Temporary Bridge	**Demolition**	Excavator	1	8	40		From Sequencing Report (bridge demo)
		Excavator w/ Hoe Ram	1	8	40		
		Loader	1	8	40		
Construct DBH Facilities(Lifeguard HQ/Helipad)	**Building Construction**	Jackhammer	1	8	40		From Sequencing Report (bridge construction) - modeled as generator
		Heavy Duty Forklift	1	8	40		
		Crane	1	8	40	Yes	
		Crawler Tractor	1	8	40		
		Generator	1	8	40		for Jackhammer above
Lagoon Grading	**Grading/Excavation**	Excavator	1	8	40		From Sediment Reuse Report (Option 4)
		Grader	1	8	40	Yes	
		Water Truck	1	8	40	Yes	
Restore Beach Area	**Site Preparation**	Tractors/Loaders/Backhoes	1	8	40		CalEEMod Defaults
		Graders	1	8	40	Yes	
Visitor Services							
	Site Preparation	Tractors/Loaders/Backhoes	1	8	40		CalEEMod Defaults
		Graders	1	8	40	Yes	
	Grading	Graders	1	8	40	Yes	CalEEMod Defaults
		Rubber Tired Dozer	1	8	40	Yes	
		Tractors/Loaders/Backhoes	1	8	40		
	Building Construction	Cranes	1	8	40	Yes	CalEEMod Defaults
		Forklifts	2	8	40		
		Tractors/Loaders/Backhoes	2	8	40		
	Paving	Cement and Mortar Mixers	4	8	40		CalEEMod Defaults
		Pavers	1	8	40		
		Rollers	1	8	40		
		Tractors/Loaders/Backhoes	1	8	40		
	Architectural Coating	Air Compressors	1	8	40		

Topanga Lagoon Restoration
Air Quality and Greenhouse Gas Assessment - Construction Assumptions Opt 2
Off-Road Heavy-Duty Construction Equipment - Maximum

Construction Phase	CalEEMod Phase Type	Heavy-Duty Equipment	No. of Heavy-Duty Equipment	No. of hours/day	Hours of Operation/Week Per Equipment	Emissions Tier Rating (After Mitigation if needed)	Notes/Comments
Seepage Pit	**Grading/Excavation**	Excavator	1	8	40		Assumptions
		Grader	1	8	40	Tier 4 Final	
		Pump	1	8	40		

LandUseSubType	LandUseUnitAmount	LandUseSizeMetric
Other Non-Asphalt Surfaces	8	1000sqft

Construction Equipment/Worker/Vendor Truck Schedule and Assumptions

Construction Phase	CalEEMod Phase Type	Start Date	End Date	Workdays (7 days/week)	Worker Vehicles/Day	Workers Trips (In/Out)/Day	Vendor Trips/Day (In/Out)
Seepage Pit	Grading/Excavation	4/1/2030	10/31/2030	214	20	40	0

Topanga Lagoon Restoration
Air Quality and Greenhouse Gas Assessment - Construction Assumptions Opt 2

LandUseSubType	LandUseUnitAmount	LandUseSizeMetric
Other Non-Asphalt Surfaces	8	1000sqft

Grading Excavation Quantities

Parameters	Amount
Excavation Volume (Export) (CY)	**1,000**
Haul Truck Capacity (CY)	10
Total Haul Trucks Required	100
Total Haul Truck Trips (In/Out)	**200**
Haul Days	**43**
Daily Haul Amount (CY)	**24**
Total Haul Truck Trips (In/Out) per day	6

Construction Haul and Concrete Truck Schedule and Assumptions

Construction Phase	CalEEMod Phase Type	Start Date	End Date	Workdays (5 days/week)	Total Haul (or Concrete) Trips (In/Out)	Total Haul (or Concrete) Trucks/Day	Haul (or Concrete) Trips/Day (In/Out)
Seepage Pit	Grading/Excavation	4/1/2030	10/31/2030	154	200	3	6

Topanga Lagoon Restoration
Air Quality and Greenhouse Gas Assessment - Construction Assumptions Opt 3
Off-Road Heavy-Duty Construction Equipment - Maximum

Construction Phase	CalEEMod Phase Type	Heavy-Duty Equipment	No. of Heavy-Duty Equipment	No. of hours/day	Hours of Operation/Week Per Equipment	Emissions Tier Rating (After Mitigation if needed)	Notes/Comments
Sewer - Option 3	**Demolition**	Excavator	1	8	40		Assumptions based on Option 3
		Excavator w/ Hoe Ram	1	8	40		
		Loader	1	8	40		
Sewer - Option 3	**Grading/Excavation**	Excavator	1	8	40		Assumptions based on Option 3
		Water Truck	1	8	40	Tier 4 Final	
		Loader	1	8	40		
		Dozer	1	8	40	Tier 4 Final	
		Grader	1	8	40	Tier 4 Final	
Sewer - Option 3	**Building Construction**	Jackhammer	1	8	40		Assumptions based on Option 3 - modeled as a gene
		Heavy Duty Forklift	1	8	40		
		Crane	1	8	40	Tier 4 Final	
		Crawler Tractor	1	8	40		
		Generator	1	8	40		for Jackhammer above
Sewer - Option 3	**Paving**	Dozer	1	8	40	Tier 4 Final	Assumptions based on Option 3
		Grader	1	8	40	Tier 4 Final	
		Paver	1	8	40		
		Roller	1	8	40		

Construction Equipment/Worker/Vendor Truck Schedule and Assumptions

LandUseSubType	LandUseUnitAmount	LandUseSizeMetric
Other Asphalt Surfaces	40	1000sqft

Construction Phase	CalEEMod Phase Type	Start Date	End Date	Workdays (7 days/week)	Worker Vehicles/Day	Workers Trips (In/Out)/Day	Vendor Trips/Day (In/Out)
Demolition NB Road/Bridge	Demolition	1/1/2031	2/28/2031	59	20	40	0
Construct NB Road/Bridge	Grading/Excavation	3/1/2031	4/30/2031	61	20	40	0
Construct NB Road/Bridge	Building Construction	5/1/2031	11/30/2031	214	20	40	0
Construct NB Road/Bridge	Paving	12/1/2031	12/31/2031	31	20	40	0

P.2-1 Project and Project Overlap Air Quality Emissions Calculations

Topanga Lagoon - Total Emissions Summary
Air Quality Construction Analysis

Regional Maximums Source	ROG	NOX	CO	SO2	Total PM10	Total PM2.5
				lb/day		
Demo + Parking Provisions - 2027	2.24	31.92	26.33	0.154	6.38	2.15
Demo + Parking Provisions - 2027 SJVAB	0.29	20.70	7.59	0.165	5.38	1.63
Unsuitable Material Replacement - 2027	2.73	58.07	36.23	0.365	14.41	5.21
Unsuitable Material Replacement - 2027 SJVAB	0.69	49.36	18.10	0.394	12.82	3.88
Relocate Utilities - 2027	0.31	2.25	4.82	0.011	0.64	0.20
Construct Temp Bridge - Grading - 2027	2.01	17.37	19.38	0.057	4.48	2.21
Construct Temp Bridge - BC - 2027	0.90	7.64	9.09	0.024	1.00	0.48
Construct Temp Bridge - Paving - 2027	1.60	12.90	15.31	0.027	1.11	0.68
Visitor Services - Site Preparation - 2027	0.44	3.47	5.99	0.009	0.50	0.21
Visitor Services - Grading - 2027	1.35	11.49	13.13	0.023	3.49	1.86
Visitor Services - Building Construction - 2027	0.75	6.90	9.82	0.021	0.48	0.29
Visitor Services - Paving - 2027	0.94	5.09	7.82	0.014	0.67	0.30
Visitor Services - Architectural Coating - 2027	8.61	1.11	1.59	0.003	0.05	0.03
NB Road/Bridge - Demo - 2028	0.41	3.92	6.19	0.019	1.03	0.30
NB Road/Bridge - Grading - 2028	2.39	33.10	27.80	0.169	8.04	3.27
NB Road/Bridge - BC - 2028	0.87	7.44	9.12	0.026	1.03	0.47
NB Road/Bridge - Paving - 2028	1.70	12.47	15.24	0.027	1.08	0.65
SB Road/Bridge - Demo - 2029	0.40	3.83	6.09	0.018	1.02	0.30
SB Road/Bridge - Grading - 2029	2.32	30.95	27.10	0.161	7.86	3.19
SB Road/Bridge - BC - 2029	0.84	7.06	8.98	0.026	1.01	0.45
SB Road/Bridge - Paving - 2029	1.65	11.71	15.06	0.027	1.05	0.62
Demo Temp Bridge - 2030	0.35	2.61	5.41	0.010	0.68	0.20
Construct DBH Facilities - 2030	0.79	5.97	8.44	0.020	0.78	0.37
Lagoon Grading - 2030	2.57	76.93	44.95	0.549	18.80	5.71
Restore Beach Area - 2030	0.46	2.90	7.05	0.012	0.85	0.27
Seepage Pit - 2030	0.55	4.25	7.00	0.018	1.08	0.35
Sewer Connection - 2031	1.80	13.15	18.02	0.045	4.02	2.02
Overlapping Phases						
	ROG	NOX	CO	SO2	Total PM10	Total PM2.5
Demo + Parking Provisions - 2027 + Unsuitable Material Replacement - 2027 + 'Visitor Services - Site Preparation - 2027	5.41	93.45	68.55	0.529	21.29	7.57
Demo + Parking Provisions - 2027 + Unsuitable Material Replacement - 2027 + 'Visitor Services - Grading - 2027	6.31	101.47	75.69	0.542	24.27	9.22
Demo + Parking Provisions - 2027 + Unsuitable Material Replacement - 2027 + 'Visitor Services - Building Construction - 2027	5.71	96.89	72.38	0.541	21.27	7.65
Demo + Parking Provisions - 2027 + Unsuitable Material Replacement - 2027 + 'Relocate Utilities - 2027 + Visitor Services - Building Construction - 2027	6.02	99.14	77.20	0.551	21.91	7.85
Relocate Utilities - 2027 + Visitor Services - Building Construction - 2027 + 'Visitor Services - Paving - 2027 + Visitor Services - Architectural Coating - 2027	10.60	15.36	24.04	0.049	1.85	0.82
Relocate Utilities - 2027 + Construct Temp Bridge - Grading - 2027	2.32	19.61	24.20	0.068	5.12	2.41
Relocate Utilities - 2027 + Construct Temp Bridge - BC - 2027	1.22	9.89	13.91	0.035	1.64	0.68
Seepage Pit - Overlap	11.15	105.72	84.19	0.570	25.36	9.58
Project Daily Maximum Emissions	**11.15**	**105.72**	**84.19**	**0.570**	**25.36**	**9.58**
SCAQMD Regional Significance Thresholds	**75.00**	**100.00**	**550.00**	**150.00**	**150.00**	**55.00**
Exceeds Thresholds?	**No**	**Yes**	**No**	**No**	**No**	**No**

Localized Maximum Source	ROG	NOX	CO	SO2	Total PM10	Total PM2.5
				lb/day		
Demo + Parking Provisions - 2027	1.88	16.26	18.51	0.029	1.95	0.84
Unsuitable Material Replacement - 2027	1.84	14.68	16.42	0.034	3.40	1.91
Relocate Utilities - 2027	0.19	1.80	2.93	0.004	0.05	0.05
Construct Temp Bridge - Grading - 2027	1.84	14.68	16.42	0.034	3.39	1.91
Construct Temp Bridge - BC - 2027	0.78	6.87	7.04	0.015	0.33	0.31
Construct Temp Bridge - Paving - 2027	1.48	12.78	13.58	0.022	0.59	0.55
Visitor Services - Site Preparation - 2027	0.41	3.44	5.56	0.008	0.37	0.17
Visitor Services - Grading - 2027	1.30	11.44	12.43	0.021	3.28	1.81
Visitor Services - Building Construction - 2027	0.69	6.51	8.94	0.017	0.25	0.23
Visitor Services - Paving - 2027	0.83	4.98	6.25	0.010	0.20	0.19
Visitor Services - Architectural Coating - 2027	8.61	1.11	1.50	0.002	0.03	0.02
NB Road/Bridge - Demo - 2028	0.27	2.57	3.95	0.005	0.22	0.08
NB Road/Bridge - Grading - 2028	1.81	14.11	16.44	0.034	3.37	1.88
NB Road/Bridge - BC - 2028	0.74	6.40	7.03	0.015	0.30	0.28
NB Road/Bridge - Paving - 2028	1.59	12.36	13.60	0.022	0.56	0.52
SB Road/Bridge - Demo - 2029	0.27	2.53	3.96	0.005	0.22	0.08
SB Road/Bridge - Grading - 2029	1.76	13.23	16.32	0.034	3.33	1.85
SB Road/Bridge - BC - 2029	0.71	6.06	6.99	0.015	0.28	0.26
SB Road/Bridge - Paving - 2029	1.55	11.61	13.51	0.022	0.53	0.49
Demo Temp Bridge - 2030	0.25	2.51	3.94	0.005	0.16	0.07
Construct DBH Facilities - 2030	0.69	5.87	6.97	0.015	0.27	0.24
Lagoon Grading - 2030	0.78	4.64	7.57	0.019	0.43	0.20
Restore Beach Area - 2030	0.36	2.81	5.58	0.008	0.33	0.14
Seepage Pit - 2030	0.43	3.29	5.10	0.008	0.35	0.16
Sewer Connection - 2031	1.69	12.23	16.21	0.034	3.29	1.82
Overlapping Phases						
Demo + Parking Provisions - 2027 + Unsuitable Material Replacement - 2027 + 'Visitor Services - Site Preparation - 2027	4.13	34.38	40.49	0.071	5.73	2.92
Demo + Parking Provisions - 2027 + Unsuitable Material Replacement - 2027 + 'Visitor Services - Grading - 2027	5.01	42.38	47.37	0.084	8.63	4.56
Demo + Parking Provisions - 2027 + Unsuitable Material Replacement - 2027 + 'Visitor Services - Building Construction - 2027	4.40	37.45	43.88	0.080	5.60	2.98
Demo + Parking Provisions - 2027 + Unsuitable Material Replacement - 2027 + 'Relocate Utilities - 2027 + Visitor Services - Building Construction - 2027	4.59	39.25	46.81	0.084	5.65	3.02
Relocate Utilities - 2027 + Visitor Services - Building Construction - 2027 + 'Visitor Services - Paving - 2027 + Visitor Services - Architectural Coating - 2027	10.32	14.40	19.62	0.034	0.53	0.48
Relocate Utilities - 2027 + Construct Temp Bridge - Grading - 2027	2.03	16.49	19.35	0.038	3.44	1.96
Relocate Utilities - 2027 + Construct Temp Bridge - BC - 2027	0.96	8.68	9.97	0.019	0.39	0.36
Seepage Pit - Overlap	10.75	45.67	52.47	0.092	8.99	4.71
Project Daily Maximum Emissions	**10.75**	**45.67**	**52.47**	**0.092**	**8.99**	**4.71**
SCAQMD Localized Significance Thresholds		**221.0**	**1531.0**		**13.0**	**6.0**
Exceeds Thresholds?		**No**	**No**		**No**	**No**

Construction Annual Construction Emissions

Regional Maximums Source	ROG	NOX	CO	SO2	Total PM10	Total PM2.5
				tons/yr		
Demo + Parking Provisions - 2027	0.06	0.82	0.74	0.00354	0.16	0.0538
Demo + Parking Provisions - 2027 SJVAB	0.01	0.43	0.16	0.00347	0.11	0.0341
Unsuitable Material Replacement - 2027	0.07	1.35	0.92	0.00802	0.34	0.1279
Unsuitable Material Replacement - 2027 SJVAB	0.01	1.04	0.38	0.00827	0.27	0.0814
Relocate Utilities - 2027	0.03	0.20	0.43	0.00093	0.06	0.0176
Construct Temp Bridge - Grading - 2027	0.03	0.25	0.29	0.00078	0.06	0.0325
Construct Temp Bridge - BC - 2027	0.06	0.46	0.56	0.00143	0.06	0.0291
Construct Temp Bridge - Paving - 2027	0.05	0.39	0.46	0.00081	0.03	0.0203
Visitor Services - Site Preparation - 2027	0.0002	0.0017	0.0030	0.000005	0.0003	0.0001
Visitor Services - Grading - 2027	0.00	0.02	0.03	0.00005	0.01	0.0037
Visitor Services - Building Construction - 2027	0.05	0.48	0.69	0.00146	0.03	0.0203
Visitor Services - Paving - 2027	0.00	0.02	0.03	0.00005	0.00	0.0011
Visitor Services - Architectural Coating - 2027	0.03	0.00	0.01	0.00001	0.00	0.0001
NB Road/Bridge - Demo - 2028	0.01	0.11	0.18	0.00048	0.03	0.0083
NB Road/Bridge - Grading - 2028	0.07	0.84	0.76	0.00398	0.21	0.0885
NB Road/Bridge - BC - 2028	0.09	0.77	0.96	0.00262	0.10	0.0486
NB Road/Bridge - Paving - 2028	0.03	0.19	0.24	0.00041	0.02	0.0101
SB Road/Bridge - Demo - 2029	0.01	0.10	0.18	0.00047	0.03	0.0080
SB Road/Bridge - Grading - 2029	0.07	0.79	0.74	0.00381	0.20	0.0864
SB Road/Bridge - BC - 2029	0.09	0.73	0.95	0.00260	0.10	0.0463
SB Road/Bridge - Paving - 2029	0.03	0.18	0.23	0.00041	0.02	0.0096
Demo Temp Bridge - 2030	0.01	0.08	0.16	0.00029	0.02	0.0058
Construct DBH Facilities - 2030	0.01	0.09	0.13	0.00030	0.01	0.0058
Lagoon Grading - 2030	0.18	4.19	2.80	0.02932	1.01	0.3099
Restore Beach Area - 2030	0.01	0.09	0.21	0.00037	0.03	0.0082
Seepage Pit - 2030	0.06	0.43	0.74	0.00178	0.11	0.0355
Sewer Connection - 2031	0.17	1.29	1.84	0.00440	0.25	0.1175
Annual Emissions						
	ROG	NOX	CO	SO2	Total PM10	Total PM2.5
2027	0.41	5.47	4.69	0.03	1.13	0.42
2028	0.20	1.91	2.14	0.01	0.36	0.16
2029	0.19	1.80	2.10	0.01	0.35	0.15
2030	0.27	4.88	4.04	0.03	1.18	0.37
2031	0.17	1.29	1.84	0.004	0.25	0.12
Maximum Annual Emissions	**0.41**	**5.47**	**4.69**	**0.03**	**1.18**	**0.42**
de Minimis Threhsold	**10**	**10**	**100**	**100**	**70**	**70**
Exceeds Thresholds?	**No**	**No**	**No**	**No**	**No**	**No**

Topanga Lagoon - Total Emissions Summary

Air Quality Construction Analysis

Construction Annual Equipment + Worker + Vendor Emissions

Days	Regional Maximums Source	ROG	NOX	CO	SO2	Total PM10	Total PM2.5
		tons/yr					
60	Demo + Parking Provisions - 2027	0.060	0.491	0.608	0.001003	0.074	0.029
60	Unsuitable Material Replacement - 2027	0.059	0.444	0.545	0.001168	0.118	0.061
182	Relocate Utilities - 2027	0.028	0.175	0.425	0.000786	0.052	0.016
30	Construct Temp Bridge - Grading - 2027	0.029	0.222	0.272	0.000584	0.059	0.031
124	Construct Temp Bridge - BC - 2027	0.055	0.434	0.545	0.001232	0.053	0.027
60	Construct Temp Bridge - Paving - 2027	0.048	0.387	0.459	0.000805	0.033	0.020
1	Visitor Services - Site Preparation - 2027	0.000	0.002	0.003	0.000005	0.000	0.000
4	Visitor Services - Grading - 2027	0.003	0.023	0.026	0.000045	0.007	0.004
140	Visitor Services - Building Construction - 2027	0.052	0.483	0.687	0.001465	0.034	0.020
7	Visitor Services - Paving - 2027	0.003	0.018	0.027	0.000051	0.002	0.001
7	Visitor Services - Architectural Coating - 2027	0.030	0.004	0.006	0.000009	0.000	0.000
60	NB Road/Bridge - Demo - 2028	0.011	0.081	0.168	0.000295	0.022	0.006
61	NB Road/Bridge - Grading - 2028	0.059	0.434	0.551	0.001185	0.119	0.061
214	NB Road/Bridge - BC - 2028	0.091	0.697	0.928	0.002116	0.088	0.044
31	NB Road/Bridge - Paving - 2028	0.026	0.193	0.236	0.000415	0.017	0.010
59	SB Road/Bridge - Demo - 2029	0.011	0.078	0.163	0.000288	0.022	0.006
61	SB Road/Bridge - Grading - 2029	0.057	0.407	0.545	0.001182	0.117	0.060
214	SB Road/Bridge - BC - 2029	0.087	0.659	0.914	0.002106	0.085	0.041
31	SB Road/Bridge - Paving - 2029	0.026	0.182	0.233	0.000413	0.016	0.010
59	Demo Temp Bridge - 2030	0.010	0.077	0.160	0.000285	0.020	0.006
31	Construct DBH Facilities - 2030	0.012	0.093	0.131	0.000304	0.012	0.006
214	Lagoon Grading - 2030	0.094	0.507	0.967	0.002488	0.101	0.036
61	Restore Beach Area - 2030	0.014	0.089	0.215	0.000375	0.026	0.008
214	Seepage Pit - 2030	0.057	0.363	0.703	0.001294	0.093	0.031
365	Sewer Connection - 2031	0.170	1.232	1.815	0.003958	0.232	0.113

Topanga Lagoon - Total Emissions Summary

Air Quality Construction Analysis

Construction Annual Haul and Concrete Truck Emissions

Days	Regional Maximums Source	ROG	NOX	CO	SO2	Total PM10	Total PM2.5
		tons/yr					
42	Demo + Parking Provisions - 2027	0.005	0.326	0.128	0.0025	0.082	0.025
42	Demo + Parking Provisions - 2027 SJVAB	0.006	0.435	0.159	0.0035	0.113	0.034
42	Unsuitable Material Replacement - 2027	0.016	0.908	0.380	0.0069	0.220	0.067
42	Unsuitable Material Replacement - 2027 SJVAB	0.015	1.037	0.380	0.0083	0.269	0.081
130	Relocate Utilities - 2027	0.000	0.021	0.010	0.0001	0.005	0.001
22	Construct Temp Bridge - Grading - 2027	0.001	0.028	0.013	0.0002	0.006	0.002
88	Construct Temp Bridge - BC - 2027	0.001	0.028	0.013	0.0002	0.006	0.002
44	Construct Temp Bridge - Paving - 2027	0.000	0.000	0.000	0.0000	0.000	0.000
1	Visitor Services - Site Preparation - 2027	0.000	0.000	0.000	0.0000	0.000	0.000
2	Visitor Services - Grading - 2027	0.000	0.000	0.000	0.0000	0.000	0.000
100	Visitor Services - Building Construction - 2027	0.000	0.000	0.000	0.0000	0.000	0.000
5	Visitor Services - Paving - 2027	0.000	0.000	0.000	0.0000	0.000	0.000
5	Visitor Services - Architectural Coating - 2027	0.000	0.000	0.000	0.0000	0.000	0.000
42	NB Road/Bridge - Demo - 2028	0.001	0.026	0.013	0.0002	0.006	0.002
43	NB Road/Bridge - Grading - 2028	0.010	0.406	0.209	0.0028	0.089	0.027
154	NB Road/Bridge - BC - 2028	0.002	0.071	0.035	0.0005	0.016	0.005
21	NB Road/Bridge - Paving - 2028	0.000	0.000	0.000	0.0000	0.000	0.000
43	SB Road/Bridge - Demo - 2029	0.001	0.026	0.013	0.0002	0.006	0.002
43	SB Road/Bridge - Grading - 2029	0.010	0.379	0.199	0.0026	0.086	0.026
154	SB Road/Bridge - BC - 2029	0.002	0.069	0.034	0.0005	0.016	0.005
21	SB Road/Bridge - Paving - 2029	0.000	0.000	0.000	0.0000	0.000	0.000
43	Demo Temp Bridge - 2030	0.000	0.000	0.000	0.0000	0.000	0.000
21	Construct DBH Facilities - 2030	0.000	0.000	0.000	0.0000	0.000	0.000
102	Lagoon Grading - 2030	0.087	3.682	1.831	0.0268	0.910	0.274
43	Restore Beach Area - 2030	0.000	0.000	0.000	0.0000	0.000	0.000
154	Seepage Pit - 2030	0.002	0.066	0.033	0.0005	0.016	0.005
261	Sewer Connection - 2031	0.001	0.060	0.030	0.0004	0.015	0.005

Demo, Temporary Bridge, Lagoon Excavation, and DBH Facilities
Air Quality Construction Analysis

Regional Maximums Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
						lb/day				
Demo + Parking Provisions - 2027	2.24	31.92	26.33	0.154	5.47	0.91	6.38	1.31	0.84	2.15
Unsuitable Material Replacement - 2027	2.73	58.07	36.23	0.365	13.24	1.17	14.41	4.12	1.09	5.21
Relocate Utilities - 2027	0.31	2.25	4.82	0.011	0.58	0.06	0.64	0.15	0.05	0.20
Construct Temp Bridge - Grading - 2027	2.01	17.37	19.38	0.057	3.82	0.66	4.48	1.61	0.60	2.21
Construct Temp Bridge - BC - 2027	0.90	7.64	9.09	0.024	0.65	0.34	1.00	0.16	0.32	0.48
Construct Temp Bridge - Paving - 2027	1.60	12.90	15.31	0.027	0.52	0.60	1.11	0.13	0.55	0.68
Demo Temp Bridge - 2030	0.35	2.61	5.41	0.010	0.63	0.06	0.68	0.15	0.05	0.20
Construct DBH Facilities - 2030	0.79	5.97	8.44	0.020	0.52	0.27	0.78	0.13	0.25	0.37
Lagoon Grading - 2030	2.57	76.93	44.95	0.549	17.71	1.08	18.80	4.68	1.03	5.71
Restore Beach Area - 2030	0.46	2.90	7.05	0.012	0.72	0.13	0.85	0.15	0.12	0.27

Overlapping Phases

	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Demo + Parking Provisions - 2027 + Unsuitable Material Replacement - 2027	4.96	89.99	62.56	0.520	18.71	2.07	20.79	5.43	1.94	7.36
Demo + Parking Provisions - 2027 + Unsuitable Material Replacement - 2027 + Relocate Utilities - 2027	5.27	92.23	67.38	0.530	19.30	2.13	21.43	5.57	1.99	7.56
Relocate Utilities - 2027 + Construct Temp Bridge - Grading - 2027	2.32	19.61	24.20	0.068	4.41	0.71	5.12	1.76	0.66	2.41
Project Daily Maximum Emissions	**5.27**	**92.23**	**67.38**	**0.549**	**19.30**	**2.13**	**21.43**	**5.57**	**1.99**	**7.56**

Localized Maximum Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
						lb/day				
Demo + Parking Provisions - 2027	1.88	16.26	18.51	0.029	1.25	0.70	1.95	0.19	0.65	0.84
Unsuitable Material Replacement - 2027	1.84	14.68	16.42	0.034	2.78	0.62	3.40	1.34	0.57	1.91
Relocate Utilities - 2027	0.19	1.80	2.93	0.004	0.00	0.05	0.05	0.00	0.05	0.05
Construct Temp Bridge - Grading - 2027	1.84	14.68	16.42	0.034	2.76	0.62	3.39	1.34	0.57	1.91
Construct Temp Bridge - BC - 2027	0.78	6.87	7.04	0.015	0.00	0.33	0.33	0.00	0.31	0.31
Construct Temp Bridge - Paving - 2027	1.48	12.78	13.58	0.022	0.00	0.59	0.59	0.00	0.55	0.55
Demo Temp Bridge - 2030	0.25	2.51	3.94	0.005	0.11	0.05	0.16	0.02	0.05	0.07
Construct DBH Facilities - 2030	0.69	5.87	6.97	0.015	0.00	0.27	0.27	0.00	0.24	0.24
Lagoon Grading - 2030	0.78	4.64	7.57	0.019	0.23	0.19	0.43	0.03	0.18	0.20
Restore Beach Area - 2030	0.36	2.81	5.58	0.008	0.21	0.13	0.33	0.02	0.12	0.14

Overlapping Phases

Demo + Parking Provisions - 2027 + Unsuitable Material Replacement - 2027	4.34	35.49	44.68	0.085	0.55	1.57	2.12	0.07	1.44	1.51
Demo + Parking Provisions - 2027 + Unsuitable Material Replacement - 2027 + Relocate Utilities - 2027	3.56	28.61	37.64	0.070	0.55	1.23	1.78	0.07	1.13	1.20
Relocate Utilities - 2027 + Construct Temp Bridge - Grading - 2027	2.08	15.83	24.06	0.047	0.55	0.64	1.19	0.07	0.59	0.65
Project Daily Maximum Emissions	**4.34**	**35.49**	**44.68**	**0.085**	**2.78**	**1.57**	**3.40**	**1.34**	**1.44**	**1.91**

Demo, Temporary Bridge, Lagoon Excavation, and DBH Facilities

Air Quality Construction Analysis

Summer	Onsite Emissions										Offsite Emissions									
Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
	lb/day										lb/day									
Demo + Parking Provisions - 2027	0.00	0.00	0.00	0.0000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Unsuitable Material Replacement - 2027	0.00	0.00	0.00	0.0000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Relocate Utilities - 2027	0.19	1.80	2.93	0.0040	0.00	0.05	0.05	0.00	0.05	0.05	0.12	0.44	1.89	0.007	0.58	0.01	0.59	0.15	0.01	0.15
Construct Temp Bridge - Grading - 2027	1.84	14.68	16.42	0.0343	2.76	0.62	3.39	1.34	0.57	1.91	0.17	2.69	2.96	0.023	1.06	0.03	1.09	0.27	0.03	0.30
Construct Temp Bridge - BC - 2027	0.78	6.87	7.04	0.0152	0.00	0.33	0.33	0.00	0.31	0.31	0.13	0.76	2.04	0.009	0.65	0.01	0.66	0.16	0.01	0.17
Construct Temp Bridge - Paving - 2027	0.00	0.00	0.00	0.0000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Demo Temp Bridge - 2030	0.00	0.00	0.00	0.0000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Construct DBH Facilities - 2030	0.00	0.00	0.00	0.0000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Lagoon Grading - 2030	0.78	4.64	7.57	0.0189	0.23	0.19	0.43	0.03	0.18	0.20	1.80	72.28	37.37	0.531	17.48	0.89	18.37	4.66	0.85	5.51
Restore Beach Area - 2030	0.00	0.00	0.00	0.0000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00

Note: Offsite emissions pasted over from EMFAC2021 analysis

Regional Emissions	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Demo + Parking Provisions - 2027	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Unsuitable Material Replacement - 2027	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Relocate Utilities - 2027	0.31	2.25	4.82	0.011	0.58	0.06	0.64	0.15	0.05	0.20
Construct Temp Bridge - Grading - 2027	2.01	17.37	19.38	0.057	3.82	0.66	4.48	1.61	0.60	2.21
Construct Temp Bridge - BC - 2027	0.90	7.64	9.09	0.024	0.65	0.34	1.00	0.16	0.32	0.48
Construct Temp Bridge - Paving - 2027	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Demo Temp Bridge - 2030	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Construct DBH Facilities - 2030	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Lagoon Grading - 2030	2.57	76.93	44.95	0.549	17.71	1.08	18.80	4.68	1.03	5.71
Restore Beach Area - 2030	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00

Overlapping Phases	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Demo + Parking Provisions - 2027 + Unsuitable Material Replacement - 2027	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Demo + Parking Provisions - 2027 + Unsuitable Material Replacement - 2027 + Relocate Utilities - 2027	0.31	2.25	4.82	0.011	0.58	0.06	0.64	0.15	0.05	0.20
Relocate Utilities - 2027 + Construct Temp Bridge - Grading - 2027	2.32	19.61	24.20	0.068	4.41	0.71	5.12	1.76	0.66	2.41
Project Daily Maximum Emissions	**2.57**	**76.93**	**44.95**	**0.549**	**17.71**	**1.08**	**18.80**	**4.68**	**1.03**	**5.71**

Demo, Temporary Bridge, Lagoon Excavation, and DBH Facilities

Air Quality Construction Analysis

Winter	Onsite Emissions										Offsite Emissions									
Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
	lb/day										lb/day									
Demo + Parking Provisions - 2027	1.88	16.26	18.51	0.029	1.25	0.70	1.95	0.19	0.65	0.84	0.36	15.66	7.81	0.125	4.22	0.20	4.43	1.12	0.20	1.31
Unsuitable Material Replacement - 2027	1.84	14.68	16.42	0.034	2.78	0.62	3.40	1.34	0.57	1.91	0.89	43.38	19.81	0.331	10.46	0.54	11.00	2.78	0.52	3.30
Relocate Utilities - 2027	0.19	1.80	2.93	0.004	0.00	0.05	0.05	0.00	0.05	0.05	0.12	0.44	1.89	0.007	0.58	0.01	0.59	0.15	0.01	0.15
Construct Temp Bridge - Grading - 2027	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Construct Temp Bridge - BC - 2027	0.78	6.87	7.04	0.015	0.00	0.33	0.33	0.00	0.31	0.31	0.13	0.76	2.04	0.009	0.65	0.01	0.66	0.16	0.01	0.17
Construct Temp Bridge - Paving - 2027	1.48	12.78	13.58	0.022	0.00	0.59	0.59	0.00	0.55	0.55	0.12	0.12	1.74	0.005	0.52	0.00	0.52	0.13	0.00	0.13
Demo Temp Bridge - 2030	0.25	2.51	3.94	0.005	0.11	0.05	0.16	0.02	0.05	0.07	0.10	0.10	1.47	0.004	0.52	0.00	0.52	0.13	0.00	0.13
Construct DBH Facilities - 2030	0.69	5.87	6.97	0.015	0.00	0.27	0.27	0.00	0.24	0.24	0.10	0.10	1.47	0.004	0.52	0.00	0.52	0.13	0.00	0.13
Lagoon Grading - 2030	0.78	4.64	7.57	0.019	0.23	0.19	0.43	0.03	0.18	0.20	1.80	72.28	37.37	0.531	17.48	0.89	18.37	4.66	0.85	5.51
Restore Beach Area - 2030	0.36	2.81	5.58	0.008	0.21	0.13	0.33	0.02	0.12	0.14	0.10	0.10	1.47	0.004	0.52	0.00	0.52	0.13	0.00	0.13

Regional Emissions	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Demo + Parking Provisions - 2027	2.24	31.92	26.33	0.154	5.47	0.91	6.38	1.31	0.84	2.15
Unsuitable Material Replacement - 2027	2.73	58.07	36.23	0.365	13.24	1.17	14.41	4.12	1.09	5.21
Relocate Utilities - 2027	0.31	2.25	4.82	0.011	0.58	0.06	0.64	0.15	0.05	0.20
Construct Temp Bridge - Grading - 2027	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Construct Temp Bridge - BC - 2027	0.90	7.64	9.09	0.024	0.65	0.34	1.00	0.16	0.32	0.48
Construct Temp Bridge - Paving - 2027	1.60	12.90	15.31	0.027	0.52	0.60	1.11	0.13	0.55	0.68
Demo Temp Bridge - 2030	0.35	2.61	5.41	0.010	0.63	0.06	0.68	0.15	0.05	0.20
Construct DBH Facilities - 2030	0.79	5.97	8.44	0.020	0.52	0.27	0.78	0.13	0.25	0.37
Lagoon Grading - 2030	2.57	76.93	44.95	0.549	17.71	1.08	18.80	4.68	1.03	5.71
Restore Beach Area - 2030	0.46	2.90	7.05	0.012	0.72	0.13	0.85	0.15	0.12	0.27

Note: Offsite emissions pasted over from EMFAC2021 analysis

Overlapping Phases	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Demo + Parking Provisions - 2027 + Unsuitable Material Replacement - 2027	4.96	89.99	62.56	0.520	18.71	2.07	20.79	5.43	1.94	7.36
Demo + Parking Provisions - 2027 + Unsuitable Material Replacement - 2027 + Relocate Utilities - 2027	5.27	92.23	67.38	0.530	19.30	2.13	21.43	5.57	1.99	7.56
Relocate Utilities - 2027 + Construct Temp Bridge - Grading - 2027	0.31	2.25	4.82	0.011	0.58	0.06	0.64	0.15	0.05	0.20
Project Daily Maximum Emissions	**5.27**	**92.23**	**67.38**	**0.549**	**19.30**	**2.13**	**21.43**	**5.57**	**1.99**	**7.56**

NB-SB Bridge Construction
Air Quality Construction Analysis

Regional Maximums	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Source						lb/day				
NB Road/Bridge - Demo - 2028	0.41	3.92	6.19	0.019	0.94	0.08	1.03	0.22	0.08	0.30
NB Road/Bridge - Grading - 2028	2.39	33.10	27.80	0.169	7.23	0.81	8.04	2.52	0.75	3.27
NB Road/Bridge - BC - 2028	0.87	7.44	9.12	0.026	0.72	0.31	1.03	0.18	0.29	0.47
NB Road/Bridge - Paving - 2028	1.70	12.47	15.24	0.027	0.52	0.57	1.08	0.13	0.52	0.65
SB Road/Bridge - Demo - 2029	0.40	3.83	6.09	0.018	0.95	0.08	1.02	0.22	0.07	0.30
SB Road/Bridge - Grading - 2029	2.32	30.95	27.10	0.161	7.10	0.76	7.86	2.48	0.71	3.19
SB Road/Bridge - BC - 2029	0.84	7.06	8.98	0.026	0.72	0.29	1.01	0.18	0.27	0.45
SB Road/Bridge - Paving - 2029	1.65	11.71	15.06	0.027	0.52	0.53	1.05	0.13	0.49	0.62
Project Daily Maximum Emissions	**2.39**	**33.10**	**27.80**	**0.169**	**7.23**	**0.81**	**8.04**	**2.52**	**0.75**	**3.27**

Localized Maximum	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Source						lb/day				
NB Road/Bridge - Demo - 2028	0.27	2.57	3.95	0.005	0.16	0.07	0.22	0.02	0.06	0.08
NB Road/Bridge - Grading - 2028	1.81	14.11	16.44	0.034	2.77	0.60	3.37	1.34	0.55	1.88
NB Road/Bridge - BC - 2028	0.74	6.40	7.03	0.015	0.00	0.30	0.30	0.00	0.28	0.28
NB Road/Bridge - Paving - 2028	1.59	12.36	13.60	0.022	0.00	0.56	0.56	0.00	0.52	0.52
SB Road/Bridge - Demo - 2029	0.27	2.53	3.96	0.005	0.16	0.06	0.22	0.02	0.05	0.08
SB Road/Bridge - Grading - 2029	1.76	13.23	16.32	0.034	2.77	0.56	3.33	1.34	0.51	1.85
SB Road/Bridge - BC - 2029	0.71	6.06	6.99	0.015	0.00	0.28	0.28	0.00	0.26	0.26
SB Road/Bridge - Paving - 2029	1.55	11.61	13.51	0.022	0.00	0.53	0.53	0.00	0.49	0.49
Project Daily Maximum Emissions	**1.81**	**14.11**	**16.44**	**0.034**	**2.77**	**0.60**	**3.37**	**1.34**	**0.55**	**1.88**

NB-SB Bridge Construction

Air Quality Construction Analysis

Summer	Onsite Emissions										Offsite Emissions									
Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
	lb/day										lb/day									
NB Road/Bridge - Demo - 2028	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
NB Road/Bridge - Grading - 2028	1.81	14.11	16.44	0.034	2.77	0.60	3.37	1.34	0.55	1.88	0.58	18.99	11.36	0.134	4.46	0.22	4.67	1.18	0.21	1.39
NB Road/Bridge - BC - 2028	0.74	6.40	7.03	0.015	0.00	0.30	0.30	0.00	0.28	0.28	0.13	1.04	2.09	0.011	0.72	0.01	0.73	0.18	0.01	0.20
NB Road/Bridge - Paving - 2028	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
SB Road/Bridge - Demo - 2029	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
SB Road/Bridge - Grading - 2029	1.76	13.23	16.32	0.034	2.77	0.56	3.33	1.34	0.51	1.85	0.55	17.72	10.79	0.127	4.32	0.21	4.53	1.14	0.20	1.34
SB Road/Bridge - BC - 2029	0.71	6.06	6.99	0.015	0.00	0.28	0.28	0.00	0.26	0.26	0.12	1.00	1.99	0.011	0.72	0.01	0.73	0.18	0.01	0.20
SB Road/Bridge - Paving - 2029	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00

Regional Emissions	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
NB Road/Bridge - Demo - 2028	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
NB Road/Bridge - Grading - 2028	2.39	33.10	27.80	0.169	7.23	0.81	8.04	2.52	0.75	3.27
NB Road/Bridge - BC - 2028	0.87	7.44	9.12	0.026	0.72	0.31	1.03	0.18	0.29	0.47
NB Road/Bridge - Paving - 2028	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
SB Road/Bridge - Demo - 2029	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
SB Road/Bridge - Grading - 2029	2.32	30.95	27.10	0.161	7.10	0.76	7.86	2.48	0.71	3.19
SB Road/Bridge - BC - 2029	0.84	7.06	8.98	0.026	0.72	0.29	1.01	0.18	0.27	0.45
SB Road/Bridge - Paving - 2029	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Project Daily Maximum Emissions	**2.39**	**33.10**	**27.80**	**0.169**	**7.23**	**0.81**	**8.04**	**2.52**	**0.75**	**3.27**

Note: Offsite emissions pasted over from EMFAC2021 analysis

Visitor Services Bridge Construction
Air Quality Construction Analysis

Regional Maximums Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
					lb/day					
Site Preparation - 2027	0.44	3.47	5.99	0.009	0.34	0.17	0.50	0.05	0.15	0.21
Grading - 2027	1.35	11.49	13.13	0.023	2.97	0.52	3.49	1.39	0.48	1.86
Building Construction - 2027	0.75	6.90	9.82	0.021	0.23	0.25	0.48	0.06	0.23	0.29
Paving - 2027	0.94	5.09	7.82	0.014	0.47	0.20	0.67	0.12	0.19	0.30
Architectural Coating - 2027	8.61	1.11	1.59	0.003	0.03	0.03	0.05	0.01	0.02	0.03

Overlapping Phases

	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Building Construction - 2027 + Paving - 2027 + Architectural Coating - 2027	10.29	13.11	19.22	0.038	0.72	0.48	1.20	0.18	0.44	0.62
Project Daily Maximum Emissions	**10.29**	**13.11**	**19.22**	**0.038**	**2.97**	**0.52**	**3.49**	**1.39**	**0.48**	**1.86**

Localized Maximum Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
					lb/day					
Site Preparation - 2027	0.41	3.44	5.56	0.008	0.21	0.17	0.37	0.02	0.15	0.17
Grading - 2027	1.30	11.44	12.43	0.021	2.76	0.52	3.28	1.34	0.48	1.81
Building Construction - 2027	0.69	6.51	8.94	0.017	0.00	0.25	0.25	0.00	0.23	0.23
Paving - 2027	0.83	4.98	6.25	0.010	0.00	0.20	0.20	0.00	0.19	0.19
Architectural Coating - 2027	8.61	1.11	1.50	0.002	0.00	0.03	0.03	0.00	0.02	0.02

Overlapping Phases

Building Construction - 2027 + Paving - 2027 + Architectural Coating - 2027	10.13	12.60	16.70	0.030	0.00	0.47	0.47	0.00	0.44	0.44
Project Daily Maximum Emissions	**10.13**	**12.60**	**16.70**	**0.030**	**2.76**	**0.52**	**3.28**	**1.34**	**0.48**	**1.81**

Visitor Services Bridge Construction

Air Quality Construction Analysis

Summer	Onsite Emissions										Offsite Emissions									
Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
	lb/day										lb/day									
Site Preparation - 2027	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Grading - 2027	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Building Construction - 2027	0.69	6.51	8.94	0.017	0.00	0.25	0.25	0.00	0.23	0.23	0.05	0.40	0.87	0.004	0.23	0.00	0.24	0.06	0.00	0.06
Paving - 2027	0.83	4.98	6.25	0.010	0.00	0.20	0.20	0.00	0.19	0.19	0.10	0.11	1.56	0.004	0.47	0.00	0.47	0.12	0.00	0.12
Architectural Coating - 2027	8.61	1.11	1.50	0.002	0.00	0.03	0.03	0.00	0.02	0.02	0.01	0.01	0.09	0.000	0.03	0.00	0.03	0.01	0.00	0.01

Note: Offsite emissions pasted over from EMFAC2021 analysis

Regional Emissions	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Site Preparation - 2027	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Grading - 2027	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Building Construction - 2027	0.75	6.90	9.82	0.021	0.23	0.25	0.48	0.06	0.23	0.29
Paving - 2027	0.94	5.09	7.82	0.014	0.47	0.20	0.67	0.12	0.19	0.30
Architectural Coating - 2027	8.61	1.11	1.59	0.003	0.03	0.03	0.05	0.01	0.02	0.03

Overlapping Phases										
	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Building Construction - 2027 + Paving - 2027 + Architectural Coating - 2027	10.29	13.11	19.22	0.038	0.72	0.48	1.20	0.18	0.44	0.62
Project Daily Maximum Emissions	**10.29**	**13.11**	**19.22**	**0.038**	**0.72**	**0.48**	**1.20**	**0.18**	**0.44**	**0.62**

Visitor Services Bridge Construction

Air Quality Construction Analysis

Winter	Onsite Emissions										Offsite Emissions									
Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
	lb/day										lb/day									
Site Preparation - 2027	0.41	3.44	5.56	0.0079	0.21	0.17	0.37	0.02	0.15	0.17	0.03	0.03	0.43	0.001	0.13	0.00	0.13	0.03	0.00	0.03
Grading - 2027	1.30	11.44	12.43	0.0207	2.76	0.52	3.28	1.34	0.48	1.81	0.05	0.05	0.70	0.002	0.21	0.00	0.21	0.05	0.00	0.05
Building Construction - 2027	0.69	6.51	8.94	0.0173	0.00	0.25	0.25	0.00	0.23	0.23	0.05	0.40	0.87	0.004	0.23	0.00	0.24	0.06	0.00	0.06
Paving - 2027	0.00	0.00	0.00	0.0000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Architectural Coating - 2027	0.00	0.00	0.00	0.0000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00

Note: Offsite emissions pasted over from EMFAC2021 analysis

Regional Emissions	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Site Preparation - 2027	0.44	3.47	5.99	0.009	0.34	0.17	0.50	0.05	0.15	0.21
Grading - 2027	1.35	11.49	13.13	0.023	2.97	0.52	3.49	1.39	0.48	1.86
Building Construction - 2027	0.75	6.90	9.82	0.021	0.23	0.25	0.48	0.06	0.23	0.29
Paving - 2027	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Architectural Coating - 2027	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00

Overlapping Phases										
	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Building Construction - 2027 + Paving - 2027 + Architectural Coating - 2027	0.75	6.90	9.82	0.021	0.23	0.25	0.48	0.06	0.23	0.29
Project Daily Maximum Emissions	**1.35**	**11.49**	**13.13**	**0.023**	**2.97**	**0.52**	**3.49**	**1.39**	**0.48**	**1.86**

Topanga Lagoon - Total Emissions Summary - Mitigated
Air Quality Construction Analysis

Regional Maximums Source	ROG	NOX	CO	SO2 lb/day	Total PM10	Total PM2.5
Demo + Parking Provisions - 2027	1.22	22.42	26.50	0.154	5.93	1.74
Demo + Parking Provisions - 2027 SJVAB	0.29	20.70	7.59	0.165	5.38	1.63
Unsuitable Material Replacement - 2027	1.39	46.79	39.98	0.365	13.89	4.75
Unsuitable Material Replacement - 2027 SJVAB	0.69	49.36	18.10	0.394	12.82	3.88
Relocate Utilities - 2027	0.31	2.25	4.82	0.011	0.64	0.20
Construct Temp Bridge - Grading - 2027	0.67	6.09	23.13	0.057	3.97	1.75
Construct Temp Bridge - BC - 2027	0.63	4.85	10.91	0.024	0.88	0.38
Construct Temp Bridge - Paving - 2027	0.58	3.41	15.48	0.027	0.66	0.27
Visitor Services - Site Preparation - 2027	0.18	1.30	6.31	0.009	0.38	0.09
Visitor Services - Grading - 2027	0.33	1.99	13.30	0.023	3.04	1.45
Visitor Services - Building Construction - 2027	0.47	4.11	11.64	0.021	0.37	0.18
Visitor Services - Paving - 2027	0.94	5.09	7.82	0.014	0.67	0.30
Visitor Services - Architectural Coating - 2027	8.61	1.11	1.59	0.003	0.05	0.03
NB Road/Bridge - Demo - 2028	0.41	3.92	6.19	0.019	1.03	0.30
NB Road/Bridge - Grading - 2028	1.07	22.36	31.54	0.169	7.56	2.83
NB Road/Bridge - BC - 2028	0.61	4.92	10.94	0.026	0.93	0.38
NB Road/Bridge - Paving - 2028	0.69	3.32	15.38	0.027	0.65	0.26
SB Road/Bridge - Demo - 2029	0.40	3.83	6.09	0.018	1.02	0.30
SB Road/Bridge - Grading - 2029	1.04	21.06	30.97	0.161	7.41	2.78
SB Road/Bridge - BC - 2029	0.59	4.76	10.84	0.026	0.91	0.36
SB Road/Bridge - Paving - 2029	0.68	3.24	15.29	0.027	0.65	0.25
Demo Temp Bridge - 2030	0.35	2.61	5.41	0.010	0.68	0.20
Construct DBH Facilities - 2030	0.55	3.77	10.31	0.020	0.69	0.29
Lagoon Grading - 2030	2.06	74.01	48.90	0.549	18.66	5.59
Restore Beach Area - 2030	0.24	1.29	7.35	0.012	0.76	0.18
Seepage Pit - 2030	0.33	2.64	7.30	0.018	0.99	0.26
Sewer Connection - 2031	0.58	4.24	21.98	0.045	3.59	1.62
Overlapping Phases						
	ROG	**NOX**	**CO**	**SO2**	**Total PM10**	**Total PM2.5**
Demo + Parking Provisions - 2027 + Unsuitable Material Replacement - 2027 + 'Visitor Services - Site Preparation - 2027	2.78	70.52	72.79	0.529	20.20	6.58
Demo + Parking Provisions - 2027 + Unsuitable Material Replacement - 2027 + 'Visitor Services - Grading - 2027	2.93	71.21	79.78	0.542	22.86	7.94
Demo + Parking Provisions - 2027 + Unsuitable Material Replacement - 2027 + 'Visitor Services - Building Construction - 2027	3.08	73.33	78.12	0.541	20.19	6.67
Demo + Parking Provisions - 2027 + Unsuitable Material Replacement - 2027 + 'Relocate Utilities - 2027 + Visitor Services - Building Construction - 2027	3.39	75.58	82.94	0.551	20.83	6.87
Relocate Utilities - 2027 + Visitor Services - Building Construction - 2027 + 'Visitor Services - Paving - 2027 + Visitor Services - Architectural Coating - 2027	10.33	12.57	25.86	0.049	1.73	0.72
Relocate Utilities - 2027 + Construct Temp Bridge - Grading - 2027	0.98	8.34	27.95	0.068	4.61	1.95
Relocate Utilities - 2027 + Construct Temp Bridge - BC - 2027	0.94	7.09	15.73	0.035	1.52	0.58
Seepage Pit - Overlap	10.66	78.22	90.24	0.570	23.85	8.20
Project Daily Maximum Emissions	**10.66**	**78.22**	**90.24**	**0.570**	**23.85**	**8.20**
SCAQMD Regional Significance Thresholds	**75.00**	**100.00**	**550.00**	**150.00**	**150.00**	**55.00**
Exceeds Thresholds?	**No**	**No**	**No**	**No**	**No**	**No**
Localized Maximum Source	**ROG**	**NOX**	**CO**	**SO2 lb/day**	**Total PM10**	**Total PM2.5**
Demo + Parking Provisions - 2027	0.86	6.76	18.68	0.029	1.50	0.42
Unsuitable Material Replacement - 2027	0.50	3.41	20.17	0.034	2.89	1.45
Relocate Utilities - 2027	0.19	1.80	2.93	0.004	0.05	0.05
Construct Temp Bridge - Grading - 2027	0.50	3.41	20.17	0.034	2.88	1.44
Construct Temp Bridge - BC - 2027	0.50	4.08	8.87	0.015	0.22	0.20
Construct Temp Bridge - Paving - 2027	0.46	3.28	13.74	0.022	0.14	0.13
Visitor Services - Site Preparation - 2027	0.15	1.27	5.87	0.008	0.25	0.06
Visitor Services - Grading - 2027	0.28	1.94	12.60	0.021	2.83	1.40
Visitor Services - Building Construction - 2027	0.42	3.71	10.77	0.017	0.13	0.12
Visitor Services - Paving - 2027	0.83	4.98	6.25	0.010	0.20	0.19
Visitor Services - Architectural Coating - 2027	8.61	1.11	1.50	0.002	0.03	0.02
NB Road/Bridge - Demo - 2028	0.27	2.57	3.95	0.005	0.22	0.08
NB Road/Bridge - Grading - 2028	0.49	3.37	20.18	0.034	2.88	1.44
NB Road/Bridge - BC - 2028	0.48	3.88	8.85	0.015	0.19	0.18
NB Road/Bridge - Paving - 2028	0.59	3.20	13.74	0.022	0.13	0.12
SB Road/Bridge - Demo - 2029	0.27	2.53	3.96	0.005	0.22	0.08
SB Road/Bridge - Grading - 2029	0.49	3.34	20.18	0.034	2.88	1.44
SB Road/Bridge - BC - 2029	0.47	3.76	8.85	0.015	0.18	0.17
SB Road/Bridge - Paving - 2029	0.58	3.14	13.74	0.022	0.13	0.12
Demo Temp Bridge - 2030	0.25	2.51	3.94	0.005	0.16	0.07
Construct DBH Facilities - 2030	0.45	3.68	8.84	0.015	0.17	0.16
Lagoon Grading - 2030	0.26	1.73	11.52	0.019	0.29	0.08
Restore Beach Area - 2030	0.14	1.20	5.88	0.008	0.24	0.05
Seepage Pit - 2030	0.21	1.68	5.40	0.008	0.26	0.07
Sewer Connection - 2031	0.48	3.59	20.17	0.034	2.86	1.43
Overlapping Phases						
Demo + Parking Provisions - 2027 + Unsuitable Material Replacement - 2027 + 'Visitor Services - Site Preparation - 2027	1.50	11.44	44.73	0.071	4.64	1.93
Demo + Parking Provisions - 2027 + Unsuitable Material Replacement - 2027 + 'Visitor Services - Grading - 2027	1.63	12.11	51.46	0.084	7.22	3.27
Demo + Parking Provisions - 2027 + Unsuitable Material Replacement - 2027 + 'Visitor Services - Building Construction - 2027	1.77	13.89	49.62	0.080	4.53	1.99
Demo + Parking Provisions - 2027 + Unsuitable Material Replacement - 2027 + 'Relocate Utilities - 2027 + Visitor Services - Building Construction - 2027	1.96	15.69	52.55	0.084	4.58	2.04
Relocate Utilities - 2027 + Visitor Services - Building Construction - 2027 + 'Visitor Services - Paving - 2027 + Visitor Services - Architectural Coating - 2027	10.05	11.61	21.45	0.034	0.41	0.38
Relocate Utilities - 2027 + Construct Temp Bridge - Grading - 2027	0.69	5.21	23.10	0.038	2.93	1.49
Relocate Utilities - 2027 + Construct Temp Bridge - BC - 2027	0.69	5.88	11.80	0.019	0.27	0.25
Seepage Pit - Overlap	10.26	17.37	57.95	0.092	7.48	3.34
Project Daily Maximum Emissions	**10.26**	**17.37**	**57.95**	**0.092**	**7.48**	**3.34**
SCAQMD Localized Significance Thresholds		**221.0**	**1531.0**		**13.0**	**6.0**
Exceeds Thresholds?		**No**	**No**		**No**	**No**

Demo, Temporary Bridge, Lagoon Excavation, and DBH Facilities

Air Quality Construction Analysis

Mitigated Emissions

Regional Maximums Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
						lb/day				
Demo + Parking Provisions - 2027	1.22	22.42	26.50	0.154	5.47	0.46	5.93	1.31	0.43	1.74
Unsuitable Material Replacement - 2027	1.39	46.79	39.98	0.365	13.24	0.66	13.89	4.12	0.63	4.75
Relocate Utilities - 2027	0.31	2.25	4.82	0.011	0.58	0.06	0.64	0.15	0.05	0.20
Construct Temp Bridge - Grading - 2027	0.67	6.09	23.13	0.057	3.82	0.15	3.97	1.61	0.14	1.75
Construct Temp Bridge - BC - 2027	0.63	4.85	10.91	0.024	0.65	0.23	0.88	0.16	0.21	0.38
Construct Temp Bridge - Paving - 2027	0.58	3.41	15.48	0.027	0.52	0.15	0.66	0.13	0.14	0.27
Demo Temp Bridge - 2030	0.35	2.61	5.41	0.010	0.63	0.06	0.68	0.15	0.05	0.20
Construct DBH Facilities - 2030	0.55	3.77	10.31	0.020	0.52	0.17	0.69	0.13	0.16	0.29
Lagoon Grading - 2030	2.06	74.01	48.90	0.549	17.71	0.94	18.66	4.68	0.90	5.59
Restore Beach Area - 2030	0.24	1.29	7.35	0.012	0.72	0.03	0.76	0.15	0.03	0.18

Overlapping Phases

	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Demo + Parking Provisions - 2027 + Unsuitable Material Replacement - 2027	2.60	69.22	66.48	0.520	18.71	1.11	19.82	5.43	1.06	6.49
Demo + Parking Provisions - 2027 + Unsuitable Material Replacement - 2027 + Relocate Utilities - 2027	2.91	71.46	71.30	0.530	19.30	1.17	20.47	5.57	1.11	6.68
Relocate Utilities - 2027 + Construct Temp Bridge - Grading - 2027	0.98	8.34	27.95	0.068	4.41	0.20	4.61	1.76	0.19	1.95
Project Daily Maximum Emissions	**2.91**	**74.01**	**71.30**	**0.549**	**19.30**	**1.17**	**20.47**	**5.57**	**1.11**	**6.68**

Localized Maximum Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
						lb/day				
Demo + Parking Provisions - 2027	0.86	6.76	18.68	0.029	1.25	0.25	1.50	0.19	0.23	0.42
Unsuitable Material Replacement - 2027	0.50	3.41	20.17	0.034	2.78	0.11	2.89	1.34	0.11	1.45
Relocate Utilities - 2027	0.19	1.80	2.93	0.004	0.00	0.05	0.05	0.00	0.05	0.05
Construct Temp Bridge - Grading - 2027	0.50	3.41	20.17	0.034	2.76	0.11	2.88	1.34	0.11	1.44
Construct Temp Bridge - BC - 2027	0.50	4.08	8.87	0.015	0.00	0.22	0.22	0.00	0.20	0.20
Construct Temp Bridge - Paving - 2027	0.46	3.28	13.74	0.022	0.00	0.14	0.14	0.00	0.13	0.13
Demo Temp Bridge - 2030	0.25	2.51	3.94	0.005	0.11	0.05	0.16	0.02	0.05	0.07
Construct DBH Facilities - 2030	0.45	3.68	8.84	0.015	0.00	0.17	0.17	0.00	0.16	0.16
Lagoon Grading - 2030	0.26	1.73	11.52	0.019	0.23	0.05	0.29	0.03	0.05	0.08
Restore Beach Area - 2030	0.14	1.20	5.88	0.008	0.21	0.03	0.24	0.02	0.03	0.05

Overlapping Phases

Demo + Parking Provisions - 2027 + Unsuitable Material Replacement - 2027	2.07	16.48	52.80	0.085	0.55	0.67	1.22	0.07	0.63	0.69
Demo + Parking Provisions - 2027 + Unsuitable Material Replacement - 2027 + Relocate Utilities - 2027	1.57	12.39	43.93	0.070	0.55	0.45	1.00	0.07	0.42	0.49
Relocate Utilities - 2027 + Construct Temp Bridge - Grading - 2027	1.10	9.11	30.18	0.047	0.55	0.31	0.86	0.07	0.29	0.35
Project Daily Maximum Emissions	**2.07**	**16.48**	**52.80**	**0.085**	**2.78**	**0.67**	**2.89**	**1.34**	**0.63**	**1.45**

Demo, Temporary Bridge, Lagoon Excavation, and DBH Facilities

Air Quality Construction Analysis

Mitigated Emissions

Summer	Onsite Emissions										Offsite Emissions									
Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
	lb/day										lb/day									
Demo + Parking Provisions - 2027	0.00	0.00	0.00	0.0000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Unsuitable Material Replacement - 2027	0.00	0.00	0.00	0.0000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Relocate Utilities - 2027	0.19	1.80	2.93	0.0040	0.00	0.05	0.05	0.00	0.05	0.05	0.12	0.44	1.89	0.007	0.58	0.01	0.59	0.15	0.01	0.15
Construct Temp Bridge - Grading - 2027	0.50	3.41	20.17	0.0343	2.76	0.11	2.88	1.34	0.11	1.44	0.17	2.69	2.96	0.023	1.06	0.03	1.09	0.27	0.03	0.30
Construct Temp Bridge - BC - 2027	0.50	4.08	8.87	0.0152	0.00	0.22	0.22	0.00	0.20	0.20	0.13	0.76	2.04	0.009	0.65	0.01	0.66	0.16	0.01	0.17
Construct Temp Bridge - Paving - 2027	0.00	0.00	0.00	0.0000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Demo Temp Bridge - 2030	0.00	0.00	0.00	0.0000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Construct DBH Facilities - 2030	0.00	0.00	0.00	0.0000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Lagoon Grading - 2030	0.26	1.73	11.52	0.0189	0.23	0.05	0.29	0.03	0.05	0.08	1.80	72.28	37.37	0.531	17.48	0.89	18.37	4.66	0.85	5.51
Restore Beach Area - 2030	0.00	0.00	0.00	0.0000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00

Regional Emissions	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Demo + Parking Provisions - 2027	0.00	0.00	0.00	0.0000	0.00	0.00	0.00	0.00	0.00	0.00
Unsuitable Material Replacement - 2027	0.00	0.00	0.00	0.0000	0.00	0.00	0.00	0.00	0.00	0.00
Relocate Utilities - 2027	0.31	2.25	4.82	0.0109	0.58	0.06	0.64	0.15	0.05	0.20
Construct Temp Bridge - Grading - 2027	0.67	6.09	23.13	0.0570	3.82	0.15	3.97	1.61	0.14	1.75
Construct Temp Bridge - BC - 2027	0.63	4.85	10.91	0.0244	0.65	0.23	0.88	0.16	0.21	0.38
Construct Temp Bridge - Paving - 2027	0.00	0.00	0.00	0.0000	0.00	0.00	0.00	0.00	0.00	0.00
Demo Temp Bridge - 2030	0.00	0.00	0.00	0.0000	0.00	0.00	0.00	0.00	0.00	0.00
Construct DBH Facilities - 2030	0.00	0.00	0.00	0.0000	0.00	0.00	0.00	0.00	0.00	0.00
Lagoon Grading - 2030	2.06	74.01	48.90	0.5494	17.71	0.94	18.66	4.68	0.90	5.59
Restore Beach Area - 2030	0.00	0.00	0.00	0.0000	0.00	0.00	0.00	0.00	0.00	0.00

Note: Offsite emissions pasted over from EMFAC2021 analysis

Overlapping Phases

	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Demo + Parking Provisions - 2027 + Unsuitable Material Replacement - 2027	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Demo + Parking Provisions - 2027 + Unsuitable Material Replacement - 2027 + Relocate Utilities - 2027	0.31	2.25	4.82	0.011	0.58	0.06	0.64	0.15	0.05	0.20
Relocate Utilities - 2027 + Construct Temp Bridge - Grading - 2027	0.98	8.34	27.95	0.068	4.41	0.20	4.61	1.76	0.19	1.95
Project Daily Maximum Emissions	**2.06**	**74.01**	**48.90**	**0.549**	**17.71**	**0.94**	**18.66**	**4.68**	**0.90**	**5.59**

Demo, Temporary Bridge, Lagoon Excavation, and DBH Facilities

Air Quality Construction Analysis

Mitigated Emissions

Winter	Onsite Emissions										Offsite Emissions									
Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
	lb/day										lb/day									
Demo + Parking Provisions - 2027	0.86	6.76	18.68	0.029	1.25	0.25	1.50	0.19	0.23	0.42	0.36	15.66	7.81	0.125	4.22	0.20	4.43	1.12	0.20	1.31
Unsuitable Material Replacement - 2027	0.50	3.41	20.17	0.034	2.78	0.11	2.89	1.34	0.11	1.45	0.89	43.38	19.81	0.331	10.46	0.54	11.00	2.78	0.52	3.30
Relocate Utilities - 2027	0.19	1.80	2.93	0.004	0.00	0.05	0.05	0.00	0.05	0.05	0.12	0.44	1.89	0.007	0.58	0.01	0.59	0.15	0.01	0.15
Construct Temp Bridge - Grading - 2027	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Construct Temp Bridge - BC - 2027	0.50	4.08	8.87	0.015	0.00	0.22	0.22	0.00	0.20	0.20	0.13	0.76	2.04	0.009	0.65	0.01	0.66	0.16	0.01	0.17
Construct Temp Bridge - Paving - 2027	0.46	3.28	13.74	0.022	0.00	0.14	0.14	0.00	0.13	0.13	0.12	0.12	1.74	0.005	0.52	0.00	0.52	0.13	0.00	0.13
Demo Temp Bridge - 2030	0.25	2.51	3.94	0.005	0.11	0.05	0.16	0.02	0.05	0.07	0.10	0.10	1.47	0.004	0.52	0.00	0.52	0.13	0.00	0.13
Construct DBH Facilities - 2030	0.45	3.68	8.84	0.015	0.00	0.17	0.17	0.00	0.16	0.16	0.10	0.10	1.47	0.004	0.52	0.00	0.52	0.13	0.00	0.13
Lagoon Grading - 2030	0.26	1.73	11.52	0.019	0.23	0.05	0.29	0.03	0.05	0.08	1.80	72.28	37.37	0.531	17.48	0.89	18.37	4.66	0.85	5.51
Restore Beach Area - 2030	0.14	1.20	5.88	0.008	0.21	0.03	0.24	0.02	0.03	0.05	0.10	0.10	1.47	0.004	0.52	0.00	0.52	0.13	0.00	0.13

Regional Emissions	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Demo + Parking Provisions - 2027	1.22	22.42	26.50	0.154	5.47	0.46	5.93	1.31	0.43	1.74
Unsuitable Material Replacement - 2027	1.39	46.79	39.98	0.365	13.24	0.66	13.89	4.12	0.63	4.75
Relocate Utilities - 2027	0.31	2.25	4.82	0.011	0.58	0.06	0.64	0.15	0.05	0.20
Construct Temp Bridge - Grading - 2027	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Construct Temp Bridge - BC - 2027	0.63	4.85	10.91	0.024	0.65	0.23	0.88	0.16	0.21	0.38
Construct Temp Bridge - Paving - 2027	0.58	3.41	15.48	0.027	0.52	0.15	0.66	0.13	0.14	0.27
Demo Temp Bridge - 2030	0.35	2.61	5.41	0.010	0.63	0.06	0.68	0.15	0.05	0.20
Construct DBH Facilities - 2030	0.55	3.77	10.31	0.020	0.52	0.17	0.69	0.13	0.16	0.29
Lagoon Grading - 2030	2.06	74.01	48.90	0.549	17.71	0.94	18.66	4.68	0.90	5.59
Restore Beach Area - 2030	0.24	1.29	7.35	0.012	0.72	0.03	0.76	0.15	0.03	0.18

Note: Offsite emissions pasted over from EMFAC2021 analysis

Overlapping Phases	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Demo + Parking Provisions - 2027 + Unsuitable Material Replacement - 2027	2.60	69.22	66.48	0.520	18.71	1.11	19.82	5.43	1.06	6.49
Demo + Parking Provisions - 2027 + Unsuitable Material Replacement - 2027 + Relocate Utilities - 2027	2.91	71.46	71.30	0.530	19.30	1.17	20.47	5.57	1.11	6.68
Relocate Utilities - 2027 + Construct Temp Bridge - Grading - 2027	0.31	2.25	4.82	0.011	0.58	0.06	0.64	0.15	0.05	0.20
Project Daily Maximum Emissions	**2.91**	**74.01**	**71.30**	**0.549**	**19.30**	**1.17**	**20.47**	**5.57**	**1.11**	**6.68**

NB-SB Bridge Construction

Air Quality Construction Analysis

Mitigated Emissions

Regional Maximums Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
					lb/day					
NB Road/Bridge - Demo - 2028	0.41	3.92	6.19	0.019	0.94	0.08	1.03	0.22	0.08	0.30
NB Road/Bridge - Grading - 2028	1.07	22.36	31.54	0.169	7.23	0.32	7.56	2.52	0.31	2.83
NB Road/Bridge - BC - 2028	0.61	4.92	10.94	0.026	0.72	0.21	0.93	0.18	0.19	0.38
NB Road/Bridge - Paving - 2028	0.69	3.32	15.38	0.027	0.52	0.13	0.65	0.13	0.13	0.26
SB Road/Bridge - Demo - 2029	0.40	3.83	6.09	0.018	0.95	0.08	1.02	0.22	0.07	0.30
SB Road/Bridge - Grading - 2029	1.04	21.06	30.97	0.161	7.10	0.31	7.41	2.48	0.30	2.78
SB Road/Bridge - BC - 2029	0.59	4.76	10.84	0.026	0.72	0.19	0.91	0.18	0.18	0.36
SB Road/Bridge - Paving - 2029	0.68	3.24	15.29	0.027	0.52	0.13	0.65	0.13	0.12	0.25
Project Daily Maximum Emissions	**1.07**	**22.36**	**31.54**	**0.169**	**7.23**	**0.32**	**7.56**	**2.52**	**0.31**	**2.83**

Localized Maximum Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
					lb/day					
NB Road/Bridge - Demo - 2028	0.27	2.57	3.95	0.005	0.16	0.07	0.22	0.02	0.06	0.08
NB Road/Bridge - Grading - 2028	0.49	3.37	20.18	0.034	2.77	0.11	2.88	1.34	0.10	1.44
NB Road/Bridge - BC - 2028	0.48	3.88	8.85	0.015	0.00	0.19	0.19	0.00	0.18	0.18
NB Road/Bridge - Paving - 2028	0.59	3.20	13.74	0.022	0.00	0.13	0.13	0.00	0.12	0.12
SB Road/Bridge - Demo - 2029	0.27	2.53	3.96	0.005	0.16	0.06	0.22	0.02	0.05	0.08
SB Road/Bridge - Grading - 2029	0.49	3.34	20.18	0.034	2.77	0.10	2.88	1.34	0.10	1.44
SB Road/Bridge - BC - 2029	0.47	3.76	8.85	0.015	0.00	0.18	0.18	0.00	0.17	0.17
SB Road/Bridge - Paving - 2029	0.58	3.14	13.74	0.022	0.00	0.13	0.13	0.00	0.12	0.12
Project Daily Maximum Emissions	**0.59**	**3.88**	**20.18**	**0.034**	**2.77**	**0.19**	**2.88**	**1.34**	**0.18**	**1.44**

NB-SB Bridge Construction

Air Quality Construction Analysis

Mitigated Emissions

Summer	Onsite Emissions										Offsite Emissions									
Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
	lb/day										lb/day									
NB Road/Bridge - Demo - 2028	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
NB Road/Bridge - Grading - 2028	0.49	3.37	20.18	0.034	2.77	0.11	2.88	1.34	0.10	1.44	0.58	18.99	11.36	0.134	4.46	0.22	4.67	1.18	0.21	1.39
NB Road/Bridge - BC - 2028	0.48	3.88	8.85	0.015	0.00	0.19	0.19	0.00	0.18	0.18	0.13	1.04	2.09	0.011	0.72	0.01	0.73	0.18	0.01	0.20
NB Road/Bridge - Paving - 2028	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
SB Road/Bridge - Demo - 2029	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
SB Road/Bridge - Grading - 2029	0.49	3.34	20.18	0.034	2.77	0.10	2.88	1.34	0.10	1.44	0.55	17.72	10.79	0.127	4.32	0.21	4.53	1.14	0.20	1.34
SB Road/Bridge - BC - 2029	0.47	3.76	8.85	0.015	0.00	0.18	0.18	0.00	0.17	0.17	0.12	1.00	1.99	0.011	0.72	0.01	0.73	0.18	0.01	0.20
SB Road/Bridge - Paving - 2029	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00

Regional Emissions	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
NB Road/Bridge - Demo - 2028	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
NB Road/Bridge - Grading - 2028	1.07	22.36	31.54	0.169	7.23	0.32	7.56	2.52	0.31	2.83
NB Road/Bridge - BC - 2028	0.61	4.92	10.94	0.026	0.72	0.21	0.93	0.18	0.19	0.38
NB Road/Bridge - Paving - 2028	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
SB Road/Bridge - Demo - 2029	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
SB Road/Bridge - Grading - 2029	1.04	21.06	30.97	0.161	7.10	0.31	7.41	2.48	0.30	2.78
SB Road/Bridge - BC - 2029	0.59	4.76	10.84	0.026	0.72	0.19	0.91	0.18	0.18	0.36
SB Road/Bridge - Paving - 2029	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Project Daily Maximum Emissions	**1.07**	**22.36**	**31.54**	**0.169**	**7.23**	**0.32**	**7.56**	**2.52**	**0.31**	**2.83**

Note: Offsite emissions pasted over from EMFAC2021 analysis

NB-SB Bridge Construction

Air Quality Construction Analysis

Mitigated Emissions

Winter	Onsite Emissions										Offsite Emissions									
Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
	lb/day										lb/day									
NB Road/Bridge - Demo - 2028	0.27	2.57	3.95	0.005	0.16	0.07	0.22	0.02	0.06	0.08	0.14	1.35	2.24	0.013	0.79	0.02	0.80	0.20	0.02	0.22
NB Road/Bridge - Grading - 2028	0.49	3.37	20.18	0.034	2.77	0.11	2.88	1.34	0.10	1.44	0.58	18.99	11.36	0.134	4.46	0.22	4.67	1.18	0.21	1.39
NB Road/Bridge - BC - 2028	0.48	3.88	8.85	0.015	0.00	0.19	0.19	0.00	0.18	0.18	0.13	1.04	2.09	0.011	0.72	0.01	0.73	0.18	0.01	0.20
NB Road/Bridge - Paving - 2028	0.59	3.20	13.74	0.022	0.00	0.13	0.13	0.00	0.12	0.12	0.11	0.11	1.64	0.005	0.52	0.00	0.52	0.13	0.00	0.13
SB Road/Bridge - Demo - 2029	0.27	2.53	3.96	0.005	0.16	0.06	0.22	0.02	0.05	0.08	0.13	1.30	2.14	0.013	0.79	0.02	0.80	0.20	0.02	0.22
SB Road/Bridge - Grading - 2029	0.49	3.34	20.18	0.034	2.77	0.10	2.88	1.34	0.10	1.44	0.55	17.72	10.79	0.127	4.32	0.21	4.53	1.14	0.20	1.34
SB Road/Bridge - BC - 2029	0.47	3.76	8.85	0.015	0.00	0.18	0.18	0.00	0.17	0.17	0.12	1.00	1.99	0.011	0.72	0.01	0.73	0.18	0.01	0.20
SB Road/Bridge - Paving - 2029	0.58	3.14	13.74	0.022	0.00	0.13	0.13	0.00	0.12	0.12	0.10	0.10	1.55	0.004	0.52	0.00	0.52	0.13	0.00	0.13

Regional Emissions	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
NB Road/Bridge - Demo - 2028	0.41	3.92	6.19	0.019	0.94	0.08	1.03	0.22	0.08	0.30
NB Road/Bridge - Grading - 2028	1.07	22.36	31.54	0.169	7.23	0.32	7.56	2.52	0.31	2.83
NB Road/Bridge - BC - 2028	0.61	4.92	10.94	0.026	0.72	0.21	0.93	0.18	0.19	0.38
NB Road/Bridge - Paving - 2028	0.69	3.32	15.38	0.027	0.52	0.13	0.65	0.13	0.13	0.26
SB Road/Bridge - Demo - 2029	0.40	3.83	6.09	0.018	0.95	0.08	1.02	0.22	0.07	0.30
SB Road/Bridge - Grading - 2029	1.04	21.06	30.97	0.161	7.10	0.31	7.41	2.48	0.30	2.78
SB Road/Bridge - BC - 2029	0.59	4.76	10.84	0.026	0.72	0.19	0.91	0.18	0.18	0.36
SB Road/Bridge - Paving - 2029	0.68	3.24	15.29	0.027	0.52	0.13	0.65	0.13	0.12	0.25
Project Daily Maximum Emissions	**1.07**	**22.36**	**31.54**	**0.169**	**7.23**	**0.32**	**7.56**	**2.52**	**0.31**	**2.83**

Note: Offsite emissions pasted over from EMFAC2021 analysis

Visitor Services Construction

Air Quality Construction Analysis

Mitigated Emissions

Regional Maximums Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
					lb/day					
Site Preparation - 2027	0.18	1.30	6.31	0.009	0.34	0.04	0.38	0.05	0.04	0.09
Grading - 2027	0.33	1.99	13.30	0.023	2.97	0.07	3.04	1.39	0.07	1.45
Building Construction - 2027	0.47	4.11	11.64	0.021	0.23	0.13	0.37	0.06	0.13	0.18
Paving - 2027	0.94	5.09	7.82	0.014	0.47	0.20	0.67	0.12	0.19	0.30
Architectural Coating - 2027	8.61	1.11	1.59	0.003	0.03	0.03	0.05	0.01	0.02	0.03
Overlapping Phases										
	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Building Construction - 2027 + Paving - 2027 + Architectural Coating - 2027	10.02	10.32	21.04	0.038	0.72	0.36	1.09	0.18	0.34	0.52
Project Daily Maximum Emissions	**10.02**	**10.32**	**21.04**	**0.038**	**2.97**	**0.36**	**3.04**	**1.39**	**0.34**	**1.45**

Localized Maximum Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
					lb/day					
Site Preparation - 2027	0.15	1.27	5.87	0.008	0.21	0.04	0.25	0.02	0.04	0.06
Grading - 2027	0.28	1.94	12.60	0.021	2.76	0.07	2.83	1.34	0.06	1.40
Building Construction - 2027	0.42	3.71	10.77	0.017	0.00	0.13	0.13	0.00	0.12	0.12
Paving - 2027	0.83	4.98	6.25	0.010	0.00	0.20	0.20	0.00	0.19	0.19
Architectural Coating - 2027	8.61	1.11	1.50	0.002	0.00	0.03	0.03	0.00	0.02	0.02
Overlapping Phases										
Building Construction - 2027 + Paving - 2027 + Architectural Coating - 2027	9.86	9.81	18.52	0.030	0.00	0.36	0.36	0.00	0.33	0.33
Project Daily Maximum Emissions	**9.86**	**9.81**	**18.52**	**0.030**	**2.76**	**0.36**	**2.83**	**1.34**	**0.33**	**1.40**

Visitor Services Construction

Air Quality Construction Analysis

Mitigated Emissions

Summer	Onsite Emissions										Offsite Emissions									
Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
	lb/day										lb/day									
Site Preparation - 2027	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Grading - 2027	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Building Construction - 2027	0.42	3.71	10.77	0.017	0.00	0.13	0.13	0.00	0.12	0.12	0.05	0.40	0.87	0.004	0.23	0.00	0.24	0.06	0.00	0.06
Paving - 2027	0.83	4.98	6.25	0.010	0.00	0.20	0.20	0.00	0.19	0.19	0.10	0.11	1.56	0.004	0.47	0.00	0.47	0.12	0.00	0.12
Architectural Coating - 2027	8.61	1.11	1.50	0.002	0.00	0.03	0.03	0.00	0.02	0.02	0.01	0.01	0.09	0.000	0.03	0.00	0.03	0.01	0.00	0.01

Note: Offsite emissions pasted over from EMFAC2021 analysis

Regional Emissions	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Site Preparation - 2027	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Grading - 2027	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Building Construction - 2027	0.47	4.11	11.64	0.021	0.23	0.13	0.37	0.06	0.13	0.18
Paving - 2027	0.94	5.09	7.82	0.014	0.47	0.20	0.67	0.12	0.19	0.30
Architectural Coating - 2027	8.61	1.11	1.59	0.003	0.03	0.03	0.05	0.01	0.02	0.03

Overlapping Phases										
	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Building Construction - 2027 + Paving - 2027 + Architectural Coating - 2027	10.02	10.32	21.04	0.038	0.72	0.36	1.09	0.18	0.34	0.52
Project Daily Maximum Emissions	**10.02**	**10.32**	**21.04**	**0.038**	**0.72**	**0.36**	**1.09**	**0.18**	**0.34**	**0.52**

Visitor Services Construction

Air Quality Construction Analysis

Mitigated Emissions

Winter	Onsite Emissions										Offsite Emissions									
Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
	lb/day										lb/day									
Site Preparation - 2027	0.15	1.27	5.87	0.008	0.21	0.04	0.25	0.02	0.04	0.06	0.03	0.03	0.43	0.001	0.13	0.00	0.13	0.03	0.00	0.03
Grading - 2027	0.28	1.94	12.60	0.021	2.76	0.07	2.83	1.34	0.06	1.40	0.05	0.05	0.70	0.002	0.21	0.00	0.21	0.05	0.00	0.05
Building Construction - 2027	0.42	3.71	10.77	0.017	0.00	0.13	0.13	0.00	0.12	0.12	0.05	0.40	0.87	0.004	0.23	0.00	0.24	0.06	0.00	0.06
Paving - 2027	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Architectural Coating - 2027	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00

Note: Offsite emissions pasted over from EMFAC2021 analysis

Regional Emissions	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Site Preparation - 2027	0.18	1.30	6.31	0.009	0.34	0.04	0.38	0.05	0.04	0.09
Grading - 2027	0.33	1.99	13.30	0.023	2.97	0.07	3.04	1.39	0.07	1.45
Building Construction - 2027	0.47	4.11	11.64	0.021	0.23	0.13	0.37	0.06	0.13	0.18
Paving - 2027	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Architectural Coating - 2027	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00

Overlapping Phases										
	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Building Construction - 2027 + Paving - 2027 + Architectural Coating - 2027	0.47	4.11	11.64	0.021	0.23	0.13	0.37	0.06	0.13	0.18
Project Daily Maximum Emissions	**0.47**	**4.11**	**13.30**	**0.023**	**2.97**	**0.13**	**3.04**	**1.39**	**0.13**	**1.45**

P.2-2 Project Construction Air Quality Mobile Emissions

Topanga Canyon - Temporary Bridge
Total Emissions

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Idling per Day (minutes)	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10 Dust	PM10 Exh	Total PM10	PM2.5 Dust	PM2.5 Exh	Total PM2.5	(MT/yr) Total CO2e
Demolition &Temp Parking Provisions	2027	Export	SCAB													
Total Haul Trips	2,162															
Hauling	52	42	8	77	15	0.25	15.54	6.08	0.12	3.70	0.20	3.91	0.99	0.19	1.18	263.27
Vendor	0	60	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	18.5	0	0.12	0.12	1.74	0.00	0.52	0.00	0.52	0.13	0.00	0.13	12.90
					Total	0.36	15.66	7.81	0.13	4.22	0.20	4.43	1.12	0.20	1.31	276.16
Unsuitable Material Replacement	2027	Export	SCAB		Workers+Vendors	0.12	0.12	1.74	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	5,200															
Hauling	124	42	8	77	15	0.59	37.05	14.49	0.29	8.83	0.48	9.31	2.36	0.46	2.82	633.20
Vendor	0	60	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	18.5	0	0.12	0.12	1.74	0.00	0.52	0.00	0.52	0.13	0.00	0.13	12.90
					Total	0.70	37.17	16.23	0.29	9.35	0.48	9.83	2.49	0.46	2.95	646.10
Relocate Utilities	2027				Workers+Vendors	0.12	0.12	1.74	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	260															
Hauling	2	130	8	36.5	15	0.01	0.32	0.15	0.00	0.07	0.00	0.07	0.02	0.00	0.02	15.41
Vendor	0	182	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	182	8	18.5	0	0.12	0.12	1.74	0.00	0.52	0.00	0.52	0.13	0.00	0.13	39.12
					Total	0.12	0.44	1.89	0.01	0.58	0.01	0.59	0.15	0.01	0.15	54.53
Construct Temporary Road/Bridge	2027	Grading/Excavation			Workers+Vendors	0.12	0.12	1.74	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	320															
Hauling	16	22	8	36.5	15	0.06	2.56	1.22	0.02	0.54	0.03	0.57	0.14	0.03	0.17	18.97
Vendor	0	30	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	30	8	18.5	0	0.12	0.12	1.74	0.00	0.52	0.00	0.52	0.13	0.00	0.13	6.45
					Total	0.17	2.69	2.96	0.02	1.06	0.03	1.09	0.27	0.03	0.30	25.41
Construct Temporary Road/Bridge	2027	Building Construction			Workers+Vendors	0.12	0.12	1.74	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	208															
Hauling	4	88	8	36.5	15	0.01	0.64	0.31	0.00	0.14	0.01	0.14	0.04	0.01	0.04	12.33
Vendor	0	124	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	124	8	18.5	0	0.12	0.12	1.74	0.00	0.52	0.00	0.52	0.13	0.00	0.13	26.65
					Total	0.13	0.76	2.04	0.01	0.65	0.01	0.66	0.16	0.01	0.17	38.98
Construct Temporary Road/Bridge	2027	Paving			Workers+Vendors	0.12	0.12	1.74	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	0															
Hauling	0	44	8	36.5	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	60	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	18.5	0	0.12	0.12	1.74	0.00	0.52	0.00	0.52	0.13	0.00	0.13	12.90
					Total	0.12	0.12	1.74	0.00	0.52	0.00	0.52	0.13	0.00	0.13	12.90
Demolition Temporary Bridge	2030				Workers+Vendors	0.12	0.12	1.74	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	0															
Hauling	0	43	8	36.5	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	59	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	18.5	0	0.10	0.10	1.47	0.00	0.52	0.00	0.52	0.13	0.00	0.13	11.91
					Total	0.10	0.10	1.47	0.00	0.52	0.00	0.52	0.13	0.00	0.13	11.91
Construct DBH Facilities(Lifeguard HQ/Helipad)	2030				Workers+Vendors	0.10	0.10	1.47	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	0															
Hauling	0	21	8	36.5	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0	0.10	0.10	1.47	0.00	0.52	0.00	0.52	0.13	0.00	0.13	6.26
					Total	0.10	0.10	1.47	0.00	0.52	0.00	0.52	0.13	0.00	0.13	6.26
Lagoon Grading	2030				Workers+Vendors	0.10	0.10	1.47	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	51,200															
Hauling	502	102	8	36.5	15	1.70	72.19	35.91	0.53	16.96	0.89	17.85	4.53	0.85	5.38	2820.96
Vendor	0	214	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0	0.10	0.10	1.47	0.00	0.52	0.00	0.52	0.13	0.00	0.13	43.18
					Total	1.80	72.28	37.37	0.53	17.48	0.89	18.37	4.66	0.85	5.51	2864.15
Restore Beach Area	2030				Workers+Vendors	0.10	0.10	1.47	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	0															
Hauling	0	43	8	36.5	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	61	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0	0.10	0.10	1.47	0.00	0.52	0.00	0.52	0.13	0.00	0.13	12.31
					Total	0.10	0.10	1.47	0.00	0.52	0.00	0.52	0.13	0.00	0.13	12.31
Unsuitable Material Replacement	2027	Export	SJVAB		Workers+Vendors	0.10	0.10	1.47	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	5200															
Hauling	124	42	8	106	15	0.69	49.36	18.10	0.39	12.16	0.66	12.82	3.24	0.63	3.88	865.92
Vendor	0	60	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	60	8	18.5	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
					Total	0.69	49.36	18.10	0.39	12.16	0.66	12.82	3.24	0.63	3.88	865.92
Unsuitable Material Replacement	2027	Import			Workers+Vendors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Total Haul Trips	2520															
Hauling	60	42	8	20	15	0.19	6.21	3.58	0.04	1.11	0.06	1.17	0.30	0.06	0.35	85.19
Vendor	0	60	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	60	8	18.5	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
					Total	0.19	6.21	3.58	0.04	1.11	0.06	1.17	0.30	0.06	0.35	85.19
Demolition &Temp Parking Provisions	2027	Export	SJVAB		Workers+Vendors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Total Haul Trips	2,162															
Hauling	52	42	8	106	15	0.29	20.70	7.59	0.17	5.10	0.28	5.38	1.36	0.27	1.63	360.02
Vendor	0	60	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	60	8	18.5	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
					Total	0.29	20.70	7.59	0.17	5.10	0.28	5.38	1.36	0.27	1.63	360.02
					Workers+Vendors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

Topanga Canyon - Temporary Bridge
Running Emissions

		Running Emissions Factor (grams/mile)						Running Emissions Factor (grams/mile)		
		ROG_RUNEX	NOx_RUNEX	CO_RUNEX	SOx_RUNEX	PM10_RUNEX	PM2.5_RUNEX	CO2_RUNEX	CH4_RUNEX	N2O_RUNEX
2027	2027Hauling Hauling	0.013128	1.553518611	0.45473657	0.01336714	0.02273486	0.02174732	1471.80075	0.0608523	0.23462364
2027	2027Vendor Vendor	0.01570588	1.102331968	0.36327753	0.01214871	0.01475662	0.01411185	1311.1435	0.03509759	0.18307889
2027	2027Worker Worker	0.01447264	0.062492418	0.90233334	0.00281062	0.00150729	0.0013867	284.320587	0.00354266	0.00566149
2028	2028Hauling Hauling	0.01261339	1.493718015	0.43877031	0.01305596	0.02247317	0.02149714	1438.29866	0.05768159	0.22931835
2028	2028Vendor Vendor	0.01417298	1.038868065	0.3360531	0.01185313	0.01426835	0.01364491	1280.01295	0.03342244	0.17922194
2028	2028Worker Worker	0.01314756	0.057035459	0.85167037	0.00274948	0.00140448	0.00129194	278.134904	0.00325313	0.00533773
2029	2029Hauling Hauling	0.01213472	1.434866903	0.4224926	0.01273534	0.0221686	0.0212059	1403.60667	0.05465536	0.22381566
2029	2029Vendor Vendor	0.0128196	0.978781777	0.31101237	0.01152628	0.01380314	0.01320005	1245.46404	0.03180989	0.17489835
2029	2029Worker Worker	0.01192021	0.051957034	0.80464317	0.00269297	0.00130724	0.00120239	272.417637	0.00298654	0.00503952
2030	2030Hauling Hauling	0.01169729	1.381905725	0.40596438	0.01241489	0.02183595	0.02088778	1368.72007	0.05170538	0.2182712
2030	2030Vendor Vendor	0.01168751	0.9252091	0.28941545	0.01117412	0.01336285	0.01277903	1208.11234	0.03023265	0.17022289
2030	2030Worker Worker	0.01081241	0.047255061	0.76242747	0.00264062	0.00121547	0.00111789	267.121939	0.00274623	0.00476556
2031	2031Hauling Hauling	0.01126827	1.331771303	0.38663416	0.01209496	0.02148002	0.02054741	1333.31591	0.04842446	0.21262163
2031	2031Vendor Vendor	0.01070694	0.874998281	0.26868024	0.01079467	0.01293916	0.01237394	1167.57711	0.02847022	0.16520071
2031	2031Worker Worker	0.00977403	0.042746598	0.72305591	0.00259298	0.00112929	0.00103861	262.302837	0.0025216	0.00450761
0	GWP	N/A	N/A	N/A	N/A	N/A	N/A	1	25	298

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day)						Regional Emissions (MT/year)			
					ROG	NOX	CO	SO2	PM10	PM2.5	CO2	CH4	N2O	CO2e
Demolition &Temp Parking	2027													
Total Haul Trips	2162													
Hauling	52	42	8	77	0.12	13.71	4.01	0.12	0.20	0.19	245.02	0.25	11.64	256.91
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	18.5	0.02	0.10	1.47	0.00	0.00	0.00	12.62	0.00	0.07	12.70
Unsuitable Material Replac	2027													
Total Haul Trips	5200													
Hauling	124	42	8	77	0.28	32.70	9.57	0.28	0.48	0.46	589.31	0.61	28.00	617.91
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	18.5	0.02	0.10	1.47	0.00	0.00	0.00	12.62	0.00	0.07	12.70
Relocate Utilities	2027													
Total Haul Trips	260													
Hauling	2	130	8	36.5	0.00	0.25	0.07	0.00	0.00	0.00	13.97	0.01	0.66	14.65
Vendor	0	182	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	182	8	18.5	0.02	0.10	1.47	0.00	0.00	0.00	38.29	0.01	0.23	38.53
Construct Temporary Road/	2027													
Total Haul Trips	320													
Hauling	16	22	8	36.5	0.02	2.00	0.59	0.02	0.03	0.03	17.19	0.02	0.82	18.03
Vendor	0	30	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	30	8	18.5	0.02	0.10	1.47	0.00	0.00	0.00	6.31	0.00	0.04	6.35
Construct Temporary Road/	2027													
Total Haul Trips	208													
Hauling	4	88	8	36.5	0.00	0.50	0.15	0.00	0.01	0.01	11.17	0.01	0.53	11.72
Vendor	0	124	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	124	8	18.5	0.02	0.10	1.47	0.00	0.00	0.00	26.09	0.01	0.15	26.25
Construct Temporary Road/	2027													
Total Haul Trips	0													
Hauling	0	44	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	18.5	0.02	0.10	1.47	0.00	0.00	0.00	12.62	0.00	0.07	12.70
Demolition Temporary Brid	2030													
Total Haul Trips	0													
Hauling	0	43	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	59	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	18.5	0.02	0.08	1.24	0.00	0.00	0.00	11.66	0.00	0.06	11.73
Construct DBH Facilities(Life	2030													
Total Haul Trips	0													
Hauling	0	21	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0.02	0.08	1.24	0.00	0.00	0.00	6.13	0.00	0.03	6.16
Lagoon Grading	2030													
Total Haul Trips	51200													
Hauling	502	102	8	36.5	0.47	55.82	16.40	0.50	0.88	0.84	2557.86	2.42	121.56	2681.84
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.02	0.08	1.24	0.00	0.00	0.00	42.30	0.01	0.22	42.54
Restore Beach Area	2030													
Total Haul Trips	0													
Hauling	0	43	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0.02	0.08	1.24	0.00	0.00	0.00	12.06	0.00	0.06	12.13
Unsuitable Material Replac	2027													
Total Haul Trips	5200													
Hauling	124	42	8	106	0.38	45.02	13.18	0.39	0.66	0.63	811.26	0.84	38.54	850.63
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	60	8	18.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Unsuitable Material Replac	2027													
Total Haul Trips	2520													
Hauling	60	42	8	20	0.03	4.11	1.20	0.04	0.06	0.06	74.18	0.08	3.52	77.78
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	60	8	18.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Demolition &Temp Parking	2027													
Total Haul Trips	2162													
Hauling	52	42	8	106	0.16	18.88	5.53	0.16	0.28	0.26	337.30	0.35	16.02	353.67
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	60	8	18.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Topanga Canyon - Temporary Bridge
Start Emissions

		Start Emissions Factor (grams/trip)						Start Emissions Factor (grams/trip)		
		ROG_STREX	NOX_STREX	CO_STREX	SOx_STREX	PM10_STREX	PM2.5_STREX	CO2_STREX	CH4_STREX	N2O_STREX
2027	2027Hauling Hauling	0.00060894	2.672142352	0.00302137	3.16557E-07	5.30481E-07	4.87758E-07	0.03202066	7.5498E-08	7.36611E-06
2027	2027Vendor Vendor	0.080213538	1.961946447	0.60365405	5.50826E-05	6.07836E-05	5.58883E-05	5.57177064	0.005494835	0.004037678
2027	2027Worker Worker	1.038950633	0.251050817	3.01934346	0.000691936	0.002053348	0.001887978	69.9913431	0.06616369	0.030829475
2028	2028Hauling Hauling	0.000490696	2.636914961	0.00257595	2.71845E-07	4.29594E-07	3.94995E-07	0.02749789	6.56178E-08	5.97594E-06
2028	2028Vendor Vendor	0.075419112	1.927915654	0.55968909	5.22383E-05	5.76932E-05	5.30468E-05	5.28405692	0.005169504	0.003780947
2028	2028Worker Worker	0.997046953	0.239560346	2.85187017	0.000675557	0.001941969	0.001785569	68.3345653	0.062483886	0.030029939
2029	2029Hauling Hauling	0.000383539	2.591170334	0.00214107	2.33546E-07	3.28727E-07	3.02252E-07	0.02362391	5.62127E-08	4.65545E-06
2029	2029Vendor Vendor	0.069289941	1.883995908	0.51714657	4.94212E-05	5.46034E-05	5.02058E-05	4.99909929	0.004852786	0.003548842
2029	2029Worker Worker	0.945798618	0.229251267	2.69630558	0.000660221	0.001832244	0.00168468	66.7833	0.059077063	0.029313823
2030	2030Hauling Hauling	0.00027279	2.546881303	0.00161285	1.92445E-07	2.06187E-07	1.89581E-07	0.01946637	4.71315E-08	4.0595E-06
2030	2030Vendor Vendor	0.063656597	1.839529651	0.47865041	4.67001E-05	5.18671E-05	4.76899E-05	4.72385215	0.004565454	0.003322989
2030	2030Worker Worker	0.901632052	0.219772527	2.55165593	0.00064583	0.001725708	0.001586724	65.3276344	0.055883281	0.028658371
2031	2031Hauling Hauling	0.000210057	2.503276097	0.00139863	1.66951E-07	1.58801E-07	1.46012E-07	0.01688763	4.13015E-08	2.64568E-06
2031	2031Vendor Vendor	0.059141215	1.792713918	0.44197461	4.38654E-05	4.91716E-05	4.52115E-05	4.43711805	0.004280254	0.003105544
2031	2031Worker Worker	0.857879142	0.211029605	2.41545051	0.000632455	0.001621689	0.001491083	63.974738	0.052892816	0.028060877
	GWP		N/A					1	25	298

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10	PM2.5	Regional Emissions (MT/year) CO2	CH4	N2O	CO2e
Demolition &Temp Parking	2027													
Total Haul Trips	2162													
Hauling	52	42	8	77	0.00	0.31	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.16
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	18.5	0.09	0.02	0.27	0.00	0.00	0.00	0.17	0.00	0.00	0.19
Unsuitable Material Replac	2027													
Total Haul Trips	5200													
Hauling	124	42	8	77	0.00	0.73	0.00	0.00	0.00	0.00	0.37	0.00	0.00	0.39
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	18.5	0.09	0.02	0.27	0.00	0.00	0.00	0.17	0.00	0.00	0.19
Relocate Utilities	2027													
Total Haul Trips	260													
Hauling	2	130	8	36.5	0.00	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.02
Vendor	0	182	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	182	8	18.5	0.09	0.02	0.27	0.00	0.00	0.00	0.51	0.00	0.00	0.59
Construct Temporary Road/	2027													
Total Haul Trips	320													
Hauling	16	22	8	36.5	0.00	0.09	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.02
Vendor	0	30	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	30	8	18.5	0.09	0.02	0.27	0.00	0.00	0.00	0.08	0.00	0.00	0.10
Construct Temporary Road/	2027													
Total Haul Trips	208													
Hauling	4	88	8	36.5	0.00	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02
Vendor	0	124	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	124	8	18.5	0.09	0.02	0.27	0.00	0.00	0.00	0.35	0.00	0.00	0.40
Construct Temporary Road/	2027													
Total Haul Trips	0													
Hauling	0	44	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	18.5	0.09	0.02	0.27	0.00	0.00	0.00	0.17	0.00	0.00	0.19
Demolition Temporary Brid	2030													
Total Haul Trips	0													
Hauling	0	43	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	59	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	18.5	0.08	0.02	0.23	0.00	0.00	0.00	0.15	0.00	0.00	0.18
Construct DBH Facilities(Life	2030													
Total Haul Trips	0													
Hauling	0	21	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0.08	0.02	0.23	0.00	0.00	0.00	0.08	0.00	0.00	0.09
Lagoon Grading	2030													
Total Haul Trips	51200													
Hauling	502	102	8	36.5	0.00	2.82	0.00	0.00	0.00	0.00	2.20	0.00	0.00	2.33
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.08	0.02	0.23	0.00	0.00	0.00	0.56	0.00	0.00	0.64
Restore Beach Area	2030													
Total Haul Trips	0													
Hauling	0	43	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0.08	0.02	0.23	0.00	0.00	0.00	0.16	0.00	0.00	0.18
Unsuitable Material Replac	2027													
Total Haul Trips	5200													
Hauling	124	42	8	106	0.00	0.73	0.00	0.00	0.00	0.00	0.37	0.00	0.00	0.39
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	60	8	18.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Unsuitable Material Replac	2027													
Total Haul Trips	2520													
Hauling	60	42	8	20	0.00	0.35	0.00	0.00	0.00	0.00	0.18	0.00	0.00	0.19
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	60	8	18.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Demolition &Temp Parking	2027													
Total Haul Trips	2162													
Hauling	52	42	8	106	0.00	0.31	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.16
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	60	8	18.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Topanga Canyon - Temporary Bridge
Idling Emissions

		Idling Emissions Factor (grams/minute)						Idling Emissions Factor (grams/minute)		
		ROG_IDLEX	NOx_IDLEX	CO_IDLEX	SOx_IDLEX	PM10_IDLEX	PM2.5_IDLEX	CO2_IDLEX	CH4_IDLEX	N2O_IDLEX
2027	2027Hauling Hauling	0.07592279	0.881696127	1.19921987	0.00159973	0.00047074	0.00044926	181.442358	0.03427011	0.02916541
2027	2027Vendor Vendor	0.05529965	0.899602458	1.04932075	0.00167506	0.00086494	0.00082645	186.589554	0.03155173	0.02918792
2027	2027Worker Worker	0	0	0	0	0	0	0	0	0
2028	2028Hauling Hauling	0.07529788	0.857767875	1.19214339	0.00156045	0.00045204	0.00043133	177.300744	0.03377364	0.02851321
2028	2028Vendor Vendor	0.05432839	0.863093228	1.0395891	0.00163993	0.00074988	0.00071632	182.978932	0.03134729	0.02865517
2028	2028Worker Worker	0	0	0	0	0	0	0	0	0
2029	2029Hauling Hauling	0.07461794	0.835480721	1.18399992	0.00152188	0.00043143	0.00041158	173.194944	0.03323976	0.02786481
2029	2029Vendor Vendor	0.05333308	0.827999465	1.02749811	0.0016013	0.00065239	0.00062302	178.951612	0.03104801	0.02805443
2029	2029Worker Worker	0	0	0	0	0	0	0	0	0
2030	2030Hauling Hauling	0.07391144	0.816007794	1.17493744	0.0014846	0.00041331	0.00039421	169.186161	0.03269373	0.0272299
2030	2030Vendor Vendor	0.05232472	0.795299763	1.01321823	0.00155966	0.00057171	0.0005458	174.561724	0.03067462	0.02739395
2030	2030Worker Worker	0	0	0	0	0	0	0	0	0
2031	2031Hauling Hauling	0.0732853	0.799579641	1.1664382	0.00145061	0.00039768	0.00037924	165.457521	0.03205186	0.02663599
2031	2031Vendor Vendor	0.05130878	0.763402339	0.99683404	0.00151522	0.00050437	0.00048136	169.805962	0.03011968	0.02667472
2031	2031Worker Worker	0	0	0	0	0	0	0	0	0
	GWP	N/A	N/A	N/A	N/A	N/A	N/A	1	25	298

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	Idling minutes per Day	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10	PM2.5	Regional Emissions (MT/year) CO2	CH4	N2O	CO2e
Demolition &Temp Parking	2027													
Total Haul Trips	2162													
Hauling	52	42	8	15	0.13	1.52	2.06	0.00	0.00	0.00	5.88	0.03	0.28	6.19
Vendor	0	60	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Unsuitable Material Replac	2027													
Total Haul Trips	5200													
Hauling	124	42	8	15	0.31	3.62	4.92	0.01	0.00	0.00	14.15	0.07	0.68	14.90
Vendor	0	60	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Relocate Utilities	2027													
Total Haul Trips	260													
Hauling	2	130	8	15	0.01	0.06	0.08	0.00	0.00	0.00	0.71	0.00	0.03	0.74
Vendor	0	182	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	182	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct Temporary Road/	2027													
Total Haul Trips	320													
Hauling	16	22	8	15	0.04	0.47	0.63	0.00	0.00	0.00	0.87	0.00	0.04	0.92
Vendor	0	30	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	30	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct Temporary Road/	2027													
Total Haul Trips	208													
Hauling	4	88	8	15	0.01	0.12	0.16	0.00	0.00	0.00	0.57	0.00	0.03	0.60
Vendor	0	124	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	124	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct Temporary Road/	2027													
Total Haul Trips	0													
Hauling	0	44	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	60	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Demolition Temporary Brid	2030													
Total Haul Trips	0													
Hauling	0	43	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	59	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct DBH Facilities(Life	2030													
Total Haul Trips	0													
Hauling	0	21	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lagoon Grading	2030													
Total Haul Trips	51200													
Hauling	502	102	8	15	1.23	13.55	19.50	0.02	0.01	0.01	129.93	0.63	6.23	136.79
Vendor	0	214	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Restore Beach Area	2030													
Total Haul Trips	0													
Hauling	0	43	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	61	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Unsuitable Material Replac	2027													
Total Haul Trips	5200													
Hauling	124	42	8	15	0.31	3.62	4.92	0.01	0.00	0.00	14.15	0.07	0.68	14.90
Vendor	0	60	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	60	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Unsuitable Material Replac	2027													
Total Haul Trips	2520													
Hauling	60	42	8	15	0.15	1.75	2.38	0.00	0.00	0.00	6.86	0.03	0.33	7.22
Vendor	0	60	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	60	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Demolition &Temp Parking	2027													
Total Haul Trips	2162													
Hauling	52	42	8	15	0.13	1.52	2.06	0.00	0.00	0.00	5.88	0.03	0.28	6.19
Vendor	0	60	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	60	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Topanga Canyon - Temporary Bridge
Road Dust, Break Wear, and Tire wear Emissions

		Emission Factors (grams/mile)					
		PM10			PM2.5		
		RD	PM10_PMBW	PM10_PMTW	RD	PM2.5_PMBW	PM2.5_PMTW
2027	2027Hauling Hauling	0.29984991	0.084297987	0.03545106	0.07359952	0.0295043	0.00886277
2027	2027Vendor Vendor	0.29984991	0.063623189	0.02372553	0.07359952	0.02226812	0.00593138
2027	2027Worker Worker	0.29984991	0.009305649	0.008	0.07359952	0.00325698	0.002
2028	2028Hauling Hauling	0.29984991	0.084486989	0.03545475	0.07359952	0.02957045	0.00886369
2028	2028Vendor Vendor	0.29984991	0.063544145	0.02372738	0.07359952	0.02224045	0.00593184
2028	2028Worker Worker	0.29984991	0.009284129	0.008	0.07359952	0.00324945	0.002
2029	2029Hauling Hauling	0.29984991	0.084584422	0.03545835	0.07359952	0.02960455	0.00886459
2029	2029Vendor Vendor	0.29984991	0.063359545	0.02372918	0.07359952	0.02217584	0.00593229
2029	2029Worker Worker	0.29984991	0.00926272	0.008	0.07359952	0.00324195	0.002
2030	2030Hauling Hauling	0.29984991	0.08460378	0.03546191	0.07359952	0.02961132	0.00886548
2030	2030Vendor Vendor	0.29984991	0.063078834	0.02373095	0.07359952	0.02207759	0.00593274
2030	2030Worker Worker	0.29984991	0.00924132	0.008	0.07359952	0.00323446	0.002
2031	2031Hauling Hauling	0.29984991	0.084504548	0.03546578	0.07359952	0.02957659	0.00886644
2031	2031Vendor Vendor	0.29984991	0.062682863	0.02373289	0.07359952	0.021939	0.00593322
2031	2031Worker Worker	0.29984991	0.009221285	0.008	0.07359952	0.00322745	0.002

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day) PM10 RD	PM10 BW	PM10 TW	PM2.5 RD	PM2.5 BW	PM2.5 TW
Demolition &Temp Parking	2027									
Total Haul Trips	2162									
Hauling	52	42	8	77	2.65	0.74	0.31	0.65	0.26	0.08
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Unsuitable Material Replac	2027									
Total Haul Trips	5200									
Hauling	124	42	8	77	6.31	1.77	0.75	1.55	0.62	0.19
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Relocate Utilities	2027									
Total Haul Trips	260									
Hauling	2	130	8	36.5	0.05	0.01	0.01	0.01	0.00	0.00
Vendor	0	182	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	182	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Construct Temporary Road/	2027									
Total Haul Trips	320									
Hauling	16	22	8	36.5	0.39	0.11	0.05	0.09	0.04	0.01
Vendor	0	30	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	30	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Construct Temporary Road/	2027									
Total Haul Trips	208									
Hauling	4	88	8	36.5	0.10	0.03	0.01	0.02	0.01	0.00
Vendor	0	124	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	124	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Construct Temporary Road/	2027									
Total Haul Trips	0									
Hauling	0	44	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Demolition Temporary Brid	2030									
Total Haul Trips	0									
Hauling	0	43	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	59	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Construct DBH Facilities(Life	2030									
Total Haul Trips	0									
Hauling	0	21	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Lagoon Grading	2030									
Total Haul Trips	51200									
Hauling	502	102	8	36.5	12.11	3.42	1.43	2.97	1.20	0.36
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Restore Beach Area	2030									
Total Haul Trips	0									
Hauling	0	43	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Unsuitable Material Replac	2027									
Total Haul Trips	5200									
Hauling	124	42	8	106	8.69	2.44	1.03	2.13	0.85	0.26
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	60	8	18.5	0.00	0.00	0.00	0.00	0.00	0.00
Unsuitable Material Replac	2027									
Total Haul Trips	2520									
Hauling	60	42	8	20	0.79	0.22	0.09	0.19	0.08	0.02
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	60	8	18.5	0.00	0.00	0.00	0.00	0.00	0.00
Demolition &Temp Parking	2027									
Total Haul Trips	2162									
Hauling	52	42	8	106	3.64	1.02	0.43	0.89	0.36	0.11
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	60	8	18.5	0.00	0.00	0.00	0.00	0.00	0.00

Topanga Canyon - Temporary Bridge
Road Dust

Paved Road Dust Emission Factors (Assumes No Precipitation)

Formula: $EF_{Dust,P} = (k\ (sL)^{0.91} \times (W)^{1.02})$

Where:

- $EF_{Dust,P}$ = Paved Road Dust Emission Factor (having the same units as k)
- k = particle size multiplier
- sL = road surface silt loading (g/m^2)
- W = average fleet vehicle weight (tons) (CARB uses 2.4 tons as a fleet average vehicle weight factor)

	Emission Factor (grams per VMT)	
	PM10	PM2.5
k	0.9979	0.2449
sL	0.1	0.1
W	2.4	2.4
$EF_{Dust,P}$	3.00E-01	7.36E-02

Unpaved Road Dust Emission Factors (Assumes No Precipitation)

Formula: $EF_{Dust,U} = (k\ (\ s / 12)^{1} \times (Sp / 30)^{0.5} / (M / 0.5)^{0.2}) - C)$

Where:

- $EF_{Dust,U}$ = Unpaved Road Dust Emission Factor (having the same units as k)
- k = particle size multiplier
- s = surface material silt content (%)
- Sp = mean vehicle speed (mph)
- M = surface material moisture content (%)
- C = Emission Factor for 1980s vehicle fleet exhaust, brake wear, and tire wear

	Emission Factor (grams per VMT)	
	PM10	PM2.5
k	816.47	81.65
s	4.3%	4.3%
Sp	15	15
M	0.5%	0.5%
C	0.00047	0.00036
$EF_{Dust,U}$	5.20E+00	5.19E-01

Sources:

SCAQMD, CalEEMod, Version 2022.1.
CARB, *Entrained Dust from Paved Road Travel: Emission Estimation Methodology Background Document* , (1997).
USEPA, *AP-42* , Fifth Edition, Volume I, Chapter 13.2.1 - Paved Roads, (2011).
ESA, 2023.

Topanga Canyon - NB/SB Bridge
Total Emissions

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Idling per Day (minutes)	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10 Dust	PM10 Exh	Total PM10	PM2.5 Dust	PM2.5 Exh	Total PM2.5	(MT/yr) Total CO2e
Demolition NB Road/Bridge	2028															
Total Haul Trips	270															
Hauling	8	42	8	36.5	15	0.03	1.24	0.60	0.01	0.27	0.01	0.28	0.07	0.01	0.09	15.64
Vendor	0	60	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	18.5	0	0.11	0.11	1.64	0.00	0.52	0.00	0.52	0.13	0.00	0.13	12.61
					Total	0.14	1.35	2.24	0.01	0.79	0.02	0.80	0.20	0.02	0.22	28.25
Construct NB Road/Bridge	2028	Grading/Excavation		Export	Workers+Ver	0.11	0.11	1.64	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	3,700															
Hauling	86	43	8	36.5	15	0.30	13.28	6.43	0.09	2.91	0.16	3.06	0.78	0.15	0.93	214.26
Vendor	0	61	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0	0.11	0.11	1.64	0.00	0.52	0.00	0.52	0.13	0.00	0.13	12.82
					Total	0.41	13.39	8.07	0.10	3.42	0.16	3.58	0.90	0.15	1.06	227.09
Construct NB Road/Bridge	2028	Building Construction			Workers+Ver	0.11	0.11	1.64	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	834															
Hauling	6	154	8	36.5	15	0.02	0.93	0.45	0.01	0.20	0.01	0.21	0.05	0.01	0.06	48.30
Vendor	0	214	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0	0.11	0.11	1.64	0.00	0.52	0.00	0.52	0.13	0.00	0.13	44.99
					Total	0.13	1.04	2.09	0.01	0.72	0.01	0.73	0.18	0.01	0.20	93.28
Construct NB Road/Bridge	2028	Paving			Workers+Ver	0.11	0.11	1.64	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	0															
Hauling	0	21	8	36.5	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0	0.11	0.11	1.64	0.00	0.52	0.00	0.52	0.13	0.00	0.13	6.52
					Total	0.11	0.11	1.64	0.00	0.52	0.00	0.52	0.13	0.00	0.13	6.52
Demolition SB Road/Bridge	2029				Workers+Ver	0.11	0.11	1.64	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	270															
Hauling	8	43	8	36.5	15	0.03	1.19	0.59	0.01	0.27	0.01	0.28	0.07	0.01	0.09	15.26
Vendor	0	59	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	18.5	0	0.10	0.10	1.55	0.00	0.52	0.00	0.52	0.13	0.00	0.13	12.14
					Total	0.13	1.30	2.14	0.01	0.79	0.02	0.80	0.20	0.02	0.22	27.40
Construct SB Road/Bridge	2029	Grading/Excavation		Export	Workers+Ver	0.10	0.10	1.55	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	3,460															
Hauling	82	43	8	36.5	15	0.28	12.20	6.00	0.09	2.77	0.15	2.92	0.74	0.14	0.88	195.51
Vendor	0	61	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0	0.10	0.10	1.55	0.00	0.52	0.00	0.52	0.13	0.00	0.13	12.56
					Total	0.39	12.31	7.55	0.09	3.29	0.15	3.44	0.87	0.14	1.01	208.07
Construct SB Road/Bridge	2029	Building Construction			Workers+Ver	0.10	0.10	1.55	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	834															
Hauling	6	154	8	36.5	15	0.02	0.89	0.44	0.01	0.20	0.01	0.21	0.05	0.01	0.06	47.13
Vendor	0	214	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0	0.10	0.10	1.55	0.00	0.52	0.00	0.52	0.13	0.00	0.13	44.05
					Total	0.12	1.00	1.99	0.01	0.72	0.01	0.73	0.18	0.01	0.20	91.17
Construct SB Road/Bridge	2029	Paving			Workers+Ver	0.10	0.10	1.55	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	0															
Hauling	0	21	8	36.5	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0	0.10	0.10	1.55	0.00	0.52	0.00	0.52	0.13	0.00	0.13	6.38
					Total	0.10	0.10	1.55	0.00	0.52	0.00	0.52	0.13	0.00	0.13	6.38
Construct NB Road/Bridge	2028	Grading/Excavation		Import	Workers+Ver	0.10	0.10	1.55	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	2,400															
Hauling	56	43	8	20	15	0.17	5.60	3.29	0.04	1.04	0.06	1.09	0.28	0.05	0.33	79.26
Vendor	0	61	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	61	8	18.5	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
					Total	0.17	5.60	3.29	0.04	1.04	0.06	1.09	0.28	0.05	0.33	79.26
Construct SB Road/Bridge	2029	Grading/Excavation		Import	Workers+Ver	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Total Haul Trips	2400															
Hauling	56	43	8	20	15	0.17	5.41	3.24	0.03	1.04	0.06	1.09	0.28	0.05	0.33	77.34
Vendor	0	61	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	61	8	18.5	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
					Total	0.17	5.41	3.24	0.03	1.04	0.06	1.09	0.28	0.05	0.33	77.34
					Workers+Ver	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

Topanga Canyon - NB/SB Bridge
Running Emissions

		Running Emissions Factor (grams/mile)						Running Emissions Factor (grams/mile)		
		ROG_RUNEX	NOx_RUNEX	CO_RUNEX	SOx_RUNEX	PM10_RUNEX	PM2.5_RUNEX	CO2_RUNEX	CH4_RUNEX	N2O_RUNEX
2027	2027Hauling Hauling	0.013128	1.553518611	0.45473657	0.01336714	0.02273486	0.02174732	1471.80075	0.0608523	0.23462364
2027	2027Vendor Vendor	0.01570588	1.102331968	0.36327753	0.01214871	0.01475662	0.01411185	1311.1435	0.03509759	0.18307889
2027	2027Worker Worker	0.01447264	0.062492418	0.90233334	0.00281062	0.00150729	0.0013867	284.320587	0.00354266	0.00566149
2028	2028Hauling Hauling	0.01261339	1.493718015	0.43877031	0.01305596	0.02247317	0.02149714	1438.29866	0.05768159	0.22931835
2028	2028Vendor Vendor	0.01417298	1.038868065	0.3360531	0.01185313	0.01426835	0.01364491	1280.01295	0.03342244	0.17922194
2028	2028Worker Worker	0.01314756	0.057035459	0.85167037	0.00274948	0.00140448	0.00129194	278.134904	0.00325313	0.00533773
2029	2029Hauling Hauling	0.01213472	1.434866903	0.4224926	0.01273534	0.0221686	0.0212059	1403.60667	0.05465536	0.22381566
2029	2029Vendor Vendor	0.0128196	0.978781777	0.31101237	0.01152628	0.01380314	0.01320005	1245.46404	0.03180989	0.17489835
2029	2029Worker Worker	0.01192021	0.051957034	0.80464317	0.00269297	0.00130724	0.00120239	272.417637	0.00298654	0.00503952
2030	2030Hauling Hauling	0.01169729	1.381905725	0.40596438	0.01241489	0.02183595	0.02088778	1368.72007	0.05170538	0.2182712
2030	2030Vendor Vendor	0.01168751	0.9252091	0.28941545	0.01117412	0.01336285	0.01277903	1208.11234	0.03023265	0.17022289
2030	2030Worker Worker	0.01081241	0.047255061	0.76242747	0.00264062	0.00121547	0.00111789	267.121939	0.00274623	0.00476556
2031	2031Hauling Hauling	0.01126827	1.331771303	0.38663416	0.01209496	0.02148002	0.02054741	1333.31591	0.04842446	0.21262163
2031	2031Vendor Vendor	0.01070694	0.874998281	0.26868024	0.01079467	0.01293916	0.01237394	1167.57711	0.02847022	0.16520071
2031	2031Worker Worker	0.00977403	0.042746598	0.72305591	0.00259298	0.00112929	0.00103861	262.302837	0.0025216	0.00450761
0	GWP	N/A	N/A	N/A	N/A	N/A	N/A	1	25	298

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10	PM2.5	Regional Emissions (MT/year) CO2	CH4	N2O	CO2e
Demolition NB Road/Bridge	2028													
Total Haul Trips	270													
Hauling	8	42	8	36.5	0.01	0.96	0.28	0.01	0.01	0.01	14.17	0.01	0.67	14.86
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	18.5	0.02	0.09	1.39	0.00	0.00	0.00	12.35	0.00	0.07	12.42
Construct NB Road/Bridge	2028													
Total Haul Trips	3700													
Hauling	86	43	8	36.5	0.09	10.34	3.04	0.09	0.16	0.15	194.24	0.19	9.23	203.67
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0.02	0.09	1.39	0.00	0.00	0.00	12.56	0.00	0.07	12.63
Construct NB Road/Bridge	2028													
Total Haul Trips	834													
Hauling	6	154	8	36.5	0.01	0.72	0.21	0.01	0.01	0.01	43.78	0.04	2.08	45.91
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.02	0.09	1.39	0.00	0.00	0.00	44.05	0.01	0.25	44.31
Construct NB Road/Bridge	2028													
Total Haul Trips	0													
Hauling	0	21	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0.02	0.09	1.39	0.00	0.00	0.00	6.38	0.00	0.04	6.42
Demolition SB Road/Bridge	2029													
Total Haul Trips	270													
Hauling	8	43	8	36.5	0.01	0.92	0.27	0.01	0.01	0.01	13.83	0.01	0.66	14.50
Vendor	0	59	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	18.5	0.02	0.08	1.31	0.00	0.00	0.00	11.89	0.00	0.07	11.96
Construct SB Road/Bridge	2029													
Total Haul Trips	3460													
Hauling	82	43	8	36.5	0.08	9.47	2.79	0.08	0.15	0.14	177.26	0.17	8.42	185.86
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0.02	0.08	1.31	0.00	0.00	0.00	12.30	0.00	0.07	12.37
Construct SB Road/Bridge	2029													
Total Haul Trips	834													
Hauling	6	154	8	36.5	0.01	0.69	0.20	0.01	0.01	0.01	42.73	0.04	2.03	44.80
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.02	0.08	1.31	0.00	0.00	0.00	43.14	0.01	0.24	43.39
Construct SB Road/Bridge	2029													
Total Haul Trips	0													
Hauling	0	21	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0.02	0.08	1.31	0.00	0.00	0.00	6.25	0.00	0.03	6.29
Construct NB Road/Bridge	2028													
Total Haul Trips	2400													
Hauling	56	43	8	20	0.03	3.69	1.08	0.03	0.06	0.05	69.04	0.07	3.28	72.39
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	61	8	18.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct SB Road/Bridge	2029													
Total Haul Trips	2400													
Hauling	56	43	8	20	0.03	3.54	1.04	0.03	0.05	0.05	67.37	0.07	3.20	70.64
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	61	8	18.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Topanga Canyon - NB/SB Bridge
Start Emissions

			Start Emissions Factor (grams/trip)						Start Emissions Factor (grams/trip)		
			ROG_STREX	NOX_STREX	CO_STREX	SOx_STREX	PM10_STREX	PM2.5_STREX	CO2_STREX	CH4_STREX	N2O_STREX
2027	2027Hauling	Hauling	0.00060894	2.672142352	0.00302137	3.16557E-07	5.30481E-07	4.87758E-07	0.03202066	7.5498E-08	7.36611E-06
2027	2027Vendor	Vendor	0.080213538	1.961946447	0.60365405	5.50826E-05	6.07836E-05	5.58883E-05	5.57177064	0.005494835	0.004037678
2027	2027Worker	Worker	1.038950633	0.251050817	3.01934346	0.000691936	0.002053348	0.001887978	69.9913431	0.06616369	0.030829475
2028	2028Hauling	Hauling	0.000490696	2.636914961	0.00257595	2.71845E-07	4.29594E-07	3.94995E-07	0.02749789	6.56178E-08	5.97594E-06
2028	2028Vendor	Vendor	0.075419112	1.927915654	0.55968909	5.22383E-05	5.76932E-05	5.30468E-05	5.28405692	0.005169504	0.003780947
2028	2028Worker	Worker	0.997046953	0.239560346	2.85187017	0.000675557	0.001941969	0.001785569	68.3345653	0.062483886	0.030029939
2029	2029Hauling	Hauling	0.000383539	2.591170334	0.00214107	2.33546E-07	3.28727E-07	3.02252E-07	0.02362391	5.62127E-08	4.65545E-06
2029	2029Vendor	Vendor	0.069289941	1.883995908	0.51714657	4.94212E-05	5.46034E-05	5.02058E-05	4.99909929	0.004852786	0.003548842
2029	2029Worker	Worker	0.945798618	0.229251267	2.69630558	0.000660221	0.001832244	0.00168468	66.7833	0.059077063	0.029313823
2030	2030Hauling	Hauling	0.00027279	2.546881303	0.00161285	1.92445E-07	2.06187E-07	1.89581E-07	0.01946637	4.71315E-08	4.0595E-06
2030	2030Vendor	Vendor	0.063656597	1.839529651	0.47865041	4.67001E-05	5.18671E-05	4.76899E-05	4.72385215	0.004565454	0.003322989
2030	2030Worker	Worker	0.901632052	0.219772527	2.55165593	0.00064583	0.001725708	0.001586724	65.3276344	0.055883281	0.028658371
2031	2031Hauling	Hauling	0.000210057	2.503276097	0.00139863	1.66951E-07	1.58801E-07	1.46012E-07	0.01688763	4.13015E-08	2.64568E-06
2031	2031Vendor	Vendor	0.059141215	1.792713918	0.44197461	4.38654E-05	4.91716E-05	4.52115E-05	4.43711805	0.004280254	0.003105544
2031	2031Worker	Worker	0.857879142	0.211029605	2.41545051	0.000632455	0.001621689	0.001491083	63.974738	0.052892816	0.028060877
	GWP			N/A					1	25	298

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10	PM2.5	Regional Emissions (MT/year) CO2	CH4	N2O	CO2e
Demolition NB Road/Bridg	2028													
Total Haul Trips	270													
Hauling	8	42	8	36.5	0.00	0.05	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.02
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	18.5	0.09	0.02	0.25	0.00	0.00	0.00	0.16	0.00	0.00	0.19
Construct NB Road/Bridge	2028													
Total Haul Trips	3700													
Hauling	86	43	8	36.5	0.00	0.50	0.00	0.00	0.00	0.00	0.22	0.00	0.00	0.24
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0.09	0.02	0.25	0.00	0.00	0.00	0.17	0.00	0.00	0.19
Construct NB Road/Bridge	2028													
Total Haul Trips	834													
Hauling	6	154	8	36.5	0.00	0.03	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.05
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.09	0.02	0.25	0.00	0.00	0.00	0.58	0.00	0.00	0.67
Construct NB Road/Bridge	2028													
Total Haul Trips	0													
Hauling	0	21	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0.09	0.02	0.25	0.00	0.00	0.00	0.08	0.00	0.00	0.10
Demolition SB Road/Bridge	2029													
Total Haul Trips	270													
Hauling	8	43	8	36.5	0.00	0.05	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01
Vendor	0	59	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	18.5	0.08	0.02	0.24	0.00	0.00	0.00	0.16	0.00	0.00	0.18
Construct SB Road/Bridge	2029													
Total Haul Trips	3460													
Hauling	82	43	8	36.5	0.00	0.47	0.00	0.00	0.00	0.00	0.18	0.00	0.00	0.19
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0.08	0.02	0.24	0.00	0.00	0.00	0.16	0.00	0.00	0.19
Construct SB Road/Bridge	2029													
Total Haul Trips	834													
Hauling	6	154	8	36.5	0.00	0.03	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.05
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.08	0.02	0.24	0.00	0.00	0.00	0.57	0.00	0.00	0.66
Construct SB Road/Bridge	2029													
Total Haul Trips	0													
Hauling	0	21	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0.08	0.02	0.24	0.00	0.00	0.00	0.08	0.00	0.00	0.10
Construct NB Road/Bridge	2028													
Total Haul Trips	2400													
Hauling	56	43	8	20	0.00	0.33	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.15
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	61	8	18.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct SB Road/Bridge	2029													
Total Haul Trips	2400													
Hauling	56	43	8	20	0.00	0.32	0.00	0.00	0.00	0.00	0.12	0.00	0.00	0.13
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	61	8	18.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Topanga Canyon - NB/SB Bridge
Idling Emissions

			Idling Emissions Factor (grams/minute)						Idling Emissions Factor (grams/minute)		
			ROG_IDLEX	NOx_IDLEX	CO_IDLEX	SOx_IDLEX	PM10_IDLEX	PM2.5_IDLEX	CO2_IDLEX	CH4_IDLEX	N2O_IDLEX
2027	2027Hauling	Hauling	0.07592279	0.881696127	1.19921987	0.00159973	0.00047074	0.00044926	181.442358	0.03427011	0.02916541
2027	2027Vendor	Vendor	0.05529965	0.899602458	1.04932075	0.00167506	0.00086494	0.00082645	186.589554	0.03155173	0.02918792
2027	2027Worker	Worker	0	0	0	0	0	0	0	0	0
2028	2028Hauling	Hauling	0.07529788	0.857767875	1.19214339	0.00156045	0.00045204	0.00043133	177.300744	0.03377364	0.02851321
2028	2028Vendor	Vendor	0.05432839	0.863093228	1.0395891	0.00163993	0.00074988	0.00071632	182.978932	0.03134729	0.02865517
2028	2028Worker	Worker	0	0	0	0	0	0	0	0	0
2029	2029Hauling	Hauling	0.07461794	0.835480721	1.18399992	0.00152188	0.00043143	0.00041158	173.194944	0.03323976	0.02786481
2029	2029Vendor	Vendor	0.05333308	0.827999465	1.02749811	0.0016013	0.00065239	0.00062302	178.951612	0.03104801	0.02805443
2029	2029Worker	Worker	0	0	0	0	0	0	0	0	0
2030	2030Hauling	Hauling	0.07391144	0.816007794	1.17493744	0.0014846	0.00041331	0.00039421	169.186161	0.03269373	0.0272299
2030	2030Vendor	Vendor	0.05232472	0.795299763	1.01321823	0.00155966	0.00057171	0.0005458	174.561724	0.03067462	0.02739395
2030	2030Worker	Worker	0	0	0	0	0	0	0	0	0
2031	2031Hauling	Hauling	0.0732853	0.799579641	1.1664382	0.00145061	0.00039768	0.00037924	165.457521	0.03205186	0.02663599
2031	2031Vendor	Vendor	0.05130878	0.763402339	0.99683404	0.00151522	0.00050437	0.00048136	169.805962	0.03011968	0.02667472
2031	2031Worker	Worker	0	0	0	0	0	0	0	0	0
	GWP		N/A	N/A	N/A	N/A	N/A	N/A	1	25	298

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	Idling minutes per Day	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10	PM2.5	Regional Emissions (MT/year) CO2	CH4	N2O	CO2e
Demolition NB Road/Bridge	2028													
Total Haul Trips	270													
Hauling	8	42	8	15	0.02	0.23	0.32	0.00	0.00	0.00	0.72	0.00	0.03	0.76
Vendor	0	60	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct NB Road/Bridge	2028													
Total Haul Trips	3700													
Hauling	86	43	8	15	0.21	2.44	3.39	0.00	0.00	0.00	9.84	0.05	0.47	10.36
Vendor	0	61	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct NB Road/Bridge	2028													
Total Haul Trips	834													
Hauling	6	154	8	15	0.01	0.17	0.24	0.00	0.00	0.00	2.22	0.01	0.11	2.33
Vendor	0	214	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct NB Road/Bridge	2028													
Total Haul Trips	0													
Hauling	0	21	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Demolition SB Road/Bridge	2029													
Total Haul Trips	270													
Hauling	8	43	8	15	0.02	0.22	0.31	0.00	0.00	0.00	0.70	0.00	0.03	0.74
Vendor	0	59	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct SB Road/Bridge	2029													
Total Haul Trips	3460													
Hauling	82	43	8	15	0.20	2.27	3.21	0.00	0.00	0.00	8.99	0.04	0.43	9.46
Vendor	0	61	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct SB Road/Bridge	2029													
Total Haul Trips	834													
Hauling	6	154	8	15	0.01	0.17	0.23	0.00	0.00	0.00	2.17	0.01	0.10	2.28
Vendor	0	214	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct SB Road/Bridge	2029													
Total Haul Trips	0													
Hauling	0	21	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct NB Road/Bridge	2028													
Total Haul Trips	2400													
Hauling	56	43	8	15	0.14	1.59	2.21	0.00	0.00	0.00	6.38	0.03	0.31	6.72
Vendor	0	61	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	61	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct SB Road/Bridge	2029													
Total Haul Trips	2400													
Hauling	56	43	8	15	0.14	1.55	2.19	0.00	0.00	0.00	6.24	0.03	0.30	6.56
Vendor	0	61	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	61	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Topanga Canyon - NB/SB Bridge
Road Dust, Break Wear, and Tire wear Emissions

		Emission Factors (grams/mile)					
		PM10			PM2.5		
		RD	PM10_PMBW	PM10_PMTW	RD	PM2.5_PMBW	PM2.5_PMTW
2027	2027Hauling Hauling	0.29984991	0.084297987	0.03545106	0.07359952	0.0295043	0.00886277
2027	2027Vendor Vendor	0.29984991	0.063623189	0.02372553	0.07359952	0.02226812	0.00593138
2027	2027Worker Worker	0.29984991	0.009305649	0.008	0.07359952	0.00325698	0.002
2028	2028Hauling Hauling	0.29984991	0.084486989	0.03545475	0.07359952	0.02957045	0.00886369
2028	2028Vendor Vendor	0.29984991	0.063544145	0.02372738	0.07359952	0.02224045	0.00593184
2028	2028Worker Worker	0.29984991	0.009284129	0.008	0.07359952	0.00324945	0.002
2029	2029Hauling Hauling	0.29984991	0.084584422	0.03545835	0.07359952	0.02960455	0.00886459
2029	2029Vendor Vendor	0.29984991	0.063359545	0.02372918	0.07359952	0.02217584	0.00593229
2029	2029Worker Worker	0.29984991	0.00926272	0.008	0.07359952	0.00324195	0.002
2030	2030Hauling Hauling	0.29984991	0.08460378	0.03546191	0.07359952	0.02961132	0.00886548
2030	2030Vendor Vendor	0.29984991	0.063078834	0.02373095	0.07359952	0.02207759	0.00593274
2030	2030Worker Worker	0.29984991	0.00924132	0.008	0.07359952	0.00323446	0.002
2031	2031Hauling Hauling	0.29984991	0.084504548	0.03546578	0.07359952	0.02957659	0.00886644
2031	2031Vendor Vendor	0.29984991	0.062682863	0.02373289	0.07359952	0.021939	0.00593322
2031	2031Worker Worker	0.29984991	0.009221285	0.008	0.07359952	0.00322745	0.002

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day)					
						PM10			PM2.5	
					RD	BW	TW	RD	BW	TW
Demolition NB Road/Bridge	2028									
Total Haul Trips	270									
Hauling	8	42	8	36.5	0.19	0.05	0.02	0.05	0.02	0.01
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Construct NB Road/Bridge	2028									
Total Haul Trips	3700									
Hauling	86	43	8	36.5	2.08	0.58	0.25	0.51	0.20	0.06
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Construct NB Road/Bridge	2028									
Total Haul Trips	834									
Hauling	6	154	8	36.5	0.14	0.04	0.02	0.04	0.01	0.00
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Construct NB Road/Bridge	2028									
Total Haul Trips	0									
Hauling	0	21	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Demolition SB Road/Bridge	2029									
Total Haul Trips	270									
Hauling	8	43	8	36.5	0.19	0.05	0.02	0.05	0.02	0.01
Vendor	0	59	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Construct SB Road/Bridge	2029									
Total Haul Trips	3460									
Hauling	82	43	8	36.5	1.98	0.56	0.23	0.49	0.20	0.06
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Construct SB Road/Bridge	2029									
Total Haul Trips	834									
Hauling	6	154	8	36.5	0.14	0.04	0.02	0.04	0.01	0.00
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Construct SB Road/Bridge	2029									
Total Haul Trips	0									
Hauling	0	21	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Construct NB Road/Bridge	2028									
Total Haul Trips	2400									
Hauling	56	43	8	20	0.74	0.21	0.09	0.18	0.07	0.02
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	61	8	18.5	0.00	0.00	0.00	0.00	0.00	0.00
Construct SB Road/Bridge	2029									
Total Haul Trips	2400									
Hauling	56	43	8	20	0.74	0.21	0.09	0.18	0.07	0.02
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	61	8	18.5	0.00	0.00	0.00	0.00	0.00	0.00

Topanga Canyon - NB/SB Bridge
Road Dust

Paved Road Dust Emission Factors (Assumes No Precipitation)

Formula: $EF_{Dust,P} = (k\ (sL)^{0.91} \times (W)^{1.02})$

Where:

$EF_{Dust,P}$ =	Paved Road Dust Emission Factor (having the same units as k)
k =	particle size multiplier
sL =	road surface silt loading (g/m^2)
W =	average fleet vehicle weight (tons) (CARB uses 2.4 tons as a fleet average vehicle weight factor)

	Emission Factor (grams per VMT)	
	PM10	PM2.5
k	0.9979	0.2449
sL	0.1	0.1
W	2.4	2.4
$EF_{Dust,P}$	3.00E-01	7.36E-02

Unpaved Road Dust Emission Factors (Assumes No Precipitation)

Formula: $EF_{Dust,U} = (k\ (\ s / 12)^{1} \times (Sp / 30)^{0.5} / (M / 0.5)^{0.2}) - C)$

Where:

$EF_{Dust,U}$ =	Unpaved Road Dust Emission Factor (having the same units as k)
k =	particle size multiplier
s =	surface material silt content (%)
Sp =	mean vehicle speed (mph)
M =	surface material moisture content (%)
C =	Emission Factor for 1980s vehicle fleet exhaust, brake wear, and tire wear

	Emission Factor (grams per VMT)	
	PM10	PM2.5
k	816.47	81.65
s	4.3%	4.3%
Sp	15	15
M	0.5%	0.5%
C	0.00047	0.00036
$EF_{Dust,U}$	5.20E+00	5.19E-01

Sources:

SCAQMD, CalEEMod, Version 2022.1.

CARB, *Entrained Dust from Paved Road Travel: Emission Estimation Methodology Background Document* , (1997).

USEPA, *AP-42* , Fifth Edition, Volume I, Chapter 13.2.1 - Paved Roads, (2011).

ESA, 2023.

Topanga Canyon - VS
Total Emissions

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Idling per Day (minutes)	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10 Dust	PM10 Exh	Total PM10	PM2.5 Dust	PM2.5 Exh	Total PM2.5	(MT/yr) Total CO2e
Site Preparation	2027															
Total Haul Trips	0															
Hauling	0	1	8	36.5	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	1	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	10	1	8	18.5	0	0.03	0.03	0.43	0.00	0.13	0.00	0.13	0.03	0.00	0.03	0.05
					Total	0.03	0.03	0.43	0.00	0.13	0.00	0.13	0.03	0.00	0.03	0.05
Grading	2027				Workers+Ver	0.03	0.03	0.43	0.00	0.13	0.00	0.13	0.03	0.00	0.03	
Total Haul Trips	0															
Hauling	0	4	8	36.5	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	4	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	16	4	8	18.5	0	0.05	0.05	0.70	0.00	0.21	0.00	0.21	0.05	0.00	0.05	0.34
					Total	0.05	0.05	0.70	0.00	0.21	0.00	0.21	0.05	0.00	0.05	0.34
Building Construction	2027				Workers+Ver	0.05	0.05	0.70	0.00	0.21	0.00	0.21	0.05	0.00	0.05	
Total Haul Trips	0															
Hauling	0	140	8	36.5	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	6	140	8	10.2	15	0.01	0.35	0.27	0.00	0.05	0.00	0.05	0.01	0.00	0.02	14.19
Worker	14	140	8	18.5	0	0.04	0.04	0.61	0.00	0.18	0.00	0.18	0.05	0.00	0.05	10.53
					Total	0.05	0.40	0.87	0.00	0.23	0.00	0.24	0.06	0.00	0.06	24.72
Paving	2027				Workers+Ver	0.05	0.40	0.87	0.00	0.23	0.00	0.24	0.06	0.00	0.06	
Total Haul Trips	0															
Hauling	0	7	8	36.5	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	7	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	36	7	8	18.5	0	0.10	0.11	1.56	0.00	0.47	0.00	0.47	0.12	0.00	0.12	1.35
					Total	0.10	0.11	1.56	0.00	0.47	0.00	0.47	0.12	0.00	0.12	1.35
Architectural Coating	2027				Workers+Ver	0.10	0.11	1.56	0.00	0.47	0.00	0.47	0.12	0.00	0.12	
Total Haul Trips	0															
Hauling	0	7	8	36.5	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	7	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	2	7	8	18.5	0	0.01	0.01	0.09	0.00	0.03	0.00	0.03	0.01	0.00	0.01	0.08
					Total	0.01	0.01	0.09	0.00	0.03	0.00	0.03	0.01	0.00	0.01	0.08
					Workers+Ver	0.01	0.01	0.09	0.00	0.03	0.00	0.03	0.01	0.00	0.01	

Topanga Canyon - VS
Running Emissions

		Running Emissions Factor (grams/mile)						Running Emissions Factor (grams/mile)		
		ROG_RUNEX	NOx_RUNEX	CO_RUNEX	SOx_RUNEX	PM10_RUNEX	PM2.5_RUNEX	CO2_RUNEX	CH4_RUNEX	N2O_RUNEX
2027	2027Hauling Hauling	0.013128	1.553518611	0.45473657	0.01336714	0.02273486	0.02174732	1471.80075	0.0608523	0.23462364
2027	2027Vendor Vendor	0.01570588	1.102331968	0.36327753	0.01214871	0.01475662	0.01411185	1311.1435	0.03509759	0.18307889
2027	2027Worker Worker	0.01447264	0.062492418	0.90233334	0.00281062	0.00150729	0.0013867	284.320587	0.00354266	0.00566149
2028	2028Hauling Hauling	0.01261339	1.493718015	0.43877031	0.01305596	0.02247317	0.02149714	1438.29866	0.05768159	0.22931835
2028	2028Vendor Vendor	0.01417298	1.038868065	0.3360531	0.01185313	0.01426835	0.01364491	1280.01295	0.03342244	0.17922194
2028	2028Worker Worker	0.01314756	0.057035459	0.85167037	0.00274948	0.00140448	0.00129194	278.134904	0.00325313	0.00533773
2029	2029Hauling Hauling	0.01213472	1.434866903	0.4224926	0.01273534	0.0221686	0.0212059	1403.60667	0.05465536	0.22381566
2029	2029Vendor Vendor	0.0128196	0.978781777	0.31101237	0.01152628	0.01380314	0.01320005	1245.46404	0.03180989	0.17489835
2029	2029Worker Worker	0.01192021	0.051957034	0.80464317	0.00269297	0.00130724	0.00120239	272.417637	0.00298654	0.00503952
2030	2030Hauling Hauling	0.01169729	1.381905725	0.40596438	0.01241489	0.02183595	0.02088778	1368.72007	0.05170538	0.2182712
2030	2030Vendor Vendor	0.01168751	0.9252091	0.28941545	0.01117412	0.01336285	0.01277903	1208.11234	0.03023265	0.17022289
2030	2030Worker Worker	0.01081241	0.047255061	0.76242747	0.00264062	0.00121547	0.00111789	267.121939	0.00274623	0.00476556
2031	2031Hauling Hauling	0.01126827	1.331771303	0.38663416	0.01209496	0.02148002	0.02054741	1333.31591	0.04842446	0.21262163
2031	2031Vendor Vendor	0.01070694	0.874998281	0.26868024	0.01079467	0.01293916	0.01237394	1167.57711	0.02847022	0.16520071
2031	2031Worker Worker	0.00977403	0.042746598	0.72305591	0.00259298	0.00112929	0.00103861	262.302837	0.0025216	0.00450761
0	GWP	N/A	N/A	N/A	N/A	N/A	N/A	1	25	298

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10	PM2.5	Regional Emissions (MT/year) CO2	CH4	N2O	CO2e
Site Preparation	2027													
Total Haul Trips	0													
Hauling	0	1	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	1	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	10	1	8	18.5	0.01	0.03	0.37	0.00	0.00	0.00	0.05	0.00	0.00	0.05
Grading	2027													
Total Haul Trips	0													
Hauling	0	4	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	4	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	16	4	8	18.5	0.01	0.04	0.59	0.00	0.00	0.00	0.34	0.00	0.00	0.34
Building Construction	2027													
Total Haul Trips	0													
Hauling	0	140	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	6	140	8	10.2	0.00	0.15	0.05	0.00	0.00	0.00	11.23	0.01	0.47	11.71
Worker	14	140	8	18.5	0.01	0.04	0.52	0.00	0.00	0.00	10.31	0.00	0.06	10.37
Paving	2027													
Total Haul Trips	0													
Hauling	0	7	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	7	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	36	7	8	18.5	0.02	0.09	1.32	0.00	0.00	0.00	1.33	0.00	0.01	1.33
Architectural Coating	2027													
Total Haul Trips	0													
Hauling	0	7	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	7	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	2	7	8	18.5	0.00	0.01	0.07	0.00	0.00	0.00	0.07	0.00	0.00	0.07

Topanga Canyon - VS
Start Emissions

			Start Emissions Factor (grams/trip)						Start Emissions Factor (grams/trip)		
			ROG_STREX	NOX_STREX	CO_STREX	SOx_STREX	PM10_STREX	PM2.5_STREX	CO2_STREX	CH4_STREX	N2O_STREX
2027	2027Hauling	Hauling	0.00060894	2.672142352	0.00302137	3.16557E-07	5.30481E-07	4.87758E-07	0.03202066	7.5498E-08	7.36611E-06
2027	2027Vendor	Vendor	0.080213538	1.961946447	0.60365405	5.50826E-05	6.07836E-05	5.58883E-05	5.57177064	0.005494835	0.004037678
2027	2027Worker	Worker	1.038950633	0.251050817	3.01934346	0.000691936	0.002053348	0.001887978	69.9913431	0.06616369	0.030829475
2028	2028Hauling	Hauling	0.000490696	2.636914961	0.00257595	2.71845E-07	4.29594E-07	3.94995E-07	0.02749789	6.56178E-08	5.97594E-06
2028	2028Vendor	Vendor	0.075419112	1.927915654	0.55968909	5.22383E-05	5.76932E-05	5.30468E-05	5.28405692	0.005169504	0.003780947
2028	2028Worker	Worker	0.997046953	0.239560346	2.85187017	0.000675557	0.001941969	0.001785569	68.3345653	0.062483886	0.030029939
2029	2029Hauling	Hauling	0.000383539	2.591170334	0.00214107	2.33546E-07	3.28727E-07	3.02252E-07	0.02362391	5.62127E-08	4.65545E-06
2029	2029Vendor	Vendor	0.069289941	1.883995908	0.51714657	4.94212E-05	5.46034E-05	5.02058E-05	4.99909929	0.004852786	0.003548842
2029	2029Worker	Worker	0.945798618	0.229251267	2.69630558	0.000660221	0.001832244	0.00168468	66.7833	0.059077063	0.029313823
2030	2030Hauling	Hauling	0.00027279	2.546881303	0.00161285	1.92445E-07	2.06187E-07	1.89581E-07	0.01946637	4.71315E-08	4.0595E-06
2030	2030Vendor	Vendor	0.063656597	1.839529651	0.47865041	4.67001E-05	5.18671E-05	4.76899E-05	4.72385215	0.004565454	0.003322989
2030	2030Worker	Worker	0.901632052	0.219772527	2.55165593	0.00064583	0.001725708	0.001586724	65.3276344	0.055883281	0.028658371
2031	2031Hauling	Hauling	0.000210057	2.503276097	0.00139863	1.66951E-07	1.58801E-07	1.46012E-07	0.01688763	4.13015E-08	2.64568E-06
2031	2031Vendor	Vendor	0.059141215	1.792713918	0.44197461	4.38654E-05	4.91716E-05	4.52115E-05	4.43711805	0.004280254	0.003105544
2031	2031Worker	Worker	0.857879142	0.211029605	2.41545051	0.000632455	0.001621689	0.001491083	63.974738	0.052892816	0.028060877
	GWP			N/A					1	25	298

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10	PM2.5	Regional Emissions (MT/year) CO2	CH4	N2O	CO2e
Site Preparation	2027													
Total Haul Trips	0													
Hauling	0	1	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	1	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	10	1	8	18.5	0.02	0.01	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grading	2027													
Total Haul Trips	0													
Hauling	0	4	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	4	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	16	4	8	18.5	0.04	0.01	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Building Construction	2027													
Total Haul Trips	0													
Hauling	0	140	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	6	140	8	10.2	0.00	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Worker	14	140	8	18.5	0.03	0.01	0.09	0.00	0.00	0.00	0.14	0.00	0.00	0.16
Paving	2027													
Total Haul Trips	0													
Hauling	0	7	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	7	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	36	7	8	18.5	0.08	0.02	0.24	0.00	0.00	0.00	0.02	0.00	0.00	0.02
Architectural Coating	2027													
Total Haul Trips	0													
Hauling	0	7	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	7	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	2	7	8	18.5	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Topanga Canyon - VS
Idling Emissions

			Idling Emissions Factor (grams/minute)						Idling Emissions Factor (grams/minute)		
			ROG_IDLEX	NOx_IDLEX	CO_IDLEX	SOx_IDLEX	PM10_IDLEX	PM2.5_IDLEX	CO2_IDLEX	CH4_IDLEX	N2O_IDLEX
2027	2027Hauling	Hauling	0.07592279	0.881696127	1.19921987	0.00159973	0.00047074	0.00044926	181.442358	0.03427011	0.02916541
2027	2027Vendor	Vendor	0.05529965	0.899602458	1.04932075	0.00167506	0.00086494	0.00082645	186.589554	0.03155173	0.02918792
2027	2027Worker	Worker	0	0	0	0	0	0	0	0	0
2028	2028Hauling	Hauling	0.07529788	0.857767875	1.19214339	0.00156045	0.00045204	0.00043133	177.300744	0.03377364	0.02851321
2028	2028Vendor	Vendor	0.05432839	0.863093228	1.0395891	0.00163993	0.00074988	0.00071632	182.978932	0.03134729	0.02865517
2028	2028Worker	Worker	0	0	0	0	0	0	0	0	0
2029	2029Hauling	Hauling	0.07461794	0.835480721	1.18399992	0.00152188	0.00043143	0.00041158	173.194944	0.03323976	0.02786481
2029	2029Vendor	Vendor	0.05333308	0.827999465	1.02749811	0.0016013	0.00065239	0.00062302	178.951612	0.03104801	0.02805443
2029	2029Worker	Worker	0	0	0	0	0	0	0	0	0
2030	2030Hauling	Hauling	0.07391144	0.816007794	1.17493744	0.0014846	0.00041331	0.00039421	169.186161	0.03269373	0.0272299
2030	2030Vendor	Vendor	0.05232472	0.795299763	1.01321823	0.00155966	0.00057171	0.0005458	174.561724	0.03067462	0.02739395
2030	2030Worker	Worker	0	0	0	0	0	0	0	0	0
2031	2031Hauling	Hauling	0.0732853	0.799579641	1.1664382	0.00145061	0.00039768	0.00037924	165.457521	0.03205186	0.02663599
2031	2031Vendor	Vendor	0.05130878	0.763402339	0.99683404	0.00151522	0.00050437	0.00048136	169.805962	0.03011968	0.02667472
2031	2031Worker	Worker	0	0	0	0	0	0	0	0	0
		GWP	N/A	N/A	N/A	N/A	N/A	N/A	1	25	298

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	Idling minutes per Day	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10	PM2.5	Regional Emissions (MT/year) CO2	CH4	N2O	CO2e
Site Preparation	2027													
Total Haul Trips	0													
Hauling	0	1	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	1	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	10	1	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grading	2027													
Total Haul Trips	0													
Hauling	0	4	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	4	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	16	4	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Building Construction	2027													
Total Haul Trips	0													
Hauling	0	140	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	6	140	8	15	0.01	0.18	0.21	0.00	0.00	0.00	2.35	0.01	0.11	2.47
Worker	14	140	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving	2027													
Total Haul Trips	0													
Hauling	0	7	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	7	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	36	7	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Architectural Coating	2027													
Total Haul Trips	0													
Hauling	0	7	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	7	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	2	7	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Topanga Canyon - VS
Road Dust, Break Wear, and Tire wear Emissions

		Emission Factors (grams/mile)					
			PM10			PM2.5	
		RD	PM10_PMBW	PM10_PMTW	RD	PM2.5_PMBW	PM2.5_PMTW
2027	2027Hauling Hauling	0.29984991	0.084297987	0.03545106	0.07359952	0.0295043	0.00886277
2027	2027Vendor Vendor	0.29984991	0.063623189	0.02372553	0.07359952	0.02226812	0.00593138
2027	2027Worker Worker	0.29984991	0.009305649	0.008	0.07359952	0.00325698	0.002
2028	2028Hauling Hauling	0.29984991	0.084486989	0.03545475	0.07359952	0.02957045	0.00886369
2028	2028Vendor Vendor	0.29984991	0.063544145	0.02372738	0.07359952	0.02224045	0.00593184
2028	2028Worker Worker	0.29984991	0.009284129	0.008	0.07359952	0.00324945	0.002
2029	2029Hauling Hauling	0.29984991	0.084584422	0.03545835	0.07359952	0.02960455	0.00886459
2029	2029Vendor Vendor	0.29984991	0.063359545	0.02372918	0.07359952	0.02217584	0.00593229
2029	2029Worker Worker	0.29984991	0.00926272	0.008	0.07359952	0.00324195	0.002
2030	2030Hauling Hauling	0.29984991	0.08460378	0.03546191	0.07359952	0.02961132	0.00886548
2030	2030Vendor Vendor	0.29984991	0.063078834	0.02373095	0.07359952	0.02207759	0.00593274
2030	2030Worker Worker	0.29984991	0.00924132	0.008	0.07359952	0.00323446	0.002
2031	2031Hauling Hauling	0.29984991	0.084504548	0.03546578	0.07359952	0.02957659	0.00886644
2031	2031Vendor Vendor	0.29984991	0.062682863	0.02373289	0.07359952	0.021939	0.00593322
2031	2031Worker Worker	0.29984991	0.009221285	0.008	0.07359952	0.00322745	0.002

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day)					
						PM10			PM2.5	
					RD	BW	TW	RD	BW	TW
Site Preparation	2027									
Total Haul Trips	0									
Hauling	0	1	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	1	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	10	1	8	18.5	0.12	0.00	0.00	0.03	0.00	0.00
Grading	2027									
Total Haul Trips	0									
Hauling	0	4	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	4	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	16	4	8	18.5	0.20	0.01	0.01	0.05	0.00	0.00
Building Construction	2027									
Total Haul Trips	0									
Hauling	0	140	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	6	140	8	10.2	0.04	0.01	0.00	0.01	0.00	0.00
Worker	14	140	8	18.5	0.17	0.01	0.00	0.04	0.00	0.00
Paving	2027									
Total Haul Trips	0									
Hauling	0	7	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	7	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	36	7	8	18.5	0.44	0.01	0.01	0.11	0.00	0.00
Architectural Coating	2027									
Total Haul Trips	0									
Hauling	0	7	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	7	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	2	7	8	18.5	0.02	0.00	0.00	0.01	0.00	0.00

Topanga Canyon - VS
Road Dust

Paved Road Dust Emission Factors (Assumes No Precipitation)

Formula: $EF_{Dust,P} = (k\ (sL)^{0.91} \times (W)^{1.02})$

Where:

$EF_{Dust,P}$ =	Paved Road Dust Emission Factor (having the same units as k)
k =	particle size multiplier
sL =	road surface silt loading (g/m^2)
W =	average fleet vehicle weight (tons) (CARB uses 2.4 tons as a fleet average vehicle weight factor)

	Emission Factor (grams per VMT)	
	PM10	PM2.5
k	0.9979	0.2449
sL	0.1	0.1
W	2.4	2.4
$EF_{Dust,P}$	3.00E-01	7.36E-02

Unpaved Road Dust Emission Factors (Assumes No Precipitation)

Formula: $EF_{Dust,U} = (k\ (\ s / 12)^{1} \times (Sp / 30)^{0.5} / (M / 0.5)^{0.2}) - C)$

Where:

$EF_{Dust,U}$ =	Unpaved Road Dust Emission Factor (having the same units as k)
k =	particle size multiplier
s =	surface material silt content (%)
Sp =	mean vehicle speed (mph)
M =	surface material moisture content (%)
C =	Emission Factor for 1980s vehicle fleet exhaust, brake wear, and tire wear

	Emission Factor (grams per VMT)	
	PM10	PM2.5
k	816.47	81.65
s	4.3%	4.3%
Sp	15	15
M	0.5%	0.5%
C	0.00047	0.00036
$EF_{Dust,U}$	5.20E+00	5.19E-01

Sources:

SCAQMD, CalEEMod, Version 2022.1.
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P.2-3 Project Construction Modeling

Topanga-Temp Bridge-Con Detailed Report

Table of Contents

1. Basic Project Information

1.1. Basic Project Information

1.2. Land Use Types

1.3. User-Selected Emission Reduction Measures by Emissions Sector

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

2.2. Construction Emissions by Year, Unmitigated

3. Construction Emissions Details

3.1. Demo + Parking Provisions (2027) - Unmitigated

3.3. Demo Temp Bridge (2030) - Unmitigated

3.5. Restore Beach Area (2030) - Unmitigated

3.7. Unsuitable Material Replacement (2027) - Unmitigated

3.9. Construct Temp Bridge - Grading (2027) - Unmitigated

3.11. Lagoon Grading (2030) - Unmitigated

3.13. Construct Temp Bridge - BC (2027) - Unmitigated

3.15. Construct DBH Facilities (2030) - Unmitigated

3.17. Construct Temp Bridge - Paving (2027) - Unmitigated

3.19. Relocate Utilities (2027) - Unmitigated

4. Operations Emissions Details

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

5. Activity Data

5.1. Construction Schedule

5.2. Off-Road Equipment

5.2.1. Unmitigated

5.3. Construction Vehicles

5.3.1. Unmitigated

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

5.5. Architectural Coatings

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

5.6.2. Construction Earthmoving Control Strategies

5.7. Construction Paving

5.8. Construction Electricity Consumption and Emissions Factors

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

5.18.2. Sequestration

5.18.2.1. Unmitigated

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

6.2. Initial Climate Risk Scores

6.3. Adjusted Climate Risk Scores

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

7.2. Healthy Places Index Scores

7.3. Overall Health & Equity Scores

7.4. Health & Equity Measures

7.5. Evaluation Scorecard

7.6. Health & Equity Custom Measures

8. User Changes to Default Data

1. Basic Project Information

1.1. Basic Project Information

Data Field	Value
Project Name	Topanga-Temp Bridge-Con
Construction Start Date	1/1/2027
Lead Agency	—
Land Use Scale	Project/site
Analysis Level for Defaults	County
Windspeed (m/s)	2.70
Precipitation (days)	4.60
Location	18711 Pacific Coast Hwy, Malibu, CA 90265, USA
County	Los Angeles-South Coast
City	Unincorporated
Air District	South Coast AQMD
Air Basin	South Coast
TAZ	3802
EDFZ	7
Electric Utility	Southern California Edison
Gas Utility	Southern California Gas
App Version	2022.1.1.21

1.2. Land Use Types

Land Use Subtype	Size	Unit	Lot Acreage	Building Area (sq ft)	Landscape Area (sq ft)	Special Landscape Area (sq ft)	Population	Description
Other Asphalt Surfaces	13.5	1000sqft	0.31	0.00	0.00	—	—	—

General Office Building	1.50	1000sqft	0.03	1,500	0.00	—	—	—
Other Non-Asphalt Surfaces	2.30	1000sqft	0.05	0.00	0.00	—	—	—

1.3. User-Selected Emission Reduction Measures by Emissions Sector

No measures selected

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Un/Mit.	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	2.41	2.03	16.5	19.4	0.04	0.68	2.76	3.44	0.62	1.34	1.96	—	4,145	4,145	0.17	0.03	0.00	4,159
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	4.64	3.90	32.7	37.9	0.07	1.38	4.03	5.41	1.27	1.53	2.79	—	7,265	7,265	0.29	0.06	0.01	7,289
Average Daily (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	1.63	1.37	11.6	13.3	0.02	0.51	0.91	1.42	0.47	0.37	0.83	—	2,602	2,602	0.10	0.02	0.03	2,611
Annual (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.30	0.25	2.12	2.42	< 0.005	0.09	0.17	0.26	0.08	0.07	0.15	—	431	431	0.02	< 0.005	< 0.005	432

2.2. Construction Emissions by Year, Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Year	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily - Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2027	2.41	2.03	16.5	19.4	0.04	0.68	2.76	3.44	0.62	1.34	1.96	—	4,145	4,145	0.17	0.03	0.00	4,159
2030	0.93	0.78	4.64	7.57	0.02	0.19	0.23	0.43	0.18	0.03	0.20	—	2,045	2,045	0.08	0.02	0.00	2,052
Daily - Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2027	4.64	3.90	32.7	37.9	0.07	1.38	4.03	5.41	1.27	1.53	2.79	—	7,265	7,265	0.29	0.06	0.01	7,289
2030	0.93	0.78	5.87	7.57	0.02	0.27	0.23	0.43	0.24	0.03	0.24	—	2,045	2,045	0.08	0.02	0.00	2,052
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2027	1.63	1.37	11.6	13.3	0.02	0.51	0.91	1.42	0.47	0.37	0.83	—	2,602	2,602	0.10	0.02	0.03	2,611
2030	0.73	0.62	4.10	6.60	0.01	0.16	0.19	0.35	0.15	0.02	0.17	—	1,570	1,570	0.06	0.01	0.00	1,576
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2027	0.30	0.25	2.12	2.42	< 0.005	0.09	0.17	0.26	0.08	0.07	0.15	—	431	431	0.02	< 0.005	< 0.005	432
2030	0.13	0.11	0.75	1.20	< 0.005	0.03	0.03	0.06	0.03	< 0.005	0.03	—	260	260	0.01	< 0.005	0.00	261

3. Construction Emissions Details

3.1. Demo + Parking Provisions (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	2.23	1.88	16.3	18.5	0.03	0.70	—	0.70	0.65	—	0.65	—	3,120	3,120	0.13	0.03	—	3,131
Demolition	—	—	—	—	—	—	1.25	1.25	—	0.19	0.19	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.37	0.31	2.67	3.04	< 0.005	0.12	—	0.12	0.11	—	0.11	—	513	513	0.02	< 0.005	—	515
Demolition	—	—	—	—	—	—	0.21	0.21	—	0.03	0.03	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.07	0.06	0.49	0.56	< 0.005	0.02	—	0.02	0.02	—	0.02	—	84.9	84.9	< 0.005	< 0.005	—	85.2
Demolition	—	—	—	—	—	—	0.04	0.04	—	0.01	0.01	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.3. Demo Temp Bridge (2030) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.30	0.25	2.51	3.94	0.01	0.05	—	0.05	0.05	—	0.05	—	574	574	0.02	< 0.005	—	576
Demolition	—	—	—	—	—	—	0.11	0.11	—	0.02	0.02	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.05	0.04	0.41	0.64	< 0.005	0.01	—	0.01	0.01	—	0.01	—	92.8	92.8	< 0.005	< 0.005	—	93.1

Demolitio	—	—	—	—	—	—	0.02	0.02	—	< 0.005	< 0.005	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.01	0.01	0.07	0.12	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	15.4	15.4	< 0.005	< 0.005	—	15.4
Demolitio n	—	—	—	—	—	—	< 0.005	< 0.005	—	< 0.005	< 0.005	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.5. Restore Beach Area (2030) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.43	0.36	2.81	5.58	0.01	0.13	—	0.13	0.12	—	0.12	—	858	858	0.03	0.01	—	861
Dust From Material Movement	—	—	—	—	—	—	0.21	0.21	—	0.02	0.02	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.07	0.06	0.47	0.93	< 0.005	0.02	—	0.02	0.02	—	0.02	—	143	143	0.01	< 0.005	—	144
Dust From Material Movement	—	—	—	—	—	—	0.03	0.03	—	< 0.005	< 0.005	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.01	0.01	0.09	0.17	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	23.8	23.8	< 0.005	< 0.005	—	23.8

Dust From Material Movement	—	—	—	—	—	—	0.01	0.01	—	< 0.005	< 0.005	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.7. Unsuitable Material Replacement (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	2.19	1.84	14.7	16.4	0.03	0.62	—	0.62	0.57	—	0.57	—	3,713	3,713	0.15	0.03	—	3,725
Dust From Material Movement	—	—	—	—	—	—	2.78	2.78	—	1.34	1.34	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.36	0.30	2.41	2.70	0.01	0.10	—	0.10	0.09	—	0.09	—	610	610	0.02	< 0.005	—	612
Dust From Material Movement	—	—	—	—	—	—	0.46	0.46	—	0.22	0.22	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.07	0.06	0.44	0.49	< 0.005	0.02	—	0.02	0.02	—	0.02	—	101	101	< 0.005	< 0.005	—	101
Dust From Material Movement	—	—	—	—	—	—	0.08	0.08	—	0.04	0.04	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.9. Construct Temp Bridge - Grading (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	2.19	1.84	14.7	16.4	0.03	0.62	—	0.62	0.57	—	0.57	—	3,713	3,713	0.15	0.03	—	3,725

Dust From Material Movement	—	—	—	—	—	—	2.76	2.76	—	1.34	1.34	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.18	0.15	1.21	1.35	< 0.005	0.05	—	0.05	0.05	—	0.05	—	305	305	0.01	< 0.005	—	306
Dust From Material Movement	—	—	—	—	—	—	0.23	0.23	—	0.11	0.11	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.03	0.03	0.22	0.25	< 0.005	0.01	—	0.01	0.01	—	0.01	—	50.5	50.5	< 0.005	< 0.005	—	50.7
Dust From Material Movement	—	—	—	—	—	—	0.04	0.04	—	0.02	0.02	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.11. Lagoon Grading (2030) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.93	0.78	4.64	7.57	0.02	0.19	—	0.19	0.18	—	0.18	—	2,045	2,045	0.08	0.02	—	2,052
Dust From Material Movement	—	—	—	—	—	—	0.23	0.23	—	0.03	0.03	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipment	0.93	0.78	4.64	7.57	0.02	0.19	—	0.19	0.18	—	0.18	—	2,045	2,045	0.08	0.02	—	2,052
Dust From Material Movement	—	—	—	—	—	—	0.23	0.23	—	0.03	0.03	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.54	0.46	2.72	4.44	0.01	0.11	—	0.11	0.10	—	0.10	—	1,199	1,199	0.05	0.01	—	1,203
Dust From Material Movement	—	—	—	—	—	—	0.14	0.14	—	0.02	0.02	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.10	0.08	0.50	0.81	< 0.005	0.02	—	0.02	0.02	—	0.02	—	198	198	0.01	< 0.005	—	199
Dust From Material Movement	—	—	—	—	—	—	0.03	0.03	—	< 0.005	< 0.005	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.13. Construct Temp Bridge - BC (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.92	0.78	6.87	7.04	0.02	0.33	—	0.33	0.31	—	0.31	—	1,595	1,595	0.06	0.01	—	1,601
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipment	0.92	0.78	6.87	7.04	0.02	0.33	—	0.33	0.31	—	0.31	—	1,595	1,595	0.06	0.01	—	1,601
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.31	0.26	2.34	2.39	0.01	0.11	—	0.11	0.10	—	0.10	—	542	542	0.02	< 0.005	—	544
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.06	0.05	0.43	0.44	< 0.005	0.02	—	0.02	0.02	—	0.02	—	89.7	89.7	< 0.005	< 0.005	—	90.0
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.15. Construct DBH Facilities (2030) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.82	0.69	5.87	6.97	0.02	0.27	—	0.27	0.24	—	0.24	—	1,596	1,596	0.06	0.01	—	1,601
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.07	0.06	0.50	0.59	< 0.005	0.02	—	0.02	0.02	—	0.02	—	136	136	0.01	< 0.005	—	136
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.01	0.01	0.09	0.11	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	22.4	22.4	< 0.005	< 0.005	—	22.5
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.17. Construct Temp Bridge - Paving (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipment	1.75	1.47	12.8	13.6	0.02	0.59	—	0.59	0.55	—	0.55	—	2,405	2,405	0.10	0.02	—	2,413
Paving	—	0.01	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.29	0.24	2.10	2.23	< 0.005	0.10	—	0.10	0.09	—	0.09	—	395	395	0.02	< 0.005	—	397
Paving	—	< 0.005	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.05	0.04	0.38	0.41	< 0.005	0.02	—	0.02	0.02	—	0.02	—	65.4	65.4	< 0.005	< 0.005	—	65.7
Paving	—	< 0.005	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.04	0.03	0.04	0.51	0.00	0.00	0.13	0.13	0.00	0.03	0.03	—	126	126	< 0.005	< 0.005	0.01	127
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.01	0.09	0.00	0.00	0.02	0.02	0.00	0.01	0.01	—	21.0	21.0	< 0.005	< 0.005	0.03	21.3
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	< 0.005	0.02	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	3.48	3.48	< 0.005	< 0.005	< 0.005	3.52
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.19. Relocate Utilities (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.22	0.19	1.80	2.93	< 0.005	0.05	—	0.05	0.05	—	0.05	—	432	432	0.02	< 0.005	—	434
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.22	0.19	1.80	2.93	< 0.005	0.05	—	0.05	0.05	—	0.05	—	432	432	0.02	< 0.005	—	434
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.11	0.09	0.90	1.46	< 0.005	0.03	—	0.03	0.02	—	0.02	—	215	215	0.01	< 0.005	—	216
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipment	0.02	0.02	0.16	0.27	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	35.7	35.7	< 0.005	< 0.005	—	35.8
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

4. Operations Emissions Details

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Vegetation	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Species	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Sequest	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

5. Activity Data

5.1. Construction Schedule

Phase Name	Phase Type	Start Date	End Date	Days Per Week	Work Days per Phase	Phase Description
Demo + Parking Provisions	Demolition	1/1/2027	3/1/2027	7.00	60.0	—
Demo Temp Bridge	Demolition	1/1/2030	2/28/2030	7.00	59.0	—
Restore Beach Area	Site Preparation	11/1/2030	12/31/2030	7.00	61.0	—
Unsuitable Material Replacement	Grading	1/1/2027	3/1/2027	7.00	60.0	—
Construct Temp Bridge - Grading	Grading	6/1/2027	6/30/2027	7.00	30.0	—
Lagoon Grading	Grading	4/1/2030	10/31/2030	7.00	214	—
Construct Temp Bridge - BC	Building Construction	7/1/2027	11/1/2027	7.00	124	—
Construct DBH Facilities	Building Construction	3/1/2030	3/31/2030	7.00	31.0	—
Construct Temp Bridge - Paving	Paving	11/2/2027	12/31/2027	7.00	60.0	—
Relocate Utilities	Trenching	2/1/2027	8/1/2027	7.00	182	—

5.2. Off-Road Equipment

5.2.1. Unmitigated

Phase Name	Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor
Demo + Parking Provisions	Tractors/Loaders/Backhoes	Diesel	Average	1.00	8.00	84.0	0.37
Demo + Parking Provisions	Rubber Tired Dozers	Diesel	Average	1.00	8.00	367	0.40
Demo + Parking Provisions	Excavators	Diesel	Average	2.00	8.00	36.0	0.38
Demo + Parking Provisions	Graders	Diesel	Average	1.00	8.00	148	0.41
Demo + Parking Provisions	Pavers	Diesel	Average	1.00	8.00	81.0	0.42
Demo + Parking Provisions	Rollers	Diesel	Average	2.00	8.00	36.0	0.38
Demo Temp Bridge	Tractors/Loaders/Backhoes	Diesel	Average	1.00	8.00	84.0	0.37
Demo Temp Bridge	Excavators	Diesel	Average	2.00	8.00	36.0	0.38
Restore Beach Area	Graders	Diesel	Average	1.00	8.00	148	0.41
Restore Beach Area	Tractors/Loaders/Backhoes	Diesel	Average	1.00	8.00	84.0	0.37
Unsuitable Material Replacement	Graders	Diesel	Average	1.00	8.00	148	0.41
Unsuitable Material Replacement	Tractors/Loaders/Backhoes	Diesel	Average	1.00	8.00	84.0	0.37
Unsuitable Material Replacement	Rubber Tired Dozers	Diesel	Average	1.00	8.00	367	0.40
Unsuitable Material Replacement	Excavators	Diesel	Average	1.00	8.00	36.0	0.38
Unsuitable Material Replacement	Off-Highway Trucks	Diesel	Average	1.00	8.00	376	0.38
Construct Temp Bridge - Grading	Tractors/Loaders/Backhoes	Diesel	Average	1.00	8.00	84.0	0.37
Construct Temp Bridge - Grading	Graders	Diesel	Average	1.00	8.00	148	0.41

Construct Temp Bridge - Grading	Rubber Tired Dozers	Diesel	Average	1.00	8.00	367	0.40
Construct Temp Bridge - Grading	Excavators	Diesel	Average	1.00	8.00	36.0	0.38
Construct Temp Bridge - Grading	Off-Highway Trucks	Diesel	Average	1.00	8.00	376	0.38
Lagoon Grading	Graders	Diesel	Average	1.00	8.00	148	0.41
Lagoon Grading	Excavators	Diesel	Average	1.00	8.00	36.0	0.38
Lagoon Grading	Off-Highway Trucks	Diesel	Average	1.00	8.00	376	0.38
Construct Temp Bridge - BC	Cranes	Diesel	Average	1.00	8.00	367	0.29
Construct Temp Bridge - BC	Forklifts	Diesel	Average	1.00	8.00	82.0	0.20
Construct Temp Bridge - BC	Crawler Tractors	Diesel	Average	1.00	8.00	87.0	0.43
Construct Temp Bridge - BC	Generator Sets	Diesel	Average	1.00	8.00	14.0	0.74
Construct DBH Facilities	Cranes	Diesel	Average	1.00	8.00	367	0.29
Construct DBH Facilities	Forklifts	Diesel	Average	1.00	8.00	82.0	0.20
Construct DBH Facilities	Generator Sets	Diesel	Average	1.00	8.00	14.0	0.74
Construct DBH Facilities	Crawler Tractors	Diesel	Average	1.00	8.00	87.0	0.43
Construct Temp Bridge - Paving	Pavers	Diesel	Average	1.00	8.00	81.0	0.42
Construct Temp Bridge - Paving	Rollers	Diesel	Average	1.00	8.00	36.0	0.38
Construct Temp Bridge - Paving	Graders	Diesel	Average	1.00	8.00	148	0.41
Construct Temp Bridge - Paving	Rubber Tired Dozers	Diesel	Average	1.00	8.00	367	0.40

Relocate Utilities	Excavators	Diesel	Average	1.00	8.00	36.0	0.38
Relocate Utilities	Tractors/Loaders/Backhoes	Diesel	Average	1.00	8.00	84.0	0.37

5.3. Construction Vehicles

5.3.1. Unmitigated

Phase Name	Trip Type	One-Way Trips per Day	Miles per Trip	Vehicle Mix
Demo + Parking Provisions	—	—	—	—
Demo + Parking Provisions	Worker	0.00	18.5	LDA,LDT1,LDT2
Demo + Parking Provisions	Vendor	—	10.2	HHDT,MHDT
Demo + Parking Provisions	Hauling	0.00	20.0	HHDT
Demo + Parking Provisions	Onsite truck	—	—	HHDT
Unsuitable Material Replacement	—	—	—	—
Unsuitable Material Replacement	Worker	0.00	18.5	LDA,LDT1,LDT2
Unsuitable Material Replacement	Vendor	—	10.2	HHDT,MHDT
Unsuitable Material Replacement	Hauling	0.00	20.0	HHDT
Unsuitable Material Replacement	Onsite truck	—	—	HHDT
Relocate Utilities	—	—	—	—
Relocate Utilities	Worker	0.00	18.5	LDA,LDT1,LDT2
Relocate Utilities	Vendor	—	10.2	HHDT,MHDT
Relocate Utilities	Hauling	0.00	20.0	HHDT
Relocate Utilities	Onsite truck	—	—	HHDT
Construct Temp Bridge - Grading	—	—	—	—
Construct Temp Bridge - Grading	Worker	0.00	18.5	LDA,LDT1,LDT2
Construct Temp Bridge - Grading	Vendor	—	10.2	HHDT,MHDT
Construct Temp Bridge - Grading	Hauling	0.00	20.0	HHDT
Construct Temp Bridge - Grading	Onsite truck	—	—	HHDT

Construct Temp Bridge - BC	—	—	—	—
Construct Temp Bridge - BC	Worker	0.00	18.5	LDA,LDT1,LDT2
Construct Temp Bridge - BC	Vendor	0.00	10.2	HHDT,MHDT
Construct Temp Bridge - BC	Hauling	0.00	20.0	HHDT
Construct Temp Bridge - BC	Onsite truck	—	—	HHDT
Demo Temp Bridge	—	—	—	—
Demo Temp Bridge	Worker	0.00	18.5	LDA,LDT1,LDT2
Demo Temp Bridge	Vendor	—	10.2	HHDT,MHDT
Demo Temp Bridge	Hauling	0.00	20.0	HHDT
Demo Temp Bridge	Onsite truck	—	—	HHDT
Restore Beach Area	—	—	—	—
Restore Beach Area	Worker	0.00	18.5	LDA,LDT1,LDT2
Restore Beach Area	Vendor	—	10.2	HHDT,MHDT
Restore Beach Area	Hauling	0.00	20.0	HHDT
Restore Beach Area	Onsite truck	—	—	HHDT
Lagoon Grading	—	—	—	—
Lagoon Grading	Worker	0.00	18.5	LDA,LDT1,LDT2
Lagoon Grading	Vendor	—	10.2	HHDT,MHDT
Lagoon Grading	Hauling	0.00	20.0	HHDT
Lagoon Grading	Onsite truck	—	—	HHDT
Construct DBH Facilities	—	—	—	—
Construct DBH Facilities	Worker	0.00	18.5	LDA,LDT1,LDT2
Construct DBH Facilities	Vendor	0.00	10.2	HHDT,MHDT
Construct DBH Facilities	Hauling	0.00	20.0	HHDT
Construct DBH Facilities	Onsite truck	—	—	HHDT
Construct Temp Bridge - Paving	—	—	—	—
Construct Temp Bridge - Paving	Worker	10.0	18.5	LDA,LDT1,LDT2

Construct Temp Bridge - Paving	Vendor	—	10.2	HHDT,MHDT
Construct Temp Bridge - Paving	Hauling	0.00	20.0	HHDT
Construct Temp Bridge - Paving	Onsite truck	—	—	HHDT

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

Non-applicable. No control strategies activated by user.

5.5. Architectural Coatings

Phase Name	Residential Interior Area Coated (sq ft)	Residential Exterior Area Coated (sq ft)	Non-Residential Interior Area Coated (sq ft)	Non-Residential Exterior Area Coated (sq ft)	Parking Area Coated (sq ft)

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

Phase Name	Material Imported (Cubic Yards)	Material Exported (Cubic Yards)	Acres Graded (acres)	Material Demolished (Ton of Debris)	Acres Paved (acres)
Demo + Parking Provisions	0.00	0.00	0.00	5,405	—
Demo Temp Bridge	0.00	0.00	0.00	465	—
Restore Beach Area	0.00	0.00	21.5	0.00	—
Unsuitable Material Replacement	12,600	26,000	42.0	0.00	—
Construct Temp Bridge - Grading	1,600	0.00	22.0	0.00	—
Lagoon Grading	0.00	256,000	77.0	0.00	—
Construct Temp Bridge - Paving	0.00	0.00	0.00	0.00	0.36

5.6.2. Construction Earthmoving Control Strategies

Control Strategies Applied	Frequency (per day)	PM10 Reduction	PM2.5 Reduction
Water Exposed Area	2	61%	61%
Water Demolished Area	2	36%	36%

5.7. Construction Paving

Land Use	Area Paved (acres)	% Asphalt
Other Asphalt Surfaces	0.31	100%
General Office Building	0.00	0%
Other Non-Asphalt Surfaces	0.05	0%

5.8. Construction Electricity Consumption and Emissions Factors

kWh per Year and Emission Factor (lb/MWh)

Year	kWh per Year	CO2	CH4	N2O
2027	0.00	532	0.03	< 0.005
2030	0.00	532	0.03	< 0.005

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

Vegetation Land Use Type	Vegetation Soil Type	Initial Acres	Final Acres

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

Biomass Cover Type	Initial Acres	Final Acres

5.18.2. Sequestration

5.18.2.1. Unmitigated

Tree Type	Number	Electricity Saved (kWh/year)	Natural Gas Saved (btu/year)

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

Cal-Adapt midcentury 2040–2059 average projections for four hazards are reported below for your project location. These are under Representation Concentration Pathway (RCP) 8.5 which assumes GHG emissions will continue to rise strongly through 2050 and then plateau around 2100.

Climate Hazard	Result for Project Location	Unit
Temperature and Extreme Heat	9.96	annual days of extreme heat
Extreme Precipitation	5.90	annual days with precipitation above 20 mm
Sea Level Rise	—	meters of inundation depth
Wildfire	20.5	annual hectares burned

Temperature and Extreme Heat data are for grid cell in which your project are located. The projection is based on the 98th historical percentile of daily maximum/minimum temperatures from observed historical data (32 climate model ensemble from Cal-Adapt, 2040–2059 average under RCP 8.5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Extreme Precipitation data are for the grid cell in which your project are located. The threshold of 20 mm is equivalent to about ¾ an inch of rain, which would be light to moderate rainfall if received over a full day or heavy rain if received over a period of 2 to 4 hours. Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Sea Level Rise data are for the grid cell in which your project are located. The projections are from Radke et al. (2017), as reported in Cal-Adapt (Radke et al., 2017, CEC-500-2017-008), and consider inundation location and depth for the San Francisco Bay, the Sacramento-San Joaquin River Delta and California coast resulting different increments of sea level rise coupled with extreme storm events. Users may select from four scenarios to view the range in potential inundation depth for the grid cell. The four scenarios are: No rise, 0.5 meter, 1.0 meter, 1.41 meters
Wildfire data are for the grid cell in which your project are located. The projections are from UC Davis, as reported in Cal-Adapt (2040–2059 average under RCP 8.5), and consider historical data of climate, vegetation, population density, and large (> 400 ha) fire history. Users may select from four model simulations to view the range in potential wildfire probabilities for the grid cell. The four simulations make different assumptions about expected rainfall and temperature are: Warmer/drier (HadGEM2-ES), Cooler/wetter (CNRM-CM5), Average conditions (CanESM2), Range of different rainfall and temperature possibilities (MIROC5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.

6.2. Initial Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	1	0	0	N/A
Extreme Precipitation	N/A	N/A	N/A	N/A

Sea Level Rise	1	0	0	N/A
Wildfire	1	0	0	N/A
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	0	0	0	N/A

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores do not include implementation of climate risk reduction measures.

6.3. Adjusted Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	1	1	1	2
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	1	1	1	2
Wildfire	1	1	1	2
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	1	1	1	2

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores include implementation of climate risk reduction measures.

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Exposure Indicators	—
AQ-Ozone	—
AQ-PM	—
AQ-DPM	—
Drinking Water	—
Lead Risk Housing	—
Pesticides	—
Toxic Releases	—
Traffic	—
Effect Indicators	—
CleanUp Sites	—
Groundwater	—
Haz Waste Facilities/Generators	—
Impaired Water Bodies	—
Solid Waste	—
Sensitive Population	—
Asthma	—
Cardio-vascular	—
Low Birth Weights	—
Socioeconomic Factor Indicators	—
Education	—
Housing	—

Linguistic	—
Poverty	—
Unemployment	—

7.2. Healthy Places Index Scores

The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Economic	—
Above Poverty	89.34941614
Employed	19.02989863
Median HI	97.69023483
Education	—
Bachelor's or higher	88.59232645
High school enrollment	100
Preschool enrollment	95.7141024
Transportation	—
Auto Access	93.63531374
Active commuting	12.16476325
Social	—
2-parent households	42.29436674
Voting	82.35596048
Neighborhood	—
Alcohol availability	89.4649044
Park access	38.81688695
Retail density	42.06339022
Supermarket access	2.399589375
Tree canopy	71.42307199

Housing	—
Homeownership	65.75131528
Housing habitability	87.501604
Low-inc homeowner severe housing cost burden	64.24996792
Low-inc renter severe housing cost burden	88.91312717
Uncrowded housing	62.10701912
Health Outcomes	—
Insured adults	89.59322469
Arthritis	0.0
Asthma ER Admissions	99.7
High Blood Pressure	0.0
Cancer (excluding skin)	0.0
Asthma	0.0
Coronary Heart Disease	0.0
Chronic Obstructive Pulmonary Disease	0.0
Diagnosed Diabetes	0.0
Life Expectancy at Birth	77.8
Cognitively Disabled	87.2
Physically Disabled	55.6
Heart Attack ER Admissions	99.5
Mental Health Not Good	0.0
Chronic Kidney Disease	0.0
Obesity	0.0
Pedestrian Injuries	93.4
Physical Health Not Good	0.0
Stroke	0.0
Health Risk Behaviors	—

Binge Drinking	0.0
Current Smoker	0.0
No Leisure Time for Physical Activity	0.0
Climate Change Exposures	—
Wildfire Risk	99.5
SLR Inundation Area	38.8
Children	43.1
Elderly	11.5
English Speaking	77.4
Foreign-born	54.6
Outdoor Workers	85.4
Climate Change Adaptive Capacity	—
Impervious Surface Cover	79.5
Traffic Density	81.9
Traffic Access	23.0
Other Indices	—
Hardship	5.4
Other Decision Support	—
2016 Voting	60.6

7.3. Overall Health & Equity Scores

Metric	Result for Project Census Tract
CalEnviroScreen 4.0 Score for Project Location (a)	—
Healthy Places Index Score for Project Location (b)	90.0
Project Located in a Designated Disadvantaged Community (Senate Bill 535)	No
Project Located in a Low-Income Community (Assembly Bill 1550)	No
Project Located in a Community Air Protection Program Community (Assembly Bill 617)	No

a: The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.
b: The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

7.4. Health & Equity Measures

No Health & Equity Measures selected.

7.5. Evaluation Scorecard

Health & Equity Evaluation Scorecard not completed.

7.6. Health & Equity Custom Measures

No Health & Equity Custom Measures created.

8. User Changes to Default Data

Screen	Justification
Construction: Construction Phases	see construction assumptions
Construction: Off-Road Equipment	see construction assumptions
Construction: Trips and VMT	construction mobile emissions calculated outside of CalEEMod
Construction: Dust From Material Movement	see construction assumptions

Topanga-NB Bridge-Con Detailed Report

Table of Contents

1. Basic Project Information

1.1. Basic Project Information

1.2. Land Use Types

1.3. User-Selected Emission Reduction Measures by Emissions Sector

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

2.2. Construction Emissions by Year, Unmitigated

3. Construction Emissions Details

3.1. NB Road/Bridge - Demo (2028) - Unmitigated

3.3. NB Road/Bridge - Grading (2028) - Unmitigated

3.5. NB Road/Bridge - BC (2028) - Unmitigated

3.7. NB Road/Bridge - Paving (2028) - Unmitigated

4. Operations Emissions Details

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

5. Activity Data

5.1. Construction Schedule

5.2. Off-Road Equipment

5.2.1. Unmitigated

5.3. Construction Vehicles

5.3.1. Unmitigated

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

5.5. Architectural Coatings

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

5.6.2. Construction Earthmoving Control Strategies

5.7. Construction Paving

5.8. Construction Electricity Consumption and Emissions Factors

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

5.18.2. Sequestration

5.18.2.1. Unmitigated

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

6.2. Initial Climate Risk Scores

6.3. Adjusted Climate Risk Scores

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

7.2. Healthy Places Index Scores

7.3. Overall Health & Equity Scores

7.4. Health & Equity Measures

7.5. Evaluation Scorecard

7.6. Health & Equity Custom Measures

8. User Changes to Default Data

1. Basic Project Information

1.1. Basic Project Information

Data Field	Value
Project Name	Topanga-NB Bridge-Con
Construction Start Date	1/1/2028
Lead Agency	—
Land Use Scale	Project/site
Analysis Level for Defaults	County
Windspeed (m/s)	2.70
Precipitation (days)	4.60
Location	18711 Pacific Coast Hwy, Malibu, CA 90265, USA
County	Los Angeles-South Coast
City	Unincorporated
Air District	South Coast AQMD
Air Basin	South Coast
TAZ	3802
EDFZ	7
Electric Utility	Southern California Edison
Gas Utility	Southern California Gas
App Version	2022.1.1.21

1.2. Land Use Types

Land Use Subtype	Size	Unit	Lot Acreage	Building Area (sq ft)	Landscape Area (sq ft)	Special Landscape Area (sq ft)	Population	Description
Other Asphalt Surfaces	78.4	1000sqft	1.80	78,408	0.00	—	—	—

1.3. User-Selected Emission Reduction Measures by Emissions Sector

No measures selected

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Un/Mit.	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	2.15	1.81	14.1	16.4	0.03	0.60	2.77	3.37	0.55	1.34	1.88	—	3,714	3,714	0.15	0.08	2.20	3,727
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	2.15	1.81	14.1	16.4	0.03	0.60	2.77	3.37	0.55	1.34	1.88	—	3,714	3,714	0.15	0.08	0.06	3,727
Average Daily (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	1.16	0.98	7.90	9.75	0.02	0.34	0.81	1.14	0.31	0.30	0.61	—	2,322	2,322	0.09	0.06	0.56	2,342
Annual (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.21	0.18	1.44	1.78	< 0.005	0.06	0.15	0.21	0.06	0.06	0.11	—	384	384	0.01	0.01	0.09	388

2.2. Construction Emissions by Year, Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Year	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily - Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

2028	2.15	1.81	14.1	16.4	0.03	0.60	2.77	3.37	0.55	1.34	1.88	—	3,714	3,714	0.15	0.08	2.20	3,727
Daily - Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2028	2.15	1.81	14.1	16.4	0.03	0.60	2.77	3.37	0.55	1.34	1.88	—	3,714	3,714	0.15	0.08	0.06	3,727
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2028	1.16	0.98	7.90	9.75	0.02	0.34	0.81	1.14	0.31	0.30	0.61	—	2,322	2,322	0.09	0.06	0.56	2,342
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2028	0.21	0.18	1.44	1.78	< 0.005	0.06	0.15	0.21	0.06	0.06	0.11	—	384	384	0.01	0.01	0.09	388

3. Construction Emissions Details

3.1. NB Road/Bridge - Demo (2028) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.32	0.27	2.57	3.95	0.01	0.07	—	0.07	0.06	—	0.06	—	574	574	0.02	< 0.005	—	576
Demolition	—	—	—	—	—	—	0.16	0.16	—	0.02	0.02	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipment	0.05	0.04	0.42	0.65	< 0.005	0.01	—	0.01	0.01	—	0.01	—	94.3	94.3	< 0.005	< 0.005	—	94.6
Demolition	—	—	—	—	—	—	0.03	0.03	—	< 0.005	< 0.005	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.01	0.01	0.08	0.12	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	15.6	15.6	< 0.005	< 0.005	—	15.7
Demolition	—	—	—	—	—	—	< 0.005	< 0.005	—	< 0.005	< 0.005	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.3. NB Road/Bridge - Grading (2028) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	2.15	1.81	14.1	16.4	0.03	0.60	—	0.60	0.55	—	0.55	—	3,714	3,714	0.15	0.03	—	3,727
Dust From Material Movement	—	—	—	—	—	—	2.77	2.77	—	1.34	1.34	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	2.15	1.81	14.1	16.4	0.03	0.60	—	0.60	0.55	—	0.55	—	3,714	3,714	0.15	0.03	—	3,727
Dust From Material Movement	—	—	—	—	—	—	2.77	2.77	—	1.34	1.34	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.36	0.30	2.36	2.75	0.01	0.10	—	0.10	0.09	—	0.09	—	621	621	0.03	0.01	—	623
Dust From Material Movement	—	—	—	—	—	—	0.46	0.46	—	0.22	0.22	—	—	—	—	—	—	—

Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.07	0.06	0.43	0.50	< 0.005	0.02	—	0.02	0.02	—	0.02	—	103	103	< 0.005	< 0.005	—	103
Dust From Material Movement	—	—	—	—	—	—	0.08	0.08	—	0.04	0.04	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.5. NB Road/Bridge - BC (2028) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.88	0.74	6.40	7.03	0.02	0.30	—	0.30	0.28	—	0.28	—	1,596	1,596	0.06	0.01	—	1,601
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.88	0.74	6.40	7.03	0.02	0.30	—	0.30	0.28	—	0.28	—	1,596	1,596	0.06	0.01	—	1,601
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.52	0.43	3.75	4.12	0.01	0.18	—	0.18	0.16	—	0.16	—	936	936	0.04	0.01	—	939
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.09	0.08	0.68	0.75	< 0.005	0.03	—	0.03	0.03	—	0.03	—	155	155	0.01	< 0.005	—	155
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.13	0.11	0.11	1.86	0.00	0.00	0.43	0.43	0.00	0.10	0.10	—	430	430	< 0.005	0.02	1.23	436
Vendor	0.03	0.01	0.40	0.19	< 0.005	< 0.005	0.11	0.11	< 0.005	0.03	0.03	—	384	384	0.01	0.05	0.97	401
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.13	0.11	0.13	1.58	0.00	0.00	0.43	0.43	0.00	0.10	0.10	—	408	408	0.01	0.02	0.03	412
Vendor	0.03	0.01	0.42	0.20	< 0.005	< 0.005	0.11	0.11	< 0.005	0.03	0.03	—	384	384	0.01	0.05	0.03	401
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.07	0.07	0.07	0.97	0.00	0.00	0.25	0.25	0.00	0.06	0.06	—	242	242	< 0.005	0.01	0.31	246
Vendor	0.01	0.01	0.25	0.11	< 0.005	< 0.005	0.06	0.07	< 0.005	0.02	0.02	—	225	225	0.01	0.03	0.24	235
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.01	0.18	0.00	0.00	0.05	0.05	0.00	0.01	0.01	—	40.1	40.1	< 0.005	< 0.005	0.05	40.7
Vendor	< 0.005	< 0.005	0.05	0.02	< 0.005	< 0.005	0.01	0.01	< 0.005	< 0.005	< 0.005	—	37.3	37.3	< 0.005	0.01	0.04	38.9
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.7. NB Road/Bridge - Paving (2028) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.71	1.44	12.4	13.6	0.02	0.56	—	0.56	0.52	—	0.52	—	2,405	2,405	0.10	0.02	—	2,414
Paving	—	0.15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.15	0.12	1.05	1.16	< 0.005	0.05	—	0.05	0.04	—	0.04	—	204	204	0.01	< 0.005	—	205
Paving	—	0.01	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.03	0.02	0.19	0.21	< 0.005	0.01	—	0.01	0.01	—	0.01	—	33.8	33.8	< 0.005	< 0.005	—	33.9
Paving	—	< 0.005	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

4. Operations Emissions Details

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Vegetation	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Species	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

5. Activity Data

5.1. Construction Schedule

Phase Name	Phase Type	Start Date	End Date	Days Per Week	Work Days per Phase	Phase Description
NB Road/Bridge - Demo	Demolition	1/1/2028	2/29/2028	7.00	60.0	—
NB Road/Bridge - Grading	Grading	3/1/2028	4/30/2028	7.00	61.0	—
NB Road/Bridge - BC	Building Construction	5/1/2028	11/30/2028	7.00	214	—
NB Road/Bridge - Paving	Paving	12/1/2028	12/31/2028	7.00	31.0	—

5.2. Off-Road Equipment

5.2.1. Unmitigated

Phase Name	Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor
NB Road/Bridge - Demo	Tractors/Loaders/Backhoes	Diesel	Average	1.00	8.00	84.0	0.37
NB Road/Bridge - Demo	Excavators	Diesel	Average	2.00	8.00	36.0	0.38
NB Road/Bridge - Grading	Graders	Diesel	Average	1.00	8.00	148	0.41
NB Road/Bridge - Grading	Tractors/Loaders/Backhoes	Diesel	Average	1.00	8.00	84.0	0.37
NB Road/Bridge - Grading	Rubber Tired Dozers	Diesel	Average	1.00	8.00	367	0.40
NB Road/Bridge - Grading	Excavators	Diesel	Average	1.00	8.00	36.0	0.38
NB Road/Bridge - Grading	Off-Highway Trucks	Diesel	Average	1.00	8.00	376	0.38
NB Road/Bridge - BC	Cranes	Diesel	Average	1.00	8.00	367	0.29
NB Road/Bridge - BC	Forklifts	Diesel	Average	1.00	8.00	82.0	0.20
NB Road/Bridge - BC	Generator Sets	Diesel	Average	1.00	8.00	14.0	0.74
NB Road/Bridge - BC	Crawler Tractors	Diesel	Average	1.00	8.00	87.0	0.43
NB Road/Bridge - Paving	Rollers	Diesel	Average	1.00	8.00	36.0	0.38
NB Road/Bridge - Paving	Pavers	Diesel	Average	1.00	8.00	81.0	0.42
NB Road/Bridge - Paving	Rubber Tired Dozers	Diesel	Average	1.00	8.00	367	0.40
NB Road/Bridge - Paving	Graders	Diesel	Average	1.00	8.00	148	0.41

5.3. Construction Vehicles

5.3.1. Unmitigated

Phase Name	Trip Type	One-Way Trips per Day	Miles per Trip	Vehicle Mix
NB Road/Bridge - Demo	—	—	—	—
NB Road/Bridge - Demo	Worker	0.00	18.5	LDA,LDT1,LDT2
NB Road/Bridge - Demo	Vendor	—	10.2	HHDT,MHDT
NB Road/Bridge - Demo	Hauling	0.00	20.0	HHDT
NB Road/Bridge - Demo	Onsite truck	—	—	HHDT
NB Road/Bridge - Grading	—	—	—	—
NB Road/Bridge - Grading	Worker	0.00	18.5	LDA,LDT1,LDT2
NB Road/Bridge - Grading	Vendor	—	10.2	HHDT,MHDT
NB Road/Bridge - Grading	Hauling	0.00	20.0	HHDT
NB Road/Bridge - Grading	Onsite truck	—	—	HHDT
NB Road/Bridge - BC	—	—	—	—
NB Road/Bridge - BC	Worker	32.9	18.5	LDA,LDT1,LDT2
NB Road/Bridge - BC	Vendor	12.9	10.2	HHDT,MHDT
NB Road/Bridge - BC	Hauling	0.00	20.0	HHDT
NB Road/Bridge - BC	Onsite truck	—	—	HHDT
NB Road/Bridge - Paving	—	—	—	—
NB Road/Bridge - Paving	Worker	0.00	18.5	LDA,LDT1,LDT2
NB Road/Bridge - Paving	Vendor	—	10.2	HHDT,MHDT
NB Road/Bridge - Paving	Hauling	0.00	20.0	HHDT
NB Road/Bridge - Paving	Onsite truck	—	—	HHDT

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

Non-applicable. No control strategies activated by user.

5.5. Architectural Coatings

Phase Name	Residential Interior Area Coated (sq ft)	Residential Exterior Area Coated (sq ft)	Non-Residential Interior Area Coated (sq ft)	Non-Residential Exterior Area Coated (sq ft)	Parking Area Coated (sq ft)

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

Phase Name	Material Imported (Cubic Yards)	Material Exported (Cubic Yards)	Acres Graded (acres)	Material Demolished (Ton of Debris)	Acres Paved (acres)
NB Road/Bridge - Demo	0.00	0.00	0.00	675	—
NB Road/Bridge - Grading	12,000	18,500	43.0	0.00	—
NB Road/Bridge - Paving	0.00	0.00	0.00	0.00	1.80

5.6.2. Construction Earthmoving Control Strategies

Control Strategies Applied	Frequency (per day)	PM10 Reduction	PM2.5 Reduction
Water Exposed Area	2	61%	61%
Water Demolished Area	2	36%	36%

5.7. Construction Paving

Land Use	Area Paved (acres)	% Asphalt
Other Asphalt Surfaces	1.80	100%

5.8. Construction Electricity Consumption and Emissions Factors

kWh per Year and Emission Factor (lb/MWh)

Year	kWh per Year	CO2	CH4	N2O
2028	0.00	532	0.03	< 0.005

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

Vegetation Land Use Type	Vegetation Soil Type	Initial Acres	Final Acres

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

Biomass Cover Type	Initial Acres	Final Acres

5.18.2. Sequestration

5.18.2.1. Unmitigated

Tree Type	Number	Electricity Saved (kWh/year)	Natural Gas Saved (btu/year)

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

Cal-Adapt midcentury 2040–2059 average projections for four hazards are reported below for your project location. These are under Representation Concentration Pathway (RCP) 8.5 which assumes GHG emissions will continue to rise strongly through 2050 and then plateau around 2100.

Climate Hazard	Result for Project Location	Unit
Temperature and Extreme Heat	9.96	annual days of extreme heat
Extreme Precipitation	5.90	annual days with precipitation above 20 mm

Sea Level Rise	—	meters of inundation depth
Wildfire	20.5	annual hectares burned

Temperature and Extreme Heat data are for grid cell in which your project are located. The projection is based on the 98th historical percentile of daily maximum/minimum temperatures from observed historical data (32 climate model ensemble from Cal-Adapt, 2040–2059 average under RCP 8.5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Extreme Precipitation data are for the grid cell in which your project are located. The threshold of 20 mm is equivalent to about ¾ an inch of rain, which would be light to moderate rainfall if received over a full day or heavy rain if received over a period of 2 to 4 hours. Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Sea Level Rise data are for the grid cell in which your project are located. The projections are from Radke et al. (2017), as reported in Cal-Adapt (Radke et al., 2017, CEC-500-2017-008), and consider inundation location and depth for the San Francisco Bay, the Sacramento-San Joaquin River Delta and California coast resulting different increments of sea level rise coupled with extreme storm events. Users may select from four scenarios to view the range in potential inundation depth for the grid cell. The four scenarios are: No rise, 0.5 meter, 1.0 meter, 1.41 meters
Wildfire data are for the grid cell in which your project are located. The projections are from UC Davis, as reported in Cal-Adapt (2040–2059 average under RCP 8.5), and consider historical data of climate, vegetation, population density, and large (> 400 ha) fire history. Users may select from four model simulations to view the range in potential wildfire probabilities for the grid cell. The four simulations make different assumptions about expected rainfall and temperature are: Warmer/drier (HadGEM2-ES), Cooler/wetter (CNRM-CM5), Average conditions (CanESM2), Range of different rainfall and temperature possibilities (MIROC5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.

6.2. Initial Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	1	0	0	N/A
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	1	0	0	N/A
Wildfire	1	0	0	N/A
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	0	0	0	N/A

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores do not include implementation of climate risk reduction measures.

6.3. Adjusted Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score

Temperature and Extreme Heat	1	1	1	2
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	1	1	1	2
Wildfire	1	1	1	2
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	1	1	1	2

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores include implementation of climate risk reduction measures.

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Exposure Indicators	—
AQ-Ozone	—
AQ-PM	—
AQ-DPM	—
Drinking Water	—
Lead Risk Housing	—
Pesticides	—
Toxic Releases	—

Traffic	—
Effect Indicators	—
CleanUp Sites	—
Groundwater	—
Haz Waste Facilities/Generators	—
Impaired Water Bodies	—
Solid Waste	—
Sensitive Population	—
Asthma	—
Cardio-vascular	—
Low Birth Weights	—
Socioeconomic Factor Indicators	—
Education	—
Housing	—
Linguistic	—
Poverty	—
Unemployment	—

7.2. Healthy Places Index Scores

The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Economic	—
Above Poverty	89.34941614
Employed	19.02989863
Median HI	97.69023483
Education	—
Bachelor's or higher	88.59232645

High school enrollment	100
Preschool enrollment	95.7141024
Transportation	—
Auto Access	93.63531374
Active commuting	12.16476325
Social	—
2-parent households	42.29436674
Voting	82.35596048
Neighborhood	—
Alcohol availability	89.4649044
Park access	38.81688695
Retail density	42.06339022
Supermarket access	2.399589375
Tree canopy	71.42307199
Housing	—
Homeownership	65.75131528
Housing habitability	87.501604
Low-inc homeowner severe housing cost burden	64.24996792
Low-inc renter severe housing cost burden	88.91312717
Uncrowded housing	62.10701912
Health Outcomes	—
Insured adults	89.59322469
Arthritis	0.0
Asthma ER Admissions	99.7
High Blood Pressure	0.0
Cancer (excluding skin)	0.0
Asthma	0.0

Coronary Heart Disease	0.0
Chronic Obstructive Pulmonary Disease	0.0
Diagnosed Diabetes	0.0
Life Expectancy at Birth	77.8
Cognitively Disabled	87.2
Physically Disabled	55.6
Heart Attack ER Admissions	99.5
Mental Health Not Good	0.0
Chronic Kidney Disease	0.0
Obesity	0.0
Pedestrian Injuries	93.4
Physical Health Not Good	0.0
Stroke	0.0
Health Risk Behaviors	—
Binge Drinking	0.0
Current Smoker	0.0
No Leisure Time for Physical Activity	0.0
Climate Change Exposures	—
Wildfire Risk	99.5
SLR Inundation Area	38.8
Children	43.1
Elderly	11.5
English Speaking	77.4
Foreign-born	54.6
Outdoor Workers	85.4
Climate Change Adaptive Capacity	—
Impervious Surface Cover	79.5

Traffic Density	81.9
Traffic Access	23.0
Other Indices	—
Hardship	5.4
Other Decision Support	—
2016 Voting	60.6

7.3. Overall Health & Equity Scores

Metric	Result for Project Census Tract
CalEnviroScreen 4.0 Score for Project Location (a)	—
Healthy Places Index Score for Project Location (b)	90.0
Project Located in a Designated Disadvantaged Community (Senate Bill 535)	No
Project Located in a Low-Income Community (Assembly Bill 1550)	No
Project Located in a Community Air Protection Program Community (Assembly Bill 617)	No

a: The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.
b: The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

7.4. Health & Equity Measures

No Health & Equity Measures selected.

7.5. Evaluation Scorecard

Health & Equity Evaluation Scorecard not completed.

7.6. Health & Equity Custom Measures

No Health & Equity Custom Measures created.

8. User Changes to Default Data

Screen	Justification
Construction: Construction Phases	see construction assumptions

Construction: Off-Road Equipment	see construction assumptions
Construction: Trips and VMT	construction mobile emissions calculated outside of CalEEMod.
Construction: Dust From Material Movement	see construction assumptions

Topanga-SB Bridge-Con Detailed Report

Table of Contents

1. Basic Project Information

1.1. Basic Project Information

1.2. Land Use Types

1.3. User-Selected Emission Reduction Measures by Emissions Sector

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

2.2. Construction Emissions by Year, Unmitigated

3. Construction Emissions Details

3.1. SB Road/Bridge - Demo (2029) - Unmitigated

3.3. SB Road/Bridge - Grading (2029) - Unmitigated

3.5. SB Road/Bridge - BC (2029) - Unmitigated

3.7. SB Road/Bridge - Paving (2029) - Unmitigated

4. Operations Emissions Details

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

5. Activity Data

5.1. Construction Schedule

5.2. Off-Road Equipment

5.2.1. Unmitigated

5.3. Construction Vehicles

5.3.1. Unmitigated

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

5.5. Architectural Coatings

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

5.6.2. Construction Earthmoving Control Strategies

5.7. Construction Paving

5.8. Construction Electricity Consumption and Emissions Factors

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

5.18.2. Sequestration

5.18.2.1. Unmitigated

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

6.2. Initial Climate Risk Scores

6.3. Adjusted Climate Risk Scores

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

7.2. Healthy Places Index Scores

7.3. Overall Health & Equity Scores

7.4. Health & Equity Measures

7.5. Evaluation Scorecard

7.6. Health & Equity Custom Measures

8. User Changes to Default Data

1. Basic Project Information

1.1. Basic Project Information

Data Field	Value
Project Name	Topanga-SB Bridge-Con
Construction Start Date	1/1/2029
Lead Agency	—
Land Use Scale	Project/site
Analysis Level for Defaults	County
Windspeed (m/s)	2.70
Precipitation (days)	4.60
Location	18711 Pacific Coast Hwy, Malibu, CA 90265, USA
County	Los Angeles-South Coast
City	Unincorporated
Air District	South Coast AQMD
Air Basin	South Coast
TAZ	3802
EDFZ	7
Electric Utility	Southern California Edison
Gas Utility	Southern California Gas
App Version	2022.1.1.21

1.2. Land Use Types

Land Use Subtype	Size	Unit	Lot Acreage	Building Area (sq ft)	Landscape Area (sq ft)	Special Landscape Area (sq ft)	Population	Description
Other Asphalt Surfaces	78.4	1000sqft	1.80	0.00	0.00	—	—	—

1.3. User-Selected Emission Reduction Measures by Emissions Sector

No measures selected

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Un/Mit.	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	2.10	1.76	13.2	16.3	0.03	0.56	2.77	3.33	0.51	1.34	1.85	—	3,713	3,713	0.15	0.03	0.00	3,726
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	2.10	1.76	13.2	16.3	0.03	0.56	2.77	3.33	0.51	1.34	1.85	—	3,713	3,713	0.15	0.03	0.00	3,726
Average Daily (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	1.04	0.89	7.16	8.61	0.02	0.31	0.49	0.80	0.29	0.23	0.51	—	1,853	1,853	0.08	0.02	0.00	1,859
Annual (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.19	0.16	1.31	1.57	< 0.005	0.06	0.09	0.15	0.05	0.04	0.09	—	307	307	0.01	< 0.005	0.00	308

2.2. Construction Emissions by Year, Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Year	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily - Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

2029	2.10	1.76	13.2	16.3	0.03	0.56	2.77	3.33	0.51	1.34	1.85	—	3,713	3,713	0.15	0.03	0.00	3,726
Daily - Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2029	2.10	1.76	13.2	16.3	0.03	0.56	2.77	3.33	0.51	1.34	1.85	—	3,713	3,713	0.15	0.03	0.00	3,726
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2029	1.04	0.89	7.16	8.61	0.02	0.31	0.49	0.80	0.29	0.23	0.51	—	1,853	1,853	0.08	0.02	0.00	1,859
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2029	0.19	0.16	1.31	1.57	< 0.005	0.06	0.09	0.15	0.05	0.04	0.09	—	307	307	0.01	< 0.005	0.00	308

3. Construction Emissions Details

3.1. SB Road/Bridge - Demo (2029) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.32	0.27	2.53	3.96	0.01	0.06	—	0.06	0.05	—	0.05	—	574	574	0.02	< 0.005	—	576
Demolition	—	—	—	—	—	—	0.16	0.16	—	0.02	0.02	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipment	0.05	0.04	0.41	0.64	< 0.005	0.01	—	0.01	0.01	—	0.01	—	92.8	92.8	< 0.005	< 0.005	—	93.1
Demolition	—	—	—	—	—	—	0.03	0.03	—	< 0.005	< 0.005	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.01	0.01	0.07	0.12	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	15.4	15.4	< 0.005	< 0.005	—	15.4
Demolition	—	—	—	—	—	—	< 0.005	< 0.005	—	< 0.005	< 0.005	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.3. SB Road/Bridge - Grading (2029) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	2.10	1.76	13.2	16.3	0.03	0.56	—	0.56	0.51	—	0.51	—	3,713	3,713	0.15	0.03	—	3,726
Dust From Material Movement	—	—	—	—	—	—	2.77	2.77	—	1.34	1.34	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	2.10	1.76	13.2	16.3	0.03	0.56	—	0.56	0.51	—	0.51	—	3,713	3,713	0.15	0.03	—	3,726
Dust From Material Movement	—	—	—	—	—	—	2.77	2.77	—	1.34	1.34	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.35	0.29	2.21	2.73	0.01	0.09	—	0.09	0.09	—	0.09	—	621	621	0.03	0.01	—	623
Dust From Material Movement	—	—	—	—	—	—	0.46	0.46	—	0.22	0.22	—	—	—	—	—	—	—

Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.06	0.05	0.40	0.50	< 0.005	0.02	—	0.02	0.02	—	0.02	—	103	103	< 0.005	< 0.005	—	103
Dust From Material Movement	—	—	—	—	—	—	0.08	0.08	—	0.04	0.04	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.5. SB Road/Bridge - BC (2029) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.85	0.71	6.06	6.99	0.02	0.28	—	0.28	0.26	—	0.26	—	1,596	1,596	0.06	0.01	—	1,601
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.85	0.71	6.06	6.99	0.02	0.28	—	0.28	0.26	—	0.26	—	1,596	1,596	0.06	0.01	—	1,601
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.50	0.42	3.55	4.10	0.01	0.16	—	0.16	0.15	—	0.15	—	936	936	0.04	0.01	—	939
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.09	0.08	0.65	0.75	< 0.005	0.03	—	0.03	0.03	—	0.03	—	155	155	0.01	< 0.005	—	155
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.7. SB Road/Bridge - Paving (2029) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.66	1.39	11.6	13.5	0.02	0.53	—	0.53	0.49	—	0.49	—	2,404	2,404	0.10	0.02	—	2,412
Paving	—	0.15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.14	0.12	0.99	1.15	< 0.005	0.05	—	0.05	0.04	—	0.04	—	204	204	0.01	< 0.005	—	205
Paving	—	0.01	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.03	0.02	0.18	0.21	< 0.005	0.01	—	0.01	0.01	—	0.01	—	33.8	33.8	< 0.005	< 0.005	—	33.9
Paving	—	< 0.005	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

4. Operations Emissions Details

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Vegetation	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Species	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

5. Activity Data

5.1. Construction Schedule

Phase Name	Phase Type	Start Date	End Date	Days Per Week	Work Days per Phase	Phase Description
SB Road/Bridge - Demo	Demolition	1/1/2029	2/28/2029	7.00	59.0	—
SB Road/Bridge - Grading	Grading	3/1/2029	4/30/2029	7.00	61.0	—
SB Road/Bridge - BC	Building Construction	5/1/2029	11/30/2029	7.00	214	—
SB Road/Bridge - Paving	Paving	12/1/2029	12/31/2029	7.00	31.0	—

5.2. Off-Road Equipment

5.2.1. Unmitigated

Phase Name	Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor
SB Road/Bridge - Demo	Tractors/Loaders/Backhoes	Diesel	Average	1.00	8.00	84.0	0.37
SB Road/Bridge - Demo	Excavators	Diesel	Average	2.00	8.00	36.0	0.38
SB Road/Bridge - Grading	Graders	Diesel	Average	1.00	8.00	148	0.41
SB Road/Bridge - Grading	Tractors/Loaders/Backhoes	Diesel	Average	1.00	8.00	84.0	0.37
SB Road/Bridge - Grading	Rubber Tired Dozers	Diesel	Average	1.00	8.00	367	0.40
SB Road/Bridge - Grading	Excavators	Diesel	Average	1.00	8.00	36.0	0.38
SB Road/Bridge - Grading	Off-Highway Trucks	Diesel	Average	1.00	8.00	376	0.38
SB Road/Bridge - BC	Cranes	Diesel	Average	1.00	8.00	367	0.29
SB Road/Bridge - BC	Forklifts	Diesel	Average	1.00	8.00	82.0	0.20
SB Road/Bridge - BC	Generator Sets	Diesel	Average	1.00	8.00	14.0	0.74
SB Road/Bridge - BC	Crawler Tractors	Diesel	Average	1.00	8.00	87.0	0.43
SB Road/Bridge - Paving	Pavers	Diesel	Average	1.00	8.00	81.0	0.42
SB Road/Bridge - Paving	Rollers	Diesel	Average	1.00	8.00	36.0	0.38
SB Road/Bridge - Paving	Rubber Tired Dozers	Diesel	Average	1.00	8.00	367	0.40
SB Road/Bridge - Paving	Graders	Diesel	Average	1.00	8.00	148	0.41

5.3. Construction Vehicles

5.3.1. Unmitigated

Phase Name	Trip Type	One-Way Trips per Day	Miles per Trip	Vehicle Mix
SB Road/Bridge - Demo	—	—	—	—
SB Road/Bridge - Demo	Worker	0.00	18.5	LDA,LDT1,LDT2
SB Road/Bridge - Demo	Vendor	—	10.2	HHDT,MHDT
SB Road/Bridge - Demo	Hauling	0.00	20.0	HHDT
SB Road/Bridge - Demo	Onsite truck	—	—	HHDT
SB Road/Bridge - Grading	—	—	—	—
SB Road/Bridge - Grading	Worker	0.00	18.5	LDA,LDT1,LDT2
SB Road/Bridge - Grading	Vendor	—	10.2	HHDT,MHDT
SB Road/Bridge - Grading	Hauling	0.00	20.0	HHDT
SB Road/Bridge - Grading	Onsite truck	—	—	HHDT
SB Road/Bridge - BC	—	—	—	—
SB Road/Bridge - BC	Worker	0.00	18.5	LDA,LDT1,LDT2
SB Road/Bridge - BC	Vendor	0.00	10.2	HHDT,MHDT
SB Road/Bridge - BC	Hauling	0.00	20.0	HHDT
SB Road/Bridge - BC	Onsite truck	—	—	HHDT
SB Road/Bridge - Paving	—	—	—	—
SB Road/Bridge - Paving	Worker	0.00	18.5	LDA,LDT1,LDT2
SB Road/Bridge - Paving	Vendor	—	10.2	HHDT,MHDT
SB Road/Bridge - Paving	Hauling	0.00	20.0	HHDT
SB Road/Bridge - Paving	Onsite truck	—	—	HHDT

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

Non-applicable. No control strategies activated by user.

5.5. Architectural Coatings

Phase Name	Residential Interior Area Coated (sq ft)	Residential Exterior Area Coated (sq ft)	Non-Residential Interior Area Coated (sq ft)	Non-Residential Exterior Area Coated (sq ft)	Parking Area Coated (sq ft)

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

Phase Name	Material Imported (Cubic Yards)	Material Exported (Cubic Yards)	Acres Graded (acres)	Material Demolished (Ton of Debris)	Acres Paved (acres)
SB Road/Bridge - Demo	0.00	0.00	0.00	675	—
SB Road/Bridge - Grading	12,000	17,300	43.0	0.00	—
SB Road/Bridge - Paving	0.00	0.00	0.00	0.00	1.80

5.6.2. Construction Earthmoving Control Strategies

Control Strategies Applied	Frequency (per day)	PM10 Reduction	PM2.5 Reduction
Water Exposed Area	2	61%	61%
Water Demolished Area	2	36%	36%

5.7. Construction Paving

Land Use	Area Paved (acres)	% Asphalt
Other Asphalt Surfaces	1.80	100%

5.8. Construction Electricity Consumption and Emissions Factors

kWh per Year and Emission Factor (lb/MWh)

Year	kWh per Year	CO2	CH4	N2O
2029	0.00	532	0.03	< 0.005

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

Vegetation Land Use Type	Vegetation Soil Type	Initial Acres	Final Acres

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

Biomass Cover Type	Initial Acres	Final Acres

5.18.2. Sequestration

5.18.2.1. Unmitigated

Tree Type	Number	Electricity Saved (kWh/year)	Natural Gas Saved (btu/year)

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

Cal-Adapt midcentury 2040–2059 average projections for four hazards are reported below for your project location. These are under Representation Concentration Pathway (RCP) 8.5 which assumes GHG emissions will continue to rise strongly through 2050 and then plateau around 2100.

Climate Hazard	Result for Project Location	Unit
Temperature and Extreme Heat	9.96	annual days of extreme heat
Extreme Precipitation	5.90	annual days with precipitation above 20 mm

Sea Level Rise	—	meters of inundation depth
Wildfire	20.5	annual hectares burned

Temperature and Extreme Heat data are for grid cell in which your project are located. The projection is based on the 98th historical percentile of daily maximum/minimum temperatures from observed historical data (32 climate model ensemble from Cal-Adapt, 2040–2059 average under RCP 8.5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Extreme Precipitation data are for the grid cell in which your project are located. The threshold of 20 mm is equivalent to about ¾ an inch of rain, which would be light to moderate rainfall if received over a full day or heavy rain if received over a period of 2 to 4 hours. Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Sea Level Rise data are for the grid cell in which your project are located. The projections are from Radke et al. (2017), as reported in Cal-Adapt (Radke et al., 2017, CEC-500-2017-008), and consider inundation location and depth for the San Francisco Bay, the Sacramento-San Joaquin River Delta and California coast resulting different increments of sea level rise coupled with extreme storm events. Users may select from four scenarios to view the range in potential inundation depth for the grid cell. The four scenarios are: No rise, 0.5 meter, 1.0 meter, 1.41 meters
Wildfire data are for the grid cell in which your project are located. The projections are from UC Davis, as reported in Cal-Adapt (2040–2059 average under RCP 8.5), and consider historical data of climate, vegetation, population density, and large (> 400 ha) fire history. Users may select from four model simulations to view the range in potential wildfire probabilities for the grid cell. The four simulations make different assumptions about expected rainfall and temperature are: Warmer/drier (HadGEM2-ES), Cooler/wetter (CNRM-CM5), Average conditions (CanESM2), Range of different rainfall and temperature possibilities (MIROC5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.

6.2. Initial Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	1	0	0	N/A
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	1	0	0	N/A
Wildfire	1	0	0	N/A
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	0	0	0	N/A

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores do not include implementation of climate risk reduction measures.

6.3. Adjusted Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score

Temperature and Extreme Heat	1	1	1	2
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	1	1	1	2
Wildfire	1	1	1	2
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	1	1	1	2

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores include implementation of climate risk reduction measures.

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Exposure Indicators	—
AQ-Ozone	—
AQ-PM	—
AQ-DPM	—
Drinking Water	—
Lead Risk Housing	—
Pesticides	—
Toxic Releases	—

Traffic	—
Effect Indicators	—
CleanUp Sites	—
Groundwater	—
Haz Waste Facilities/Generators	—
Impaired Water Bodies	—
Solid Waste	—
Sensitive Population	—
Asthma	—
Cardio-vascular	—
Low Birth Weights	—
Socioeconomic Factor Indicators	—
Education	—
Housing	—
Linguistic	—
Poverty	—
Unemployment	—

7.2. Healthy Places Index Scores

The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Economic	—
Above Poverty	89.34941614
Employed	19.02989863
Median HI	97.69023483
Education	—
Bachelor's or higher	88.59232645

High school enrollment	100
Preschool enrollment	95.7141024
Transportation	—
Auto Access	93.63531374
Active commuting	12.16476325
Social	—
2-parent households	42.29436674
Voting	82.35596048
Neighborhood	—
Alcohol availability	89.4649044
Park access	38.81688695
Retail density	42.06339022
Supermarket access	2.399589375
Tree canopy	71.42307199
Housing	—
Homeownership	65.75131528
Housing habitability	87.501604
Low-inc homeowner severe housing cost burden	64.24996792
Low-inc renter severe housing cost burden	88.91312717
Uncrowded housing	62.10701912
Health Outcomes	—
Insured adults	89.59322469
Arthritis	0.0
Asthma ER Admissions	99.7
High Blood Pressure	0.0
Cancer (excluding skin)	0.0
Asthma	0.0

Coronary Heart Disease	0.0
Chronic Obstructive Pulmonary Disease	0.0
Diagnosed Diabetes	0.0
Life Expectancy at Birth	77.8
Cognitively Disabled	87.2
Physically Disabled	55.6
Heart Attack ER Admissions	99.5
Mental Health Not Good	0.0
Chronic Kidney Disease	0.0
Obesity	0.0
Pedestrian Injuries	93.4
Physical Health Not Good	0.0
Stroke	0.0
Health Risk Behaviors	—
Binge Drinking	0.0
Current Smoker	0.0
No Leisure Time for Physical Activity	0.0
Climate Change Exposures	—
Wildfire Risk	99.5
SLR Inundation Area	38.8
Children	43.1
Elderly	11.5
English Speaking	77.4
Foreign-born	54.6
Outdoor Workers	85.4
Climate Change Adaptive Capacity	—
Impervious Surface Cover	79.5

Traffic Density	81.9
Traffic Access	23.0
Other Indices	—
Hardship	5.4
Other Decision Support	—
2016 Voting	60.6

7.3. Overall Health & Equity Scores

Metric	Result for Project Census Tract
CalEnviroScreen 4.0 Score for Project Location (a)	—
Healthy Places Index Score for Project Location (b)	90.0
Project Located in a Designated Disadvantaged Community (Senate Bill 535)	No
Project Located in a Low-Income Community (Assembly Bill 1550)	No
Project Located in a Community Air Protection Program Community (Assembly Bill 617)	No

a: The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.
b: The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

7.4. Health & Equity Measures

No Health & Equity Measures selected.

7.5. Evaluation Scorecard

Health & Equity Evaluation Scorecard not completed.

7.6. Health & Equity Custom Measures

No Health & Equity Custom Measures created.

8. User Changes to Default Data

Screen	Justification
Construction: Construction Phases	see construction assumptions

Topanga-VS-Con Detailed Report

Table of Contents

1. Basic Project Information

1.1. Basic Project Information

1.2. Land Use Types

1.3. User-Selected Emission Reduction Measures by Emissions Sector

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

2.2. Construction Emissions by Year, Unmitigated

3. Construction Emissions Details

3.1. Site Preparation (2027) - Unmitigated

3.3. Grading (2027) - Unmitigated

3.5. Building Construction (2027) - Unmitigated

3.7. Paving (2027) - Unmitigated

3.9. Architectural Coating (2027) - Unmitigated

4. Operations Emissions Details

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

5. Activity Data

5.1. Construction Schedule

5.2. Off-Road Equipment

5.2.1. Unmitigated

5.3. Construction Vehicles

5.3.1. Unmitigated

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

5.5. Architectural Coatings

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

5.6.2. Construction Earthmoving Control Strategies

5.7. Construction Paving

5.8. Construction Electricity Consumption and Emissions Factors

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

5.18.2. Sequestration

5.18.2.1. Unmitigated

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

6.2. Initial Climate Risk Scores

6.3. Adjusted Climate Risk Scores

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

7.2. Healthy Places Index Scores

7.3. Overall Health & Equity Scores

7.4. Health & Equity Measures

7.5. Evaluation Scorecard

7.6. Health & Equity Custom Measures

8. User Changes to Default Data

1. Basic Project Information

1.1. Basic Project Information

Data Field	Value
Project Name	Topanga-VS-Con
Construction Start Date	1/1/2027
Lead Agency	—
Land Use Scale	Project/site
Analysis Level for Defaults	County
Windspeed (m/s)	2.70
Precipitation (days)	4.60
Location	18711 Pacific Coast Hwy, Malibu, CA 90265, USA
County	Los Angeles-South Coast
City	Unincorporated
Air District	South Coast AQMD
Air Basin	South Coast
TAZ	3802
EDFZ	7
Electric Utility	Southern California Edison
Gas Utility	Southern California Gas
App Version	2022.1.1.21

1.2. Land Use Types

Land Use Subtype	Size	Unit	Lot Acreage	Building Area (sq ft)	Landscape Area (sq ft)	Special Landscape Area (sq ft)	Population	Description
General Office Building	5.50	1000sqft	0.13	5,500	0.00	—	—	—

Parking Lot	75.0	Space	0.67	0.00	0.00	—	—	—

1.3. User-Selected Emission Reduction Measures by Emissions Sector

No measures selected

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Un/Mit.	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	1.70	10.1	12.6	16.7	0.03	0.47	0.00	0.47	0.44	0.00	0.44	—	3,026	3,026	0.12	0.02	0.00	3,037
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	1.55	1.30	11.4	12.4	0.02	0.52	2.76	3.28	0.48	1.34	1.81	—	2,238	2,238	0.09	0.02	0.00	2,245
Average Daily (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.35	0.46	2.75	3.73	0.01	0.11	0.03	0.14	0.10	0.01	0.11	—	768	768	0.03	0.01	0.00	771
Annual (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.06	0.08	0.50	0.68	< 0.005	0.02	0.01	0.02	0.02	< 0.005	0.02	—	127	127	0.01	< 0.005	0.00	128

2.2. Construction Emissions by Year, Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Year	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e

Daily - Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2027	1.70	10.1	12.6	16.7	0.03	0.47	0.00	0.47	0.44	0.00	0.44	—	3,026	3,026	0.12	0.02	0.00	3,037
Daily - Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2027	1.55	1.30	11.4	12.4	0.02	0.52	2.76	3.28	0.48	1.34	1.81	—	2,238	2,238	0.09	0.02	0.00	2,245
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2027	0.35	0.46	2.75	3.73	0.01	0.11	0.03	0.14	0.10	0.01	0.11	—	768	768	0.03	0.01	0.00	771
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2027	0.06	0.08	0.50	0.68	< 0.005	0.02	0.01	0.02	0.02	< 0.005	0.02	—	127	127	0.01	< 0.005	0.00	128

3. Construction Emissions Details

3.1. Site Preparation (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.49	0.41	3.44	5.56	0.01	0.17	—	0.17	0.15	—	0.15	—	859	859	0.03	0.01	—	862
Dust From Material Movement	—	—	—	—	—	—	0.21	0.21	—	0.02	0.02	—	—	—	—	—	—	—

Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	< 0.005	< 0.005	0.01	0.02	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	2.35	2.35	< 0.005	< 0.005	—	2.36
Dust From Material Movement	—	—	—	—	—	—	< 0.005	< 0.005	—	< 0.005	< 0.005	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	0.39	0.39	< 0.005	< 0.005	—	0.39
Dust From Material Movement	—	—	—	—	—	—	< 0.005	< 0.005	—	< 0.005	< 0.005	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.3. Grading (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.55	1.30	11.4	12.4	0.02	0.52	—	0.52	0.48	—	0.48	—	2,238	2,238	0.09	0.02	—	2,245
Dust From Material Movement	—	—	—	—	—	—	2.76	2.76	—	1.34	1.34	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.02	0.01	0.13	0.14	< 0.005	0.01	—	0.01	0.01	—	0.01	—	24.5	24.5	< 0.005	< 0.005	—	24.6

Dust From Material Movement	—	—	—	—	—	—	0.03	0.03	—	0.01	0.01	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	< 0.005	< 0.005	0.02	0.02	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	4.06	4.06	< 0.005	< 0.005	—	4.07
Dust From Material Movement	—	—	—	—	—	—	0.01	0.01	—	< 0.005	< 0.005	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.5. Building Construction (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.82	0.69	6.51	8.94	0.02	0.25	—	0.25	0.23	—	0.23	—	1,876	1,876	0.08	0.02	—	1,882
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.82	0.69	6.51	8.94	0.02	0.25	—	0.25	0.23	—	0.23	—	1,876	1,876	0.08	0.02	—	1,882
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.32	0.27	2.50	3.43	0.01	0.10	—	0.10	0.09	—	0.09	—	719	719	0.03	0.01	—	722
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.06	0.05	0.46	0.63	< 0.005	0.02	—	0.02	0.02	—	0.02	—	119	119	< 0.005	< 0.005	—	120
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.7. Paving (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipment	0.70	0.58	4.98	6.25	0.01	0.20	—	0.20	0.19	—	0.19	—	973	973	0.04	0.01	—	976
Paving	—	0.25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.01	0.01	0.10	0.12	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	18.7	18.7	< 0.005	< 0.005	—	18.7
Paving	—	< 0.005	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	< 0.005	< 0.005	0.02	0.02	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	3.09	3.09	< 0.005	< 0.005	—	3.10
Paving	—	< 0.005	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.9. Architectural Coating (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.18	0.15	1.11	1.50	< 0.005	0.03	—	0.03	0.02	—	0.02	—	178	178	0.01	< 0.005	—	179
Architectural Coatings	—	8.45	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	< 0.005	< 0.005	0.02	0.03	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	3.41	3.41	< 0.005	< 0.005	—	3.43
Architectural Coatings	—	0.16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	< 0.005	< 0.005	< 0.005	0.01	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	0.57	0.57	< 0.005	< 0.005	—	0.57
Architectural Coatings	—	0.03	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

4. Operations Emissions Details

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Vegetation	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Species	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

5. Activity Data

5.1. Construction Schedule

Phase Name	Phase Type	Start Date	End Date	Days Per Week	Work Days per Phase	Phase Description
Site Preparation	Site Preparation	1/1/2027	1/1/2027	7.00	1.00	—
Grading	Grading	1/2/2027	1/5/2027	7.00	4.00	—
Building Construction	Building Construction	1/6/2027	5/25/2027	7.00	140	—
Paving	Paving	5/19/2027	5/25/2027	7.00	7.00	—
Architectural Coating	Architectural Coating	5/19/2027	5/25/2027	7.00	7.00	—

5.2. Off-Road Equipment

5.2.1. Unmitigated

Phase Name	Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor
Site Preparation	Graders	Diesel	Average	1.00	8.00	148	0.41
Site Preparation	Tractors/Loaders/Backhoes	Diesel	Average	1.00	8.00	84.0	0.37

Grading	Graders	Diesel	Average	1.00	8.00	148	0.41
Grading	Rubber Tired Dozers	Diesel	Average	1.00	8.00	367	0.40
Grading	Tractors/Loaders/Backhoes	Diesel	Average	1.00	8.00	84.0	0.37
Building Construction	Cranes	Diesel	Average	1.00	8.00	367	0.29
Building Construction	Forklifts	Diesel	Average	2.00	8.00	82.0	0.20
Building Construction	Tractors/Loaders/Backhoes	Diesel	Average	2.00	8.00	84.0	0.37
Paving	Tractors/Loaders/Backhoes	Diesel	Average	1.00	8.00	84.0	0.37
Paving	Cement and Mortar Mixers	Diesel	Average	4.00	8.00	10.0	0.56
Paving	Pavers	Diesel	Average	1.00	8.00	81.0	0.42
Paving	Rollers	Diesel	Average	1.00	8.00	36.0	0.38
Architectural Coating	Air Compressors	Diesel	Average	1.00	8.00	37.0	0.48

5.3. Construction Vehicles

5.3.1. Unmitigated

Phase Name	Trip Type	One-Way Trips per Day	Miles per Trip	Vehicle Mix
Site Preparation	—	—	—	—
Site Preparation	Worker	0.00	18.5	LDA,LDT1,LDT2
Site Preparation	Vendor	—	10.2	HHDT,MHDT
Site Preparation	Hauling	0.00	20.0	HHDT
Site Preparation	Onsite truck	—	—	HHDT
Grading	—	—	—	—
Grading	Worker	0.00	18.5	LDA,LDT1,LDT2
Grading	Vendor	—	10.2	HHDT,MHDT
Grading	Hauling	0.00	20.0	HHDT

Grading	Onsite truck	—	—	HHDT
Building Construction	—	—	—	—
Building Construction	Worker	0.00	18.5	LDA,LDT1,LDT2
Building Construction	Vendor	0.00	10.2	HHDT,MHDT
Building Construction	Hauling	0.00	20.0	HHDT
Building Construction	Onsite truck	—	—	HHDT
Paving	—	—	—	—
Paving	Worker	0.00	18.5	LDA,LDT1,LDT2
Paving	Vendor	—	10.2	HHDT,MHDT
Paving	Hauling	0.00	20.0	HHDT
Paving	Onsite truck	—	—	HHDT
Architectural Coating	—	—	—	—
Architectural Coating	Worker	0.00	18.5	LDA,LDT1,LDT2
Architectural Coating	Vendor	—	10.2	HHDT,MHDT
Architectural Coating	Hauling	0.00	20.0	HHDT
Architectural Coating	Onsite truck	—	—	HHDT

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

Non-applicable. No control strategies activated by user.

5.5. Architectural Coatings

Phase Name	Residential Interior Area Coated (sq ft)	Residential Exterior Area Coated (sq ft)	Non-Residential Interior Area Coated (sq ft)	Non-Residential Exterior Area Coated (sq ft)	Parking Area Coated (sq ft)
Architectural Coating	0.00	0.00	8,250	2,750	1,764

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

Phase Name	Material Imported (cy)	Material Exported (cy)	Acres Graded (acres)	Material Demolished (sq. ft.)	Acres Paved (acres)
Site Preparation	—	—	0.50	0.00	—
Grading	—	—	4.00	0.00	—
Paving	0.00	0.00	0.00	0.00	0.67

5.6.2. Construction Earthmoving Control Strategies

Control Strategies Applied	Frequency (per day)	PM10 Reduction	PM2.5 Reduction
Water Exposed Area	2	61%	61%

5.7. Construction Paving

Land Use	Area Paved (acres)	% Asphalt
General Office Building	0.00	0%
Parking Lot	0.67	100%

5.8. Construction Electricity Consumption and Emissions Factors

kWh per Year and Emission Factor (lb/MWh)

Year	kWh per Year	CO2	CH4	N2O
2027	0.00	532	0.03	< 0.005

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

Vegetation Land Use Type	Vegetation Soil Type	Initial Acres	Final Acres

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

Biomass Cover Type	Initial Acres	Final Acres

5.18.2. Sequestration

5.18.2.1. Unmitigated

Tree Type	Number	Electricity Saved (kWh/year)	Natural Gas Saved (btu/year)

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

Cal-Adapt midcentury 2040–2059 average projections for four hazards are reported below for your project location. These are under Representation Concentration Pathway (RCP) 8.5 which assumes GHG emissions will continue to rise strongly through 2050 and then plateau around 2100.

Climate Hazard	Result for Project Location	Unit
Temperature and Extreme Heat	9.96	annual days of extreme heat
Extreme Precipitation	5.90	annual days with precipitation above 20 mm
Sea Level Rise	—	meters of inundation depth
Wildfire	20.5	annual hectares burned

Temperature and Extreme Heat data are for grid cell in which your project are located. The projection is based on the 98th historical percentile of daily maximum/minimum temperatures from observed historical data (32 climate model ensemble from Cal-Adapt, 2040–2059 average under RCP 8.5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Extreme Precipitation data are for the grid cell in which your project are located. The threshold of 20 mm is equivalent to about ¾ an inch of rain, which would be light to moderate rainfall if received over a full day or heavy rain if received over a period of 2 to 4 hours. Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Sea Level Rise data are for the grid cell in which your project are located. The projections are from Radke et al. (2017), as reported in Cal-Adapt (Radke et al., 2017, CEC-500-2017-008), and consider inundation location and depth for the San Francisco Bay, the Sacramento-San Joaquin River Delta and California coast resulting different increments of sea level rise coupled with extreme storm events. Users may select from four scenarios to view the range in potential inundation depth for the grid cell. The four scenarios are: No rise, 0.5 meter, 1.0 meter, 1.41 meters
Wildfire data are for the grid cell in which your project are located. The projections are from UC Davis, as reported in Cal-Adapt (2040–2059 average under RCP 8.5), and consider historical data of climate, vegetation, population density, and large (> 400 ha) fire history. Users may select from four model simulations to view the range in potential wildfire probabilities for the grid cell. The four simulations make different assumptions about expected rainfall and temperature are: Warmer/drier (HadGEM2-ES), Cooler/wetter (CNRM-CM5), Average conditions (CanESM2), Range of different rainfall and temperature possibilities (MIROC5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.

6.2. Initial Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	1	0	0	N/A
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	1	0	0	N/A
Wildfire	1	0	0	N/A
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	0	0	0	N/A

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores do not include implementation of climate risk reduction measures.

6.3. Adjusted Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	1	1	1	2
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	1	1	1	2
Wildfire	1	1	1	2
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	1	1	1	2

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.

The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores include implementation of climate risk reduction measures.

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Exposure Indicators	—
AQ-Ozone	—
AQ-PM	—
AQ-DPM	—
Drinking Water	—
Lead Risk Housing	—
Pesticides	—
Toxic Releases	—
Traffic	—
Effect Indicators	—
CleanUp Sites	—
Groundwater	—
Haz Waste Facilities/Generators	—
Impaired Water Bodies	—
Solid Waste	—
Sensitive Population	—
Asthma	—
Cardio-vascular	—

Low Birth Weights	—
Socioeconomic Factor Indicators	—
Education	—
Housing	—
Linguistic	—
Poverty	—
Unemployment	—

7.2. Healthy Places Index Scores

The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Economic	—
Above Poverty	89.34941614
Employed	19.02989863
Median HI	97.69023483
Education	—
Bachelor's or higher	88.59232645
High school enrollment	100
Preschool enrollment	95.7141024
Transportation	—
Auto Access	93.63531374
Active commuting	12.16476325
Social	—
2-parent households	42.29436674
Voting	82.35596048
Neighborhood	—
Alcohol availability	89.4649044

Park access	38.81688695
Retail density	42.06339022
Supermarket access	2.399589375
Tree canopy	71.42307199
Housing	—
Homeownership	65.75131528
Housing habitability	87.501604
Low-inc homeowner severe housing cost burden	64.24996792
Low-inc renter severe housing cost burden	88.91312717
Uncrowded housing	62.10701912
Health Outcomes	—
Insured adults	89.59322469
Arthritis	0.0
Asthma ER Admissions	99.7
High Blood Pressure	0.0
Cancer (excluding skin)	0.0
Asthma	0.0
Coronary Heart Disease	0.0
Chronic Obstructive Pulmonary Disease	0.0
Diagnosed Diabetes	0.0
Life Expectancy at Birth	77.8
Cognitively Disabled	87.2
Physically Disabled	55.6
Heart Attack ER Admissions	99.5
Mental Health Not Good	0.0
Chronic Kidney Disease	0.0
Obesity	0.0

Pedestrian Injuries	93.4
Physical Health Not Good	0.0
Stroke	0.0
Health Risk Behaviors	—
Binge Drinking	0.0
Current Smoker	0.0
No Leisure Time for Physical Activity	0.0
Climate Change Exposures	—
Wildfire Risk	99.5
SLR Inundation Area	38.8
Children	43.1
Elderly	11.5
English Speaking	77.4
Foreign-born	54.6
Outdoor Workers	85.4
Climate Change Adaptive Capacity	—
Impervious Surface Cover	79.5
Traffic Density	81.9
Traffic Access	23.0
Other Indices	—
Hardship	5.4
Other Decision Support	—
2016 Voting	60.6

7.3. Overall Health & Equity Scores

Metric	Result for Project Census Tract
CalEnviroScreen 4.0 Score for Project Location (a)	—

Healthy Places Index Score for Project Location (b)	90.0
Project Located in a Designated Disadvantaged Community (Senate Bill 535)	No
Project Located in a Low-Income Community (Assembly Bill 1550)	No
Project Located in a Community Air Protection Program Community (Assembly Bill 617)	No

a: The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.
b: The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

7.4. Health & Equity Measures

No Health & Equity Measures selected.

7.5. Evaluation Scorecard

Health & Equity Evaluation Scorecard not completed.

7.6. Health & Equity Custom Measures

No Health & Equity Custom Measures created.

8. User Changes to Default Data

Screen	Justification
Land Use	see construction assumptions
Construction: Construction Phases	see construction assumptions
Construction: Off-Road Equipment	see construction assumptions
Construction: Trips and VMT	construction mobile emissions calculated outside of CalEEMod.

Construction: Off-Road Equipment	see construction assumptions
Construction: Trips and VMT	construction mobile emissions calculated outside of CalEEMod.
Construction: Dust From Material Movement	see construction assumptions

P.3-1 Option 2 Construction Air Quality Emissions Calculations

Topanga Lagoon Option 2
Air Quality Construction Analysis

Regional Maximums Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
					lb/day					
Grading - 2029	0.55	4.25	7.00	0.018	0.93	0.16	1.08	0.21	0.15	0.35
Project Daily Maximum Emissions	**0.55**	**4.25**	**7.00**	**0.018**	**0.93**	**0.16**	**1.08**	**0.21**	**0.15**	**0.35**

Localized Maximum Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
					lb/day					
Grading - 2029	0.43	3.29	5.10	0.008	0.21	0.14	0.35	0.02	0.13	0.16
Project Daily Maximum Emissions	**0.43**	**3.29**	**5.10**	**0.008**	**0.21**	**0.14**	**0.35**	**0.02**	**0.13**	**0.16**

Topanga Lagoon Option 2

Air Quality Construction Analysis

Summer	Onsite Emissions										Offsite Emissions									
Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
	lb/day										lb/day									
Grading - 2029	0.43	3.29	5.10	0.008	0.21	0.14	0.35	0.02	0.13	0.16	0.12	0.96	1.90	0.011	0.72	0.01	0.73	0.18	0.01	0.19

Regional Emissions	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Grading - 2029	0.55	4.25	7.00	0.018	0.93	0.16	1.08	0.21	0.15	0.35
Project Daily Maximum Emissions	**0.55**	**4.25**	**7.00**	**0.018**	**0.93**	**0.16**	**1.08**	**0.21**	**0.15**	**0.35**

Note: Offsite emissions pasted over from EMFAC2021 analysis

Topanga Lagoon Option 2

Air Quality Construction Analysis

	Onsite Emissions										Offsite Emissions									
Winter																				
Source	**ROG**	**NOX**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**Total PM10**	**Fugitive PM2.5**	**Exhaust PM2.5**	**Total PM2.5**	**ROG**	**NOX**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**Total PM10**	**Fugitive PM2.5**	**Exhaust PM2.5**	**Total PM2.5**
						lb/day									lb/day					
Grading - 2029	0.43	3.29	5.10	0.008	0.21	0.14	0.35	0.02	0.13	0.16	0.12	0.96	1.90	0.011	0.72	0.01	0.73	0.18	0.01	0.19

Regional Emissions	**ROG**	**NOX**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**Total PM10**	**Fugitive PM2.5**	**Exhaust PM2.5**	**Total PM2.5**
Grading - 2029	0.55	4.25	7.00	0.018	0.93	0.16	1.08	0.21	0.15	0.35
Project Daily Maximum Emissions	**0.55**	**4.25**	**7.00**	**0.018**	**0.93**	**0.16**	**1.08**	**0.21**	**0.15**	**0.35**

Note: Offsite emissions pasted over from EMFAC2021 analysis

Topanga Lagoon Option 2
Air Quality Construction Analysis
Mitigated Emissions

Regional Maximums Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
					lb/day					
Grading - 2029	0.33	2.64	7.30	0.018	0.93	0.06	0.99	0.21	0.06	0.26
Project Daily Maximum Emissions	**0.33**	**2.64**	**7.30**	**0.018**	**0.93**	**0.06**	**0.99**	**0.21**	**0.06**	**0.26**

Localized Maximum Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
					lb/day					
Grading - 2029	0.21	1.68	5.40	0.008	0.21	0.05	0.26	0.02	0.05	0.07
Project Daily Maximum Emissions	**0.21**	**1.68**	**5.40**	**0.008**	**0.21**	**0.05**	**0.26**	**0.02**	**0.05**	**0.07**

Topanga Lagoon Option 2

Air Quality Construction Analysis

Mitigated Emissions

Summer	Onsite Emissions										Offsite Emissions									
Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
	lb/day										lb/day									
Grading - 2029	0.21	1.68	5.40	0.008	0.21	0.05	0.26	0.02	0.05	0.07	0.12	0.96	1.90	0.011	0.72	0.01	0.73	0.18	0.01	0.19

Regional Emissions	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Grading - 2029	0.33	2.64	7.30	0.018	0.93	0.06	0.99	0.21	0.06	0.26
Project Daily Maximum Emissions	**0.33**	**2.64**	**7.30**	**0.018**	**0.93**	**0.06**	**0.99**	**0.21**	**0.06**	**0.26**

Note: Offsite emissions pasted over from EMFAC2021 analysis

Topanga Lagoon Option 2
Air Quality Construction Analysis
Mitigated Emissions

Winter	Onsite Emissions										Offsite Emissions									
Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
	lb/day										lb/day									
Grading - 2029	0.21	1.68	5.40	0.008	0.21	0.05	0.26	0.02	0.05	0.07	0.12	0.96	1.90	0.011	0.72	0.01	0.73	0.18	0.01	0.19

Note: Offsite emissions pasted over from EMFAC2021 analysis

Regional Emissions	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Grading - 2029	0.33	2.64	7.30	0.018	0.93	0.06	0.99	0.21	0.06	0.26
Project Daily Maximum Emissions	**0.33**	**2.64**	**7.30**	**0.018**	**0.93**	**0.06**	**0.99**	**0.21**	**0.06**	**0.26**

P.3-2 Option 2 Construction Air Quality Mobile Emissions

Topanga Canyon - Op2 and 3
Total Emissions

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Idling per Day (minutes)	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10 Dust	PM10 Exh	Total PM10	PM2.5 Dust	PM2.5 Exh	Total PM2.5	(MT/yr) Total CO2e
Grading/Excavation	2030															
Total Haul Trips	200															
Hauling	6	43	8	36.5	15	0.02	0.86	0.43	0.01	0.20	0.01	0.21	0.05	0.01	0.06	11.02
Vendor	0	214	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0	0.10	0.10	1.47	0.00	0.52	0.00	0.52	0.13	0.00	0.13	43.18
					Total	0.12	0.96	1.90	0.01	0.72	0.01	0.73	0.18	0.01	0.19	54.20
Demolition NB Road/Bridge	2031				Workers+Ver	0.10	0.10	1.47	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	0															
Hauling	0	43	8	36.5	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	59	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	18.5	0	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	11.69
					Total	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	11.69
Construct NB Road/Bridge	2031	Grading/Excavation			Workers+Ver	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	200															
Hauling	6	43	8	36.5	15	0.02	0.83	0.42	0.01	0.20	0.01	0.21	0.05	0.01	0.06	10.73
Vendor	0	61	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	12.08
					Total	0.11	0.92	1.81	0.01	0.72	0.01	0.73	0.18	0.01	0.19	22.82
Construct NB Road/Bridge	2031	Building Construction			Workers+Ver	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	330															
Hauling	4	152	8	36.5	15	0.01	0.56	0.28	0.00	0.14	0.01	0.14	0.04	0.01	0.04	17.71
Vendor	0	214	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	42.39
					Total	0.10	0.64	1.67	0.01	0.65	0.01	0.66	0.16	0.01	0.17	60.10
Construct NB Road/Bridge	2031	Paving			Workers+Ver	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	0															
Hauling	0	23	8	36.5	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	6.14
					Total	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	6.14
					Workers+Ver	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	

Topanga Canyon - Op2 and 3
Running Emissions

		Running Emissions Factor (grams/mile)						Running Emissions Factor (grams/mile)		
		ROG_RUNEX	NOx_RUNEX	CO_RUNEX	SOx_RUNEX	PM10_RUNEX	PM2.5_RUNEX	CO2_RUNEX	CH4_RUNEX	N2O_RUNEX
2027	2027Hauling Hauling	0.013128	1.553518611	0.45473657	0.01336714	0.02273486	0.02174732	1471.80075	0.0608523	0.23462364
2027	2027Vendor Vendor	0.01570588	1.102331968	0.36327753	0.01214871	0.01475662	0.01411185	1311.1435	0.03509759	0.18307889
2027	2027Worker Worker	0.01447264	0.062492418	0.90233334	0.00281062	0.00150729	0.0013867	284.320587	0.00354266	0.00566149
2028	2028Hauling Hauling	0.01261339	1.493718015	0.43877031	0.01305596	0.02247317	0.02149714	1438.29866	0.05768159	0.22931835
2028	2028Vendor Vendor	0.01417298	1.038868065	0.3360531	0.01185313	0.01426835	0.01364491	1280.01295	0.03342244	0.17922194
2028	2028Worker Worker	0.01314756	0.057035459	0.85167037	0.00274948	0.00140448	0.00129194	278.134904	0.00325313	0.00533773
2029	2029Hauling Hauling	0.01213472	1.434866903	0.4224926	0.01273534	0.0221686	0.0212059	1403.60667	0.05465536	0.22381566
2029	2029Vendor Vendor	0.0128196	0.978781777	0.31101237	0.01152628	0.01380314	0.01320005	1245.46404	0.03180989	0.17489835
2029	2029Worker Worker	0.01192021	0.051957034	0.80464317	0.00269297	0.00130724	0.00120239	272.417637	0.00298654	0.00503952
2030	2030Hauling Hauling	0.01169729	1.381905725	0.40596438	0.01241489	0.02183595	0.02088778	1368.72007	0.05170538	0.2182712
2030	2030Vendor Vendor	0.01168751	0.9252091	0.28941545	0.01117412	0.01336285	0.01277903	1208.11234	0.03023265	0.17022289
2030	2030Worker Worker	0.01081241	0.047255061	0.76242747	0.00264062	0.00121547	0.00111789	267.121939	0.00274623	0.00476556
2031	2031Hauling Hauling	0.01126827	1.331771303	0.38663416	0.01209496	0.02148002	0.02054741	1333.31591	0.04842446	0.21262163
2031	2031Vendor Vendor	0.01070694	0.874998281	0.26868024	0.01079467	0.01293916	0.01237394	1167.57711	0.02847022	0.16520071
2031	2031Worker Worker	0.00977403	0.042746598	0.72305591	0.00259298	0.00112929	0.00103861	262.302837	0.0025216	0.00450761
0	GWP	N/A	N/A	N/A	N/A	N/A	N/A	1	25	298

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10	PM2.5	Regional Emissions (MT/year) CO2	CH4	N2O	CO2e
Grading/Excavation	2030													
Total Haul Trips	200													
Hauling	6	43	8	36.5	0.01	0.67	0.20	0.01	0.01	0.01	9.99	0.01	0.47	10.48
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.02	0.08	1.24	0.00	0.00	0.00	42.30	0.01	0.22	42.54
Demolition NB Road/Bridge	2031													
Total Haul Trips	0													
Hauling	0	43	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	59	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	18.5	0.02	0.07	1.18	0.00	0.00	0.00	11.45	0.00	0.06	11.51
Construct NB Road/Bridge	2031													
Total Haul Trips	200													
Hauling	6	43	8	36.5	0.01	0.64	0.19	0.01	0.01	0.01	9.73	0.01	0.46	10.20
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0.02	0.07	1.18	0.00	0.00	0.00	11.84	0.00	0.06	11.90
Construct NB Road/Bridge	2031													
Total Haul Trips	330													
Hauling	4	152	8	36.5	0.00	0.43	0.12	0.00	0.01	0.01	16.06	0.01	0.76	16.84
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.02	0.07	1.18	0.00	0.00	0.00	41.54	0.01	0.21	41.76
Construct NB Road/Bridge	2031													
Total Haul Trips	0													
Hauling	0	23	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0.02	0.07	1.18	0.00	0.00	0.00	6.02	0.00	0.03	6.05

Topanga Canyon - Op2 and 3
Start Emissions

			Start Emissions Factor (grams/trip)						Start Emissions Factor (grams/trip)		
			ROG_STREX	NOX_STREX	CO_STREX	SOx_STREX	PM10_STREX	PM2.5_STREX	CO2_STREX	CH4_STREX	N2O_STREX
2027	2027Hauling	Hauling	0.00060894	2.672142352	0.00302137	3.16557E-07	5.30481E-07	4.87758E-07	0.03202066	7.5498E-08	7.36611E-06
2027	2027Vendor	Vendor	0.080213538	1.961946447	0.60365405	5.50826E-05	6.07836E-05	5.58883E-05	5.57177064	0.005494835	0.004037678
2027	2027Worker	Worker	1.038950633	0.251050817	3.01934346	0.000691936	0.002053348	0.001887978	69.9913431	0.06616369	0.030829475
2028	2028Hauling	Hauling	0.000490696	2.636914961	0.00257595	2.71845E-07	4.29594E-07	3.94995E-07	0.02749789	6.56178E-08	5.97594E-06
2028	2028Vendor	Vendor	0.075419112	1.927915654	0.55968909	5.22383E-05	5.76932E-05	5.30468E-05	5.28405692	0.005169504	0.003780947
2028	2028Worker	Worker	0.997046953	0.239560346	2.85187017	0.000675557	0.001941969	0.001785569	68.3345653	0.062483886	0.030029939
2029	2029Hauling	Hauling	0.000383539	2.591170334	0.00214107	2.33546E-07	3.28727E-07	3.02252E-07	0.02362391	5.62127E-08	4.65545E-06
2029	2029Vendor	Vendor	0.069289941	1.883995908	0.51714657	4.94212E-05	5.46034E-05	5.02058E-05	4.99909929	0.004852786	0.003548842
2029	2029Worker	Worker	0.945798618	0.229251267	2.69630558	0.000660221	0.001832244	0.00168468	66.7833	0.059077063	0.029313823
2030	2030Hauling	Hauling	0.00027279	2.546881303	0.00161285	1.92445E-07	2.06187E-07	1.89581E-07	0.01946637	4.71315E-08	4.0595E-06
2030	2030Vendor	Vendor	0.063656597	1.839529651	0.47865041	4.67001E-05	5.18671E-05	4.76899E-05	4.72385215	0.004565454	0.003322989
2030	2030Worker	Worker	0.901632052	0.219772527	2.55165593	0.00064583	0.001725708	0.001586724	65.3276344	0.055883281	0.028658371
2031	2031Hauling	Hauling	0.000210057	2.503276097	0.00139863	1.66951E-07	1.58801E-07	1.46012E-07	0.01688763	4.13015E-08	2.64568E-06
2031	2031Vendor	Vendor	0.059141215	1.792713918	0.44197461	4.38654E-05	4.91716E-05	4.52115E-05	4.43711805	0.004280254	0.003105544
2031	2031Worker	Worker	0.857879142	0.211029605	2.41545051	0.000632455	0.001621689	0.001491083	63.974738	0.052892816	0.028060877
	GWP			N/A					1	25	298

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10	PM2.5	Regional Emissions (MT/year) CO2	CH4	N2O	CO2e
Grading/Excavation	2030													
Total Haul Trips	200													
Hauling	6	43	8	36.5	0.00	0.03	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.08	0.02	0.23	0.00	0.00	0.00	0.56	0.00	0.00	0.64
Demolition NB Road/Bridg	2031													
Total Haul Trips	0													
Hauling	0	43	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	59	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	18.5	0.08	0.02	0.21	0.00	0.00	0.00	0.15	0.00	0.00	0.17
Construct NB Road/Bridge	2031													
Total Haul Trips	200													
Hauling	6	43	8	36.5	0.00	0.03	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0.08	0.02	0.21	0.00	0.00	0.00	0.16	0.00	0.00	0.18
Construct NB Road/Bridge	2031													
Total Haul Trips	330													
Hauling	4	152	8	36.5	0.00	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.08	0.02	0.21	0.00	0.00	0.00	0.55	0.00	0.00	0.63
Construct NB Road/Bridge	2031													
Total Haul Trips	0													
Hauling	0	23	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0.08	0.02	0.21	0.00	0.00	0.00	0.08	0.00	0.00	0.09

Topanga Canyon - Op2 and 3
Idling Emissions

			Idling Emissions Factor (grams/minute)						Idling Emissions Factor (grams/minute)		
			ROG_IDLEX	NOx_IDLEX	CO_IDLEX	SOx_IDLEX	PM10_IDLEX	PM2.5_IDLEX	CO2_IDLEX	CH4_IDLEX	N2O_IDLEX
2027	2027Hauling	Hauling	0.07592279	0.881696127	1.19921987	0.00159973	0.00047074	0.00044926	181.442358	0.03427011	0.02916541
2027	2027Vendor	Vendor	0.05529965	0.899602458	1.04932075	0.00167506	0.00086494	0.00082645	186.589554	0.03155173	0.02918792
2027	2027Worker	Worker	0	0	0	0	0	0	0	0	0
2028	2028Hauling	Hauling	0.07529788	0.857767875	1.19214339	0.00156045	0.00045204	0.00043133	177.300744	0.03377364	0.02851321
2028	2028Vendor	Vendor	0.05432839	0.863093228	1.0395891	0.00163993	0.00074988	0.00071632	182.978932	0.03134729	0.02865517
2028	2028Worker	Worker	0	0	0	0	0	0	0	0	0
2029	2029Hauling	Hauling	0.07461794	0.835480721	1.18399992	0.00152188	0.00043143	0.00041158	173.194944	0.03323976	0.02786481
2029	2029Vendor	Vendor	0.05333308	0.827999465	1.02749811	0.0016013	0.00065239	0.00062302	178.951612	0.03104801	0.02805443
2029	2029Worker	Worker	0	0	0	0	0	0	0	0	0
2030	2030Hauling	Hauling	0.07391144	0.816007794	1.17493744	0.0014846	0.00041331	0.00039421	169.186161	0.03269373	0.0272299
2030	2030Vendor	Vendor	0.05232472	0.795299763	1.01321823	0.00155966	0.00057171	0.0005458	174.561724	0.03067462	0.02739395
2030	2030Worker	Worker	0	0	0	0	0	0	0	0	0
2031	2031Hauling	Hauling	0.0732853	0.799579641	1.1664382	0.00145061	0.00039768	0.00037924	165.457521	0.03205186	0.02663599
2031	2031Vendor	Vendor	0.05130878	0.763402339	0.99683404	0.00151522	0.00050437	0.00048136	169.805962	0.03011968	0.02667472
2031	2031Worker	Worker	0	0	0	0	0	0	0	0	0
		GWP	N/A	N/A	N/A	N/A	N/A	N/A	1	25	298

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	Idling minutes per Day	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10	PM2.5	Regional Emissions (MT/year) CO2	CH4	N2O	CO2e
Grading/Excavation	2030													
Total Haul Trips	200													
Hauling	6	43	8	15	0.01	0.16	0.23	0.00	0.00	0.00	0.51	0.00	0.02	0.53
Vendor	0	214	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Demolition NB Road/Bridge	2031													
Total Haul Trips	0													
Hauling	0	43	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	59	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct NB Road/Bridge	2031													
Total Haul Trips	200													
Hauling	6	43	8	15	0.01	0.16	0.23	0.00	0.00	0.00	0.50	0.00	0.02	0.52
Vendor	0	61	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct NB Road/Bridge	2031													
Total Haul Trips	330													
Hauling	4	152	8	15	0.01	0.11	0.15	0.00	0.00	0.00	0.82	0.00	0.04	0.86
Vendor	0	214	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct NB Road/Bridge	2031													
Total Haul Trips	0													
Hauling	0	23	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Topanga Canyon - Op2 and 3
Road Dust, Break Wear, and Tire wear Emissions

			Emission Factors (grams/mile)					
			PM10			PM2.5		
			RD	PM10_PMBW	PM10_PMTW	RD	PM2.5_PMBW	PM2.5_PMTW
2027	2027Hauling	Hauling	0.29984991	0.084297987	0.03545106	0.07359952	0.0295043	0.00886277
2027	2027Vendor	Vendor	0.29984991	0.063623189	0.02372553	0.07359952	0.02226812	0.00593138
2027	2027Worker	Worker	0.29984991	0.009305649	0.008	0.07359952	0.00325698	0.002
2028	2028Hauling	Hauling	0.29984991	0.084486989	0.03545475	0.07359952	0.02957045	0.00886369
2028	2028Vendor	Vendor	0.29984991	0.063544145	0.02372738	0.07359952	0.02224045	0.00593184
2028	2028Worker	Worker	0.29984991	0.009284129	0.008	0.07359952	0.00324945	0.002
2029	2029Hauling	Hauling	0.29984991	0.084584422	0.03545835	0.07359952	0.02960455	0.00886459
2029	2029Vendor	Vendor	0.29984991	0.063359545	0.02372918	0.07359952	0.02217584	0.00593229
2029	2029Worker	Worker	0.29984991	0.00926272	0.008	0.07359952	0.00324195	0.002
2030	2030Hauling	Hauling	0.29984991	0.08460378	0.03546191	0.07359952	0.02961132	0.00886548
2030	2030Vendor	Vendor	0.29984991	0.063078834	0.02373095	0.07359952	0.02207759	0.00593274
2030	2030Worker	Worker	0.29984991	0.00924132	0.008	0.07359952	0.00323446	0.002
2031	2031Hauling	Hauling	0.29984991	0.084504548	0.03546578	0.07359952	0.02957659	0.00886644
2031	2031Vendor	Vendor	0.29984991	0.062682863	0.02373289	0.07359952	0.021939	0.00593322
2031	2031Worker	Worker	0.29984991	0.009221285	0.008	0.07359952	0.00322745	0.002

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day)					
					PM10			PM2.5		
					RD	BW	TW	RD	BW	TW
Grading/Excavation	2030									
Total Haul Trips	200									
Hauling	6	43	8	36.5	0.14	0.04	0.02	0.04	0.01	0.00
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Demolition NB Road/Bridge	2031									
Total Haul Trips	0									
Hauling	0	43	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	59	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Construct NB Road/Bridge	2031									
Total Haul Trips	200									
Hauling	6	43	8	36.5	0.14	0.04	0.02	0.04	0.01	0.00
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Construct NB Road/Bridge	2031									
Total Haul Trips	330									
Hauling	4	152	8	36.5	0.10	0.03	0.01	0.02	0.01	0.00
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Construct NB Road/Bridge	2031									
Total Haul Trips	0									
Hauling	0	23	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00

Topanga Canyon - Op2 and 3
Road Dust

Paved Road Dust Emission Factors (Assumes No Precipitation)

Formula: $EF_{Dust,P} = (k\ (sL)^{0.91} \times (W)^{1.02})$

Where:

$EF_{Dust,P}$ =	Paved Road Dust Emission Factor (having the same units as k)
k =	particle size multiplier
sL =	road surface silt loading (g/m^2)
W =	average fleet vehicle weight (tons) (CARB uses 2.4 tons as a fleet average vehicle weight factor)

	Emission Factor (grams per VMT)	
	PM10	PM2.5
k	0.9979	0.2449
sL	0.1	0.1
W	2.4	2.4
$EF_{Dust,P}$	3.00E-01	7.36E-02

Unpaved Road Dust Emission Factors (Assumes No Precipitation)

Formula: $EF_{Dust,U} = (k\ (\ s / 12)^{1} \times (Sp / 30)^{0.5} / (M / 0.5)^{0.2}) - C)$

Where:

$EF_{Dust,U}$ =	Unpaved Road Dust Emission Factor (having the same units as k)
k =	particle size multiplier
s =	surface material silt content (%)
Sp =	mean vehicle speed (mph)
M =	surface material moisture content (%)
C =	Emission Factor for 1980s vehicle fleet exhaust, brake wear, and tire wear

	Emission Factor (grams per VMT)	
	PM10	PM2.5
k	816.47	81.65
s	4.3%	4.3%
Sp	15	15
M	0.5%	0.5%
C	0.00047	0.00036
$EF_{Dust,U}$	5.20E+00	5.19E-01

Sources:

SCAQMD, CalEEMod, Version 2022.1.

CARB, *Entrained Dust from Paved Road Travel: Emission Estimation Methodology Background Document* , (1997).

USEPA, *AP-42* , Fifth Edition, Volume I, Chapter 13.2.1 - Paved Roads, (2011).

ESA, 2023.

P.3-3 Option 2 Construction Modeling

Topanga-Op2-Con Detailed Report

Table of Contents

1. Basic Project Information

1.1. Basic Project Information

1.2. Land Use Types

1.3. User-Selected Emission Reduction Measures by Emissions Sector

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

2.2. Construction Emissions by Year, Unmitigated

3. Construction Emissions Details

3.1. Grading (2030) - Unmitigated

4. Operations Emissions Details

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

5. Activity Data

5.1. Construction Schedule

5.2. Off-Road Equipment

5.2.1. Unmitigated

5.3. Construction Vehicles

5.3.1. Unmitigated

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

5.5. Architectural Coatings

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

5.6.2. Construction Earthmoving Control Strategies

5.7. Construction Paving

5.8. Construction Electricity Consumption and Emissions Factors

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

5.18.2. Sequestration

5.18.2.1. Unmitigated

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

6.2. Initial Climate Risk Scores

6.3. Adjusted Climate Risk Scores

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

7.2. Healthy Places Index Scores

7.3. Overall Health & Equity Scores

7.4. Health & Equity Measures

7.5. Evaluation Scorecard

7.6. Health & Equity Custom Measures

8. User Changes to Default Data

1. Basic Project Information

1.1. Basic Project Information

Data Field	Value
Project Name	Topanga-Op2-Con
Construction Start Date	4/1/2030
Lead Agency	—
Land Use Scale	Project/site
Analysis Level for Defaults	County
Windspeed (m/s)	2.70
Precipitation (days)	4.60
Location	18711 Pacific Coast Hwy, Malibu, CA 90265, USA
County	Los Angeles-South Coast
City	Unincorporated
Air District	South Coast AQMD
Air Basin	South Coast
TAZ	3802
EDFZ	7
Electric Utility	Southern California Edison
Gas Utility	Southern California Gas
App Version	2022.1.1.21

1.2. Land Use Types

Land Use Subtype	Size	Unit	Lot Acreage	Building Area (sq ft)	Landscape Area (sq ft)	Special Landscape Area (sq ft)	Population	Description
Other Non-Asphalt Surfaces	8.00	1000sqft	0.18	0.00	0.00	—	—	—

1.3. User-Selected Emission Reduction Measures by Emissions Sector

No measures selected

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Un/Mit.	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.52	0.43	3.29	5.10	0.01	0.14	0.21	0.35	0.13	0.02	0.16	—	792	792	0.03	0.01	0.00	795
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.52	0.43	3.29	5.10	0.01	0.14	0.21	0.35	0.13	0.02	0.16	—	792	792	0.03	0.01	0.00	795
Average Daily (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.30	0.25	1.93	2.99	< 0.005	0.08	0.12	0.21	0.08	0.01	0.09	—	464	464	0.02	< 0.005	0.00	466
Annual (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.06	0.05	0.35	0.55	< 0.005	0.02	0.02	0.04	0.01	< 0.005	0.02	—	76.9	76.9	< 0.005	< 0.005	0.00	77.1

2.2. Construction Emissions by Year, Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Year	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily - Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

2030	0.52	0.43	3.29	5.10	0.01	0.14	0.21	0.35	0.13	0.02	0.16	—	792	792	0.03	0.01	0.00	795
Daily - Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2030	0.52	0.43	3.29	5.10	0.01	0.14	0.21	0.35	0.13	0.02	0.16	—	792	792	0.03	0.01	0.00	795
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2030	0.30	0.25	1.93	2.99	< 0.005	0.08	0.12	0.21	0.08	0.01	0.09	—	464	464	0.02	< 0.005	0.00	466
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2030	0.06	0.05	0.35	0.55	< 0.005	0.02	0.02	0.04	0.01	< 0.005	0.02	—	76.9	76.9	< 0.005	< 0.005	0.00	77.1

3. Construction Emissions Details

3.1. Grading (2030) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.52	0.43	3.29	5.10	0.01	0.14	—	0.14	0.13	—	0.13	—	792	792	0.03	0.01	—	795
Dust From Material Movement	—	—	—	—	—	—	0.21	0.21	—	0.02	0.02	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipment	0.52	0.43	3.29	5.10	0.01	0.14	—	0.14	0.13	—	0.13	—	792	792	0.03	0.01	—	795
Dust From Material Movement	—	—	—	—	—	—	0.21	0.21	—	0.02	0.02	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.30	0.25	1.93	2.99	< 0.005	0.08	—	0.08	0.08	—	0.08	—	464	464	0.02	< 0.005	—	466
Dust From Material Movement	—	—	—	—	—	—	0.12	0.12	—	0.01	0.01	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.06	0.05	0.35	0.55	< 0.005	0.02	—	0.02	0.01	—	0.01	—	76.9	76.9	< 0.005	< 0.005	—	77.1
Dust From Material Movement	—	—	—	—	—	—	0.02	0.02	—	< 0.005	< 0.005	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

4. Operations Emissions Details

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Vegetation	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Species	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Sequest	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

5. Activity Data

5.1. Construction Schedule

Phase Name	Phase Type	Start Date	End Date	Days Per Week	Work Days per Phase	Phase Description
Grading	Grading	4/1/2030	10/31/2030	7.00	214	—

5.2. Off-Road Equipment

5.2.1. Unmitigated

Phase Name	Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor
Grading	Graders	Diesel	Average	1.00	8.00	148	0.41
Grading	Excavators	Diesel	Average	1.00	8.00	36.0	0.38
Grading	Pumps	Diesel	Average	1.00	8.00	11.0	0.74

5.3. Construction Vehicles

5.3.1. Unmitigated

Phase Name	Trip Type	One-Way Trips per Day	Miles per Trip	Vehicle Mix
Grading	—	—	—	—
Grading	Worker	0.00	18.5	LDA,LDT1,LDT2
Grading	Vendor	—	10.2	HHDT,MHDT
Grading	Hauling	0.00	20.0	HHDT
Grading	Onsite truck	—	—	HHDT

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

Non-applicable. No control strategies activated by user.

5.5. Architectural Coatings

Phase Name	Residential Interior Area Coated (sq ft)	Residential Exterior Area Coated (sq ft)	Non-Residential Interior Area Coated (sq ft)	Non-Residential Exterior Area Coated (sq ft)	Parking Area Coated (sq ft)

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

Phase Name	Material Imported (Cubic Yards)	Material Exported (Cubic Yards)	Acres Graded (acres)	Material Demolished (sq. ft.)	Acres Paved (acres)
Grading	—	1,000	77.0	0.00	—

5.6.2. Construction Earthmoving Control Strategies

Control Strategies Applied	Frequency (per day)	PM10 Reduction	PM2.5 Reduction
Water Exposed Area	2	61%	61%

5.7. Construction Paving

Land Use	Area Paved (acres)	% Asphalt
Other Non-Asphalt Surfaces	0.18	0%

5.8. Construction Electricity Consumption and Emissions Factors

kWh per Year and Emission Factor (lb/MWh)

Year	kWh per Year	CO2	CH4	N2O
2030	0.00	532	0.03	< 0.005

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

Vegetation Land Use Type	Vegetation Soil Type	Initial Acres	Final Acres

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

Biomass Cover Type	Initial Acres	Final Acres

5.18.2. Sequestration

5.18.2.1. Unmitigated

Tree Type	Number	Electricity Saved (kWh/year)	Natural Gas Saved (btu/year)

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

Cal-Adapt midcentury 2040–2059 average projections for four hazards are reported below for your project location. These are under Representation Concentration Pathway (RCP) 8.5 which assumes GHG emissions will continue to rise strongly through 2050 and then plateau around 2100.

Climate Hazard	Result for Project Location	Unit
Temperature and Extreme Heat	9.96	annual days of extreme heat
Extreme Precipitation	5.90	annual days with precipitation above 20 mm
Sea Level Rise	—	meters of inundation depth
Wildfire	20.5	annual hectares burned

Temperature and Extreme Heat data are for grid cell in which your project are located. The projection is based on the 98th historical percentile of daily maximum/minimum temperatures from observed historical data (32 climate model ensemble from Cal-Adapt, 2040–2059 average under RCP 8.5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Extreme Precipitation data are for the grid cell in which your project are located. The threshold of 20 mm is equivalent to about ¾ an inch of rain, which would be light to moderate rainfall if received over a full day or heavy rain if received over a period of 2 to 4 hours. Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Sea Level Rise data are for the grid cell in which your project are located. The projections are from Radke et al. (2017), as reported in Cal-Adapt (Radke et al., 2017, CEC-500-2017-008), and consider inundation location and depth for the San Francisco Bay, the Sacramento-San Joaquin River Delta and California coast resulting different increments of sea level rise coupled with extreme storm events. Users may select from four scenarios to view the range in potential inundation depth for the grid cell. The four scenarios are: No rise, 0.5 meter, 1.0 meter, 1.41 meters
Wildfire data are for the grid cell in which your project are located. The projections are from UC Davis, as reported in Cal-Adapt (2040–2059 average under RCP 8.5), and consider historical data of climate, vegetation, population density, and large (> 400 ha) fire history. Users may select from four model simulations to view the range in potential wildfire probabilities for the grid cell. The four simulations make different assumptions about expected rainfall and temperature are: Warmer/drier (HadGEM2-ES), Cooler/wetter (CNRM-CM5), Average conditions (CanESM2), Range of different rainfall and temperature possibilities (MIROC5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.

6.2. Initial Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	1	0	0	N/A
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	1	0	0	N/A
Wildfire	1	0	0	N/A
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	0	0	0	N/A

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores do not include implementation of climate risk reduction measures.

6.3. Adjusted Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	1	1	1	2
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	1	1	1	2

Wildfire	1	1	1	2
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	1	1	1	2

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores include implementation of climate risk reduction measures.

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Exposure Indicators	—
AQ-Ozone	—
AQ-PM	—
AQ-DPM	—
Drinking Water	—
Lead Risk Housing	—
Pesticides	—
Toxic Releases	—
Traffic	—
Effect Indicators	—
CleanUp Sites	—

Groundwater	—
Haz Waste Facilities/Generators	—
Impaired Water Bodies	—
Solid Waste	—
Sensitive Population	—
Asthma	—
Cardio-vascular	—
Low Birth Weights	—
Socioeconomic Factor Indicators	—
Education	—
Housing	—
Linguistic	—
Poverty	—
Unemployment	—

7.2. Healthy Places Index Scores

The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Economic	—
Above Poverty	89.34941614
Employed	19.02989863
Median HI	97.69023483
Education	—
Bachelor's or higher	88.59232645
High school enrollment	100
Preschool enrollment	95.7141024
Transportation	—

Auto Access	93.63531374
Active commuting	12.16476325
Social	—
2-parent households	42.29436674
Voting	82.35596048
Neighborhood	—
Alcohol availability	89.4649044
Park access	38.81688695
Retail density	42.06339022
Supermarket access	2.399589375
Tree canopy	71.42307199
Housing	—
Homeownership	65.75131528
Housing habitability	87.501604
Low-inc homeowner severe housing cost burden	64.24996792
Low-inc renter severe housing cost burden	88.91312717
Uncrowded housing	62.10701912
Health Outcomes	—
Insured adults	89.59322469
Arthritis	0.0
Asthma ER Admissions	99.7
High Blood Pressure	0.0
Cancer (excluding skin)	0.0
Asthma	0.0
Coronary Heart Disease	0.0
Chronic Obstructive Pulmonary Disease	0.0
Diagnosed Diabetes	0.0

Life Expectancy at Birth	77.8
Cognitively Disabled	87.2
Physically Disabled	55.6
Heart Attack ER Admissions	99.5
Mental Health Not Good	0.0
Chronic Kidney Disease	0.0
Obesity	0.0
Pedestrian Injuries	93.4
Physical Health Not Good	0.0
Stroke	0.0
Health Risk Behaviors	—
Binge Drinking	0.0
Current Smoker	0.0
No Leisure Time for Physical Activity	0.0
Climate Change Exposures	—
Wildfire Risk	99.5
SLR Inundation Area	38.8
Children	43.1
Elderly	11.5
English Speaking	77.4
Foreign-born	54.6
Outdoor Workers	85.4
Climate Change Adaptive Capacity	—
Impervious Surface Cover	79.5
Traffic Density	81.9
Traffic Access	23.0
Other Indices	—

Hardship	5.4
Other Decision Support	—
2016 Voting	60.6

7.3. Overall Health & Equity Scores

Metric	Result for Project Census Tract
CalEnviroScreen 4.0 Score for Project Location (a)	—
Healthy Places Index Score for Project Location (b)	90.0
Project Located in a Designated Disadvantaged Community (Senate Bill 535)	No
Project Located in a Low-Income Community (Assembly Bill 1550)	No
Project Located in a Community Air Protection Program Community (Assembly Bill 617)	No

a: The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.
b: The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

7.4. Health & Equity Measures

No Health & Equity Measures selected.

7.5. Evaluation Scorecard

Health & Equity Evaluation Scorecard not completed.

7.6. Health & Equity Custom Measures

No Health & Equity Custom Measures created.

8. User Changes to Default Data

Screen	Justification
Construction: Construction Phases	see construction assumptions
Construction: Off-Road Equipment	see construction assumptions
Construction: Trips and VMT	construction mobile emissions calculated outside of CalEEMod.
Construction: Dust From Material Movement	see construction assumptions

P.4-1 Option 3 Construction Air Quality Emissions Calculations

Topanga Lagoon Option 3

Air Quality Construction Analysis

Regional Maximums Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
						lb/day				
Demolition - 2030	0.33	2.57	5.32	0.010	0.52	0.05	0.57	0.13	0.05	0.17
Grading - 2030	1.80	13.15	18.02	0.045	3.48	0.54	4.02	1.52	0.50	2.02
Building Construction - 2030	0.78	6.28	8.61	0.024	0.65	0.26	0.92	0.16	0.24	0.41
Paving - 2030	1.50	10.87	14.82	0.026	0.52	0.50	1.02	0.13	0.46	0.59
Project Daily Maximum Emissions	**1.80**	**13.15**	**18.02**	**0.045**	**3.48**	**0.54**	**4.02**	**1.52**	**0.50**	**2.02**

Localized Maximum Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
						lb/day				
Demolition - 2030	0.24	2.48	3.93	0.005	0.00	0.05	0.05	0.00	0.04	0.04
Grading - 2030	1.69	12.23	16.21	0.034	2.76	0.53	3.29	1.34	0.49	1.82
Building Construction - 2030	0.68	5.63	6.94	0.015	0.00	0.25	0.25	0.00	0.23	0.23
Paving - 2030	1.41	10.78	13.42	0.022	0.00	0.50	0.50	0.00	0.46	0.46
Project Daily Maximum Emissions	**1.69**	**12.23**	**16.21**	**0.034**	**2.76**	**0.53**	**3.29**	**1.34**	**0.49**	**1.82**

Topanga Lagoon Option 3

Air Quality Construction Analysis

Summer	Onsite Emissions										Offsite Emissions									
Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
	lb/day										lb/day									
Demolition - 2030	0.00	0.00	0.00	0.0000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Grading - 2030	1.69	12.23	16.21	0.0343	2.76	0.53	3.29	1.34	0.49	1.82	0.11	0.92	1.81	0.010	0.72	0.01	0.73	0.18	0.01	0.19
Building Construction - 2030	0.68	5.63	6.94	0.0152	0.00	0.25	0.25	0.00	0.23	0.23	0.10	0.64	1.67	0.008	0.65	0.01	0.66	0.16	0.01	0.17
Paving - 2030	0.00	0.00	0.00	0.0000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00

Regional Emissions	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Demolition - 2030	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Grading - 2030	1.80	13.15	18.02	0.045	3.48	0.54	4.02	1.52	0.50	2.02
Building Construction - 2030	0.78	6.28	8.61	0.024	0.65	0.26	0.92	0.16	0.24	0.41
Paving - 2030	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
Project Daily Maximum Emissions	**1.80**	**13.15**	**18.02**	**0.045**	**3.48**	**0.54**	**4.02**	**1.52**	**0.50**	**2.02**

Note: Offsite emissions pasted over from EMFAC2021 analysis

Topanga Lagoon Option 3

Air Quality Construction Analysis

Winter	Onsite Emissions										Offsite Emissions									
Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
	lb/day										lb/day									
Demolition - 2030	0.24	2.48	3.93	0.0053	0.00	0.05	0.05	0.00	0.04	0.04	0.09	0.09	1.39	0.004	0.52	0.00	0.52	0.13	0.00	0.13
Grading - 2030	1.69	12.23	16.21	0.0343	2.76	0.53	3.29	1.34	0.49	1.82	0.11	0.92	1.81	0.010	0.72	0.01	0.73	0.18	0.01	0.19
Building Construction - 2030	0.68	5.63	6.94	0.0152	0.00	0.25	0.25	0.00	0.23	0.23	0.10	0.64	1.67	0.008	0.65	0.01	0.66	0.16	0.01	0.17
Paving - 2030	1.41	10.78	13.42	0.0222	0.00	0.50	0.50	0.00	0.46	0.46	0.09	0.09	1.39	0.004	0.52	0.00	0.52	0.13	0.00	0.13

Note: Offsite emissions pasted over from EMFAC2021 analysis

Regional Emissions	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Demolition - 2030	0.33	2.57	5.32	0.010	0.52	0.05	0.57	0.13	0.05	0.17
Grading - 2030	1.80	13.15	18.02	0.045	3.48	0.54	4.02	1.52	0.50	2.02
Building Construction - 2030	0.78	6.28	8.61	0.024	0.65	0.26	0.92	0.16	0.24	0.41
Paving - 2030	1.50	10.87	14.82	0.026	0.52	0.50	1.02	0.13	0.46	0.59
Project Daily Maximum Emissions	**1.80**	**13.15**	**18.02**	**0.045**	**3.48**	**0.54**	**4.02**	**1.52**	**0.50**	**2.02**

Topanga Lagoon Option 2
Air Quality Construction Analysis
Mitigated Emissions

Regional Maximums Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
					lb/day					
Grading - 2029	0.33	2.64	7.30	0.018	0.93	0.06	0.99	0.21	0.06	0.26
Project Daily Maximum Emissions	**0.33**	**2.64**	**7.30**	**0.018**	**0.93**	**0.06**	**0.99**	**0.21**	**0.06**	**0.26**

Localized Maximum Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
					lb/day					
Grading - 2029	0.21	1.68	5.40	0.008	0.21	0.05	0.26	0.02	0.05	0.07
Project Daily Maximum Emissions	**0.21**	**1.68**	**5.40**	**0.008**	**0.21**	**0.05**	**0.26**	**0.02**	**0.05**	**0.07**

Topanga Lagoon Option 2

Air Quality Construction Analysis

Mitigated Emissions

Summer	Onsite Emissions										Offsite Emissions									
Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
	lb/day										lb/day									
Grading - 2029	0.21	1.68	5.40	0.008	0.21	0.05	0.26	0.02	0.05	0.07	0.12	0.96	1.90	0.011	0.72	0.01	0.73	0.18	0.01	0.19

Regional Emissions	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Grading - 2029	0.33	2.64	7.30	0.018	0.93	0.06	0.99	0.21	0.06	0.26
Project Daily Maximum Emissions	**0.33**	**2.64**	**7.30**	**0.018**	**0.93**	**0.06**	**0.99**	**0.21**	**0.06**	**0.26**

Note: Offsite emissions pasted over from EMFAC2021 analysis

Topanga Lagoon Option 2
Air Quality Construction Analysis
Mitigated Emissions

Winter	Onsite Emissions										Offsite Emissions									
Source	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
	lb/day										lb/day									
Grading - 2029	0.21	1.68	5.40	0.008	0.21	0.05	0.26	0.02	0.05	0.07	0.12	0.96	1.90	0.011	0.72	0.01	0.73	0.18	0.01	0.19

Note: Offsite emissions pasted over from EMFAC2021 analysis

Regional Emissions	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Grading - 2029	0.33	2.64	7.30	0.018	0.93	0.06	0.99	0.21	0.06	0.26
Project Daily Maximum Emissions	**0.33**	**2.64**	**7.30**	**0.018**	**0.93**	**0.06**	**0.99**	**0.21**	**0.06**	**0.26**

P.4-2 Option 3 Construction Air Quality Mobile Emissions

Topanga Canyon - Op2 and 3
Total Emissions

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Idling per Day (minutes)	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10 Dust	PM10 Exh	Total PM10	PM2.5 Dust	PM2.5 Exh	Total PM2.5	(MT/yr) Total CO2e
Grading/Excavation	2030															
Total Haul Trips	200															
Hauling	6	43	8	36.5	15	0.02	0.86	0.43	0.01	0.20	0.01	0.21	0.05	0.01	0.06	11.02
Vendor	0	214	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0	0.10	0.10	1.47	0.00	0.52	0.00	0.52	0.13	0.00	0.13	43.18
					Total	0.12	0.96	1.90	0.01	0.72	0.01	0.73	0.18	0.01	0.19	54.20
Demolition NB Road/Bridge	2031				Workers+Ver	0.10	0.10	1.47	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	0															
Hauling	0	43	8	36.5	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	59	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	18.5	0	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	11.69
					Total	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	11.69
Construct NB Road/Bridge	2031	Grading/Excavation			Workers+Ver	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	200															
Hauling	6	43	8	36.5	15	0.02	0.83	0.42	0.01	0.20	0.01	0.21	0.05	0.01	0.06	10.73
Vendor	0	61	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	12.08
					Total	0.11	0.92	1.81	0.01	0.72	0.01	0.73	0.18	0.01	0.19	22.82
Construct NB Road/Bridge	2031	Building Construction			Workers+Ver	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	330															
Hauling	4	152	8	36.5	15	0.01	0.56	0.28	0.00	0.14	0.01	0.14	0.04	0.01	0.04	17.71
Vendor	0	214	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	42.39
					Total	0.10	0.64	1.67	0.01	0.65	0.01	0.66	0.16	0.01	0.17	60.10
Construct NB Road/Bridge	2031	Paving			Workers+Ver	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	0															
Hauling	0	23	8	36.5	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	6.14
					Total	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	6.14
					Workers+Ver	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	

Topanga Canyon - Op2 and 3
Running Emissions

		Running Emissions Factor (grams/mile)						Running Emissions Factor (grams/mile)		
		ROG_RUNEX	NOx_RUNEX	CO_RUNEX	SOx_RUNEX	PM10_RUNEX	PM2.5_RUNEX	CO2_RUNEX	CH4_RUNEX	N2O_RUNEX
2027	2027Hauling Hauling	0.013128	1.553518611	0.45473657	0.01336714	0.02273486	0.02174732	1471.80075	0.0608523	0.23462364
2027	2027Vendor Vendor	0.01570588	1.102331968	0.36327753	0.01214871	0.01475662	0.01411185	1311.1435	0.03509759	0.18307889
2027	2027Worker Worker	0.01447264	0.062492418	0.90233334	0.00281062	0.00150729	0.0013867	284.320587	0.00354266	0.00566149
2028	2028Hauling Hauling	0.01261339	1.493718015	0.43877031	0.01305596	0.02247317	0.02149714	1438.29866	0.05768159	0.22931835
2028	2028Vendor Vendor	0.01417298	1.038868065	0.3360531	0.01185313	0.01426835	0.01364491	1280.01295	0.03342244	0.17922194
2028	2028Worker Worker	0.01314756	0.057035459	0.85167037	0.00274948	0.00140448	0.00129194	278.134904	0.00325313	0.00533773
2029	2029Hauling Hauling	0.01213472	1.434866903	0.4224926	0.01273534	0.0221686	0.0212059	1403.60667	0.05465536	0.22381566
2029	2029Vendor Vendor	0.0128196	0.978781777	0.31101237	0.01152628	0.01380314	0.01320005	1245.46404	0.03180989	0.17489835
2029	2029Worker Worker	0.01192021	0.051957034	0.80464317	0.00269297	0.00130724	0.00120239	272.417637	0.00298654	0.00503952
2030	2030Hauling Hauling	0.01169729	1.381905725	0.40596438	0.01241489	0.02183595	0.02088778	1368.72007	0.05170538	0.2182712
2030	2030Vendor Vendor	0.01168751	0.9252091	0.28941545	0.01117412	0.01336285	0.01277903	1208.11234	0.03023265	0.17022289
2030	2030Worker Worker	0.01081241	0.047255061	0.76242747	0.00264062	0.00121547	0.00111789	267.121939	0.00274623	0.00476556
2031	2031Hauling Hauling	0.01126827	1.331771303	0.38663416	0.01209496	0.02148002	0.02054741	1333.31591	0.04842446	0.21262163
2031	2031Vendor Vendor	0.01070694	0.874998281	0.26868024	0.01079467	0.01293916	0.01237394	1167.57711	0.02847022	0.16520071
2031	2031Worker Worker	0.00977403	0.042746598	0.72305591	0.00259298	0.00112929	0.00103861	262.302837	0.0025216	0.00450761
0	GWP	N/A	N/A	N/A	N/A	N/A	N/A	1	25	298

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10	PM2.5	Regional Emissions (MT/year) CO2	CH4	N2O	CO2e
Grading/Excavation	2030													
Total Haul Trips	200													
Hauling	6	43	8	36.5	0.01	0.67	0.20	0.01	0.01	0.01	9.99	0.01	0.47	10.48
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.02	0.08	1.24	0.00	0.00	0.00	42.30	0.01	0.22	42.54
Demolition NB Road/Bridge	2031													
Total Haul Trips	0													
Hauling	0	43	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	59	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	18.5	0.02	0.07	1.18	0.00	0.00	0.00	11.45	0.00	0.06	11.51
Construct NB Road/Bridge	2031													
Total Haul Trips	200													
Hauling	6	43	8	36.5	0.01	0.64	0.19	0.01	0.01	0.01	9.73	0.01	0.46	10.20
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0.02	0.07	1.18	0.00	0.00	0.00	11.84	0.00	0.06	11.90
Construct NB Road/Bridge	2031													
Total Haul Trips	330													
Hauling	4	152	8	36.5	0.00	0.43	0.12	0.00	0.01	0.01	16.06	0.01	0.76	16.84
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.02	0.07	1.18	0.00	0.00	0.00	41.54	0.01	0.21	41.76
Construct NB Road/Bridge	2031													
Total Haul Trips	0													
Hauling	0	23	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0.02	0.07	1.18	0.00	0.00	0.00	6.02	0.00	0.03	6.05

Topanga Canyon - Op2 and 3
Start Emissions

			Start Emissions Factor (grams/trip)						Start Emissions Factor (grams/trip)		
			ROG_STREX	NOX_STREX	CO_STREX	SOx_STREX	PM10_STREX	PM2.5_STREX	CO2_STREX	CH4_STREX	N2O_STREX
2027	2027Hauling	Hauling	0.00060894	2.672142352	0.00302137	3.16557E-07	5.30481E-07	4.87758E-07	0.03202066	7.5498E-08	7.36611E-06
2027	2027Vendor	Vendor	0.080213538	1.961946447	0.60365405	5.50826E-05	6.07836E-05	5.58883E-05	5.57177064	0.005494835	0.004037678
2027	2027Worker	Worker	1.038950633	0.251050817	3.01934346	0.000691936	0.002053348	0.001887978	69.9913431	0.06616369	0.030829475
2028	2028Hauling	Hauling	0.000490696	2.636914961	0.00257595	2.71845E-07	4.29594E-07	3.94995E-07	0.02749789	6.56178E-08	5.97594E-06
2028	2028Vendor	Vendor	0.075419112	1.927915654	0.55968909	5.22383E-05	5.76932E-05	5.30468E-05	5.28405692	0.005169504	0.003780947
2028	2028Worker	Worker	0.997046953	0.239560346	2.85187017	0.000675557	0.001941969	0.001785569	68.3345653	0.062483886	0.030029939
2029	2029Hauling	Hauling	0.000383539	2.591170334	0.00214107	2.33546E-07	3.28727E-07	3.02252E-07	0.02362391	5.62127E-08	4.65545E-06
2029	2029Vendor	Vendor	0.069289941	1.883995908	0.51714657	4.94212E-05	5.46034E-05	5.02058E-05	4.99909929	0.004852786	0.003548842
2029	2029Worker	Worker	0.945798618	0.229251267	2.69630558	0.000660221	0.001832244	0.00168468	66.7833	0.059077063	0.029313823
2030	2030Hauling	Hauling	0.00027279	2.546881303	0.00161285	1.92445E-07	2.06187E-07	1.89581E-07	0.01946637	4.71315E-08	4.0595E-06
2030	2030Vendor	Vendor	0.063656597	1.839529651	0.47865041	4.67001E-05	5.18671E-05	4.76899E-05	4.72385215	0.004565454	0.003322989
2030	2030Worker	Worker	0.901632052	0.219772527	2.55165593	0.00064583	0.001725708	0.001586724	65.3276344	0.055883281	0.028658371
2031	2031Hauling	Hauling	0.000210057	2.503276097	0.00139863	1.66951E-07	1.58801E-07	1.46012E-07	0.01688763	4.13015E-08	2.64568E-06
2031	2031Vendor	Vendor	0.059141215	1.792713918	0.44197461	4.38654E-05	4.91716E-05	4.52115E-05	4.43711805	0.004280254	0.003105544
2031	2031Worker	Worker	0.857879142	0.211029605	2.41545051	0.000632455	0.001621689	0.001491083	63.974738	0.052892816	0.028060877
	GWP			N/A					1	25	298

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10	PM2.5	Regional Emissions (MT/year) CO2	CH4	N2O	CO2e
Grading/Excavation	2030													
Total Haul Trips	200													
Hauling	6	43	8	36.5	0.00	0.03	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.08	0.02	0.23	0.00	0.00	0.00	0.56	0.00	0.00	0.64
Demolition NB Road/Bridg	2031													
Total Haul Trips	0													
Hauling	0	43	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	59	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	18.5	0.08	0.02	0.21	0.00	0.00	0.00	0.15	0.00	0.00	0.17
Construct NB Road/Bridge	2031													
Total Haul Trips	200													
Hauling	6	43	8	36.5	0.00	0.03	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0.08	0.02	0.21	0.00	0.00	0.00	0.16	0.00	0.00	0.18
Construct NB Road/Bridge	2031													
Total Haul Trips	330													
Hauling	4	152	8	36.5	0.00	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.08	0.02	0.21	0.00	0.00	0.00	0.55	0.00	0.00	0.63
Construct NB Road/Bridge	2031													
Total Haul Trips	0													
Hauling	0	23	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0.08	0.02	0.21	0.00	0.00	0.00	0.08	0.00	0.00	0.09

Topanga Canyon - Op2 and 3
Idling Emissions

			Idling Emissions Factor (grams/minute)						Idling Emissions Factor (grams/minute)		
			ROG_IDLEX	NOx_IDLEX	CO_IDLEX	SOx_IDLEX	PM10_IDLEX	PM2.5_IDLEX	CO2_IDLEX	CH4_IDLEX	N2O_IDLEX
2027	2027Hauling	Hauling	0.07592279	0.881696127	1.19921987	0.00159973	0.00047074	0.00044926	181.442358	0.03427011	0.02916541
2027	2027Vendor	Vendor	0.05529965	0.899602458	1.04932075	0.00167506	0.00086494	0.00082645	186.589554	0.03155173	0.02918792
2027	2027Worker	Worker	0	0	0	0	0	0	0	0	0
2028	2028Hauling	Hauling	0.07529788	0.857767875	1.19214339	0.00156045	0.00045204	0.00043133	177.300744	0.03377364	0.02851321
2028	2028Vendor	Vendor	0.05432839	0.863093228	1.0395891	0.00163993	0.00074988	0.00071632	182.978932	0.03134729	0.02865517
2028	2028Worker	Worker	0	0	0	0	0	0	0	0	0
2029	2029Hauling	Hauling	0.07461794	0.835480721	1.18399992	0.00152188	0.00043143	0.00041158	173.194944	0.03323976	0.02786481
2029	2029Vendor	Vendor	0.05333308	0.827999465	1.02749811	0.0016013	0.00065239	0.00062302	178.951612	0.03104801	0.02805443
2029	2029Worker	Worker	0	0	0	0	0	0	0	0	0
2030	2030Hauling	Hauling	0.07391144	0.816007794	1.17493744	0.0014846	0.00041331	0.00039421	169.186161	0.03269373	0.0272299
2030	2030Vendor	Vendor	0.05232472	0.795299763	1.01321823	0.00155966	0.00057171	0.0005458	174.561724	0.03067462	0.02739395
2030	2030Worker	Worker	0	0	0	0	0	0	0	0	0
2031	2031Hauling	Hauling	0.0732853	0.799579641	1.1664382	0.00145061	0.00039768	0.00037924	165.457521	0.03205186	0.02663599
2031	2031Vendor	Vendor	0.05130878	0.763402339	0.99683404	0.00151522	0.00050437	0.00048136	169.805962	0.03011968	0.02667472
2031	2031Worker	Worker	0	0	0	0	0	0	0	0	0
		GWP	N/A	N/A	N/A	N/A	N/A	N/A	1	25	298

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	Idling minutes per Day	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10	PM2.5	Regional Emissions (MT/year) CO2	CH4	N2O	CO2e
Grading/Excavation	2030													
Total Haul Trips	200													
Hauling	6	43	8	15	0.01	0.16	0.23	0.00	0.00	0.00	0.51	0.00	0.02	0.53
Vendor	0	214	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Demolition NB Road/Bridge	2031													
Total Haul Trips	0													
Hauling	0	43	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	59	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct NB Road/Bridge	2031													
Total Haul Trips	200													
Hauling	6	43	8	15	0.01	0.16	0.23	0.00	0.00	0.00	0.50	0.00	0.02	0.52
Vendor	0	61	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct NB Road/Bridge	2031													
Total Haul Trips	330													
Hauling	4	152	8	15	0.01	0.11	0.15	0.00	0.00	0.00	0.82	0.00	0.04	0.86
Vendor	0	214	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct NB Road/Bridge	2031													
Total Haul Trips	0													
Hauling	0	23	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Topanga Canyon - Op2 and 3
Road Dust, Break Wear, and Tire wear Emissions

			Emission Factors (grams/mile)					
			PM10			PM2.5		
			RD	PM10_PMBW	PM10_PMTW	RD	PM2.5_PMBW	PM2.5_PMTW
2027	2027Hauling	Hauling	0.29984991	0.084297987	0.03545106	0.07359952	0.0295043	0.00886277
2027	2027Vendor	Vendor	0.29984991	0.063623189	0.02372553	0.07359952	0.02226812	0.00593138
2027	2027Worker	Worker	0.29984991	0.009305649	0.008	0.07359952	0.00325698	0.002
2028	2028Hauling	Hauling	0.29984991	0.084486989	0.03545475	0.07359952	0.02957045	0.00886369
2028	2028Vendor	Vendor	0.29984991	0.063544145	0.02372738	0.07359952	0.02224045	0.00593184
2028	2028Worker	Worker	0.29984991	0.009284129	0.008	0.07359952	0.00324945	0.002
2029	2029Hauling	Hauling	0.29984991	0.084584422	0.03545835	0.07359952	0.02960455	0.00886459
2029	2029Vendor	Vendor	0.29984991	0.063359545	0.02372918	0.07359952	0.02217584	0.00593229
2029	2029Worker	Worker	0.29984991	0.00926272	0.008	0.07359952	0.00324195	0.002
2030	2030Hauling	Hauling	0.29984991	0.08460378	0.03546191	0.07359952	0.02961132	0.00886548
2030	2030Vendor	Vendor	0.29984991	0.063078834	0.02373095	0.07359952	0.02207759	0.00593274
2030	2030Worker	Worker	0.29984991	0.00924132	0.008	0.07359952	0.00323446	0.002
2031	2031Hauling	Hauling	0.29984991	0.084504548	0.03546578	0.07359952	0.02957659	0.00886644
2031	2031Vendor	Vendor	0.29984991	0.062682863	0.02373289	0.07359952	0.021939	0.00593322
2031	2031Worker	Worker	0.29984991	0.009221285	0.008	0.07359952	0.00322745	0.002

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day)					
					PM10			PM2.5		
					RD	BW	TW	RD	BW	TW
Grading/Excavation	2030									
Total Haul Trips	200									
Hauling	6	43	8	36.5	0.14	0.04	0.02	0.04	0.01	0.00
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Demolition NB Road/Bridge	2031									
Total Haul Trips	0									
Hauling	0	43	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	59	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Construct NB Road/Bridge	2031									
Total Haul Trips	200									
Hauling	6	43	8	36.5	0.14	0.04	0.02	0.04	0.01	0.00
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Construct NB Road/Bridge	2031									
Total Haul Trips	330									
Hauling	4	152	8	36.5	0.10	0.03	0.01	0.02	0.01	0.00
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Construct NB Road/Bridge	2031									
Total Haul Trips	0									
Hauling	0	23	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00

Topanga Canyon - Op2 and 3
Road Dust

Paved Road Dust Emission Factors (Assumes No Precipitation)

Formula: $EF_{Dust,P} = (k\ (sL)^{0.91} \times (W)^{1.02})$

Where:

$EF_{Dust,P}$ =	Paved Road Dust Emission Factor (having the same units as k)
k =	particle size multiplier
sL =	road surface silt loading (g/m^2)
W =	average fleet vehicle weight (tons) (CARB uses 2.4 tons as a fleet average vehicle weight factor)

	Emission Factor (grams per VMT)	
	PM10	PM2.5
k	0.9979	0.2449
sL	0.1	0.1
W	2.4	2.4
$EF_{Dust,P}$	3.00E-01	7.36E-02

Unpaved Road Dust Emission Factors (Assumes No Precipitation)

Formula: $EF_{Dust,U} = (k\ (\ s / 12)^{1} \times (Sp / 30)^{0.5} / (M / 0.5)^{0.2}) - C)$

Where:

$EF_{Dust,U}$ =	Unpaved Road Dust Emission Factor (having the same units as k)
k =	particle size multiplier
s =	surface material silt content (%)
Sp =	mean vehicle speed (mph)
M =	surface material moisture content (%)
C =	Emission Factor for 1980s vehicle fleet exhaust, brake wear, and tire wear

	Emission Factor (grams per VMT)	
	PM10	PM2.5
k	816.47	81.65
s	4.3%	4.3%
Sp	15	15
M	0.5%	0.5%
C	0.00047	0.00036
$EF_{Dust,U}$	5.20E+00	5.19E-01

Sources:

SCAQMD, CalEEMod, Version 2022.1.

CARB, *Entrained Dust from Paved Road Travel: Emission Estimation Methodology Background Document* , (1997).

USEPA, *AP-42* , Fifth Edition, Volume I, Chapter 13.2.1 - Paved Roads, (2011).

ESA, 2023.

P.4-3 Option 3 Construction Modeling

Topanga-Op3-Con Detailed Report

Table of Contents

1. Basic Project Information

1.1. Basic Project Information

1.2. Land Use Types

1.3. User-Selected Emission Reduction Measures by Emissions Sector

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

2.2. Construction Emissions by Year, Unmitigated

3. Construction Emissions Details

3.1. Demolition (2031) - Unmitigated

3.3. Grading (2031) - Unmitigated

3.5. Building Construction (2031) - Unmitigated

3.7. Paving (2031) - Unmitigated

4. Operations Emissions Details

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

5. Activity Data

5.1. Construction Schedule

5.2. Off-Road Equipment

5.2.1. Unmitigated

5.3. Construction Vehicles

5.3.1. Unmitigated

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

5.5. Architectural Coatings

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

5.6.2. Construction Earthmoving Control Strategies

5.7. Construction Paving

5.8. Construction Electricity Consumption and Emissions Factors

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

5.18.2. Sequestration

5.18.2.1. Unmitigated

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

6.2. Initial Climate Risk Scores

6.3. Adjusted Climate Risk Scores

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

7.2. Healthy Places Index Scores

7.3. Overall Health & Equity Scores

7.4. Health & Equity Measures

7.5. Evaluation Scorecard

7.6. Health & Equity Custom Measures

8. User Changes to Default Data

1. Basic Project Information

1.1. Basic Project Information

Data Field	Value
Project Name	Topanga-Op3-Con
Construction Start Date	1/1/2031
Lead Agency	—
Land Use Scale	Project/site
Analysis Level for Defaults	County
Windspeed (m/s)	2.70
Precipitation (days)	4.60
Location	18711 Pacific Coast Hwy, Malibu, CA 90265, USA
County	Los Angeles-South Coast
City	Unincorporated
Air District	South Coast AQMD
Air Basin	South Coast
TAZ	3802
EDFZ	7
Electric Utility	Southern California Edison
Gas Utility	Southern California Gas
App Version	2022.1.1.21

1.2. Land Use Types

Land Use Subtype	Size	Unit	Lot Acreage	Building Area (sq ft)	Landscape Area (sq ft)	Special Landscape Area (sq ft)	Population	Description
Other Asphalt Surfaces	40.0	1000sqft	0.92	0.00	0.00	—	—	—

1.3. User-Selected Emission Reduction Measures by Emissions Sector

No measures selected

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Un/Mit.	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	2.01	1.69	12.2	16.2	0.03	0.53	2.76	3.29	0.49	1.34	1.82	—	3,713	3,713	0.15	0.03	0.00	3,726
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	2.01	1.69	12.2	16.2	0.03	0.53	2.76	3.29	0.49	1.34	1.82	—	3,713	3,713	0.15	0.03	0.00	3,726
Average Daily (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.99	0.84	6.66	8.55	0.02	0.29	0.46	0.75	0.26	0.22	0.49	—	1,853	1,853	0.08	0.02	0.00	1,859
Annual (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.18	0.15	1.22	1.56	< 0.005	0.05	0.08	0.14	0.05	0.04	0.09	—	307	307	0.01	< 0.005	0.00	308

2.2. Construction Emissions by Year, Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Year	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily - Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

2031	2.01	1.69	12.2	16.2	0.03	0.53	2.76	3.29	0.49	1.34	1.82	—	3,713	3,713	0.15	0.03	0.00	3,726
Daily - Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2031	2.01	1.69	12.2	16.2	0.03	0.53	2.76	3.29	0.49	1.34	1.82	—	3,713	3,713	0.15	0.03	0.00	3,726
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2031	0.99	0.84	6.66	8.55	0.02	0.29	0.46	0.75	0.26	0.22	0.49	—	1,853	1,853	0.08	0.02	0.00	1,859
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2031	0.18	0.15	1.22	1.56	< 0.005	0.05	0.08	0.14	0.05	0.04	0.09	—	307	307	0.01	< 0.005	0.00	308

3. Construction Emissions Details

3.1. Demolition (2031) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.28	0.24	2.48	3.93	0.01	0.05	—	0.05	0.04	—	0.04	—	574	574	0.02	< 0.005	—	576
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipment	0.05	0.04	0.40	0.63	< 0.005	0.01	—	0.01	0.01	—	0.01	—	92.8	92.8	< 0.005	< 0.005	—	93.1
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.01	0.01	0.07	0.12	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	15.4	15.4	< 0.005	< 0.005	—	15.4
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.3. Grading (2031) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	2.01	1.69	12.2	16.2	0.03	0.53	—	0.53	0.49	—	0.49	—	3,713	3,713	0.15	0.03	—	3,726
Dust From Material Movement	—	—	—	—	—	—	2.76	2.76	—	1.34	1.34	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	2.01	1.69	12.2	16.2	0.03	0.53	—	0.53	0.49	—	0.49	—	3,713	3,713	0.15	0.03	—	3,726
Dust From Material Movement	—	—	—	—	—	—	2.76	2.76	—	1.34	1.34	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.34	0.28	2.04	2.71	0.01	0.09	—	0.09	0.08	—	0.08	—	621	621	0.03	0.01	—	623
Dust From Material Movement	—	—	—	—	—	—	0.46	0.46	—	0.22	0.22	—	—	—	—	—	—	—

Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.06	0.05	0.37	0.49	< 0.005	0.02	—	0.02	0.01	—	0.01	—	103	103	< 0.005	< 0.005	—	103
Dust From Material Movement	—	—	—	—	—	—	0.08	0.08	—	0.04	0.04	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.5. Building Construction (2031) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.81	0.68	5.63	6.94	0.02	0.25	—	0.25	0.23	—	0.23	—	1,596	1,596	0.06	0.01	—	1,601
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.81	0.68	5.63	6.94	0.02	0.25	—	0.25	0.23	—	0.23	—	1,596	1,596	0.06	0.01	—	1,601
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.47	0.40	3.30	4.07	0.01	0.15	—	0.15	0.14	—	0.14	—	936	936	0.04	0.01	—	939
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.09	0.07	0.60	0.74	< 0.005	0.03	—	0.03	0.03	—	0.03	—	155	155	0.01	< 0.005	—	155
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.7. Paving (2031) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.58	1.33	10.8	13.4	0.02	0.50	—	0.50	0.46	—	0.46	—	2,404	2,404	0.10	0.02	—	2,412
Paving	—	0.08	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.13	0.11	0.92	1.14	< 0.005	0.04	—	0.04	0.04	—	0.04	—	204	204	0.01	< 0.005	—	205
Paving	—	0.01	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.02	0.02	0.17	0.21	< 0.005	0.01	—	0.01	0.01	—	0.01	—	33.8	33.8	< 0.005	< 0.005	—	33.9
Paving	—	< 0.005	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

4. Operations Emissions Details

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Vegetation	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Species	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

5. Activity Data

5.1. Construction Schedule

Phase Name	Phase Type	Start Date	End Date	Days Per Week	Work Days per Phase	Phase Description
Demolition	Demolition	1/1/2031	2/28/2031	7.00	59.0	—
Grading	Grading	3/1/2031	4/30/2031	7.00	61.0	—
Building Construction	Building Construction	5/1/2031	11/30/2031	7.00	214	—
Paving	Paving	12/1/2031	12/31/2031	7.00	31.0	—

5.2. Off-Road Equipment

5.2.1. Unmitigated

Phase Name	Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor
Demolition	Tractors/Loaders/Backhoes	Diesel	Average	1.00	8.00	84.0	0.37
Demolition	Excavators	Diesel	Average	2.00	8.00	36.0	0.38
Grading	Graders	Diesel	Average	1.00	8.00	148	0.41
Grading	Rubber Tired Dozers	Diesel	Average	1.00	8.00	367	0.40
Grading	Tractors/Loaders/Backhoes	Diesel	Average	1.00	8.00	84.0	0.37
Grading	Excavators	Diesel	Average	1.00	8.00	36.0	0.38
Grading	Off-Highway Trucks	Diesel	Average	1.00	8.00	376	0.38
Building Construction	Cranes	Diesel	Average	1.00	8.00	367	0.29
Building Construction	Forklifts	Diesel	Average	1.00	8.00	82.0	0.20
Building Construction	Crawler Tractors	Diesel	Average	1.00	8.00	87.0	0.43
Building Construction	Generator Sets	Diesel	Average	1.00	8.00	14.0	0.74
Paving	Pavers	Diesel	Average	1.00	8.00	81.0	0.42
Paving	Rollers	Diesel	Average	1.00	8.00	36.0	0.38
Paving	Rubber Tired Dozers	Diesel	Average	1.00	8.00	367	0.40
Paving	Graders	Diesel	Average	1.00	8.00	148	0.41

5.3. Construction Vehicles

5.3.1. Unmitigated

Phase Name	Trip Type	One-Way Trips per Day	Miles per Trip	Vehicle Mix
Demolition	—	—	—	—
Demolition	Worker	0.00	18.5	LDA,LDT1,LDT2

Demolition	Vendor	—	10.2	HHDT,MHDT
Demolition	Hauling	0.00	20.0	HHDT
Demolition	Onsite truck	—	—	HHDT
Grading	—	—	—	—
Grading	Worker	0.00	18.5	LDA,LDT1,LDT2
Grading	Vendor	—	10.2	HHDT,MHDT
Grading	Hauling	0.00	20.0	HHDT
Grading	Onsite truck	—	—	HHDT
Building Construction	—	—	—	—
Building Construction	Worker	0.00	18.5	LDA,LDT1,LDT2
Building Construction	Vendor	0.00	10.2	HHDT,MHDT
Building Construction	Hauling	0.00	20.0	HHDT
Building Construction	Onsite truck	—	—	HHDT
Paving	—	—	—	—
Paving	Worker	0.00	18.5	LDA,LDT1,LDT2
Paving	Vendor	—	10.2	HHDT,MHDT
Paving	Hauling	0.00	20.0	HHDT
Paving	Onsite truck	—	—	HHDT

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

Non-applicable. No control strategies activated by user.

5.5. Architectural Coatings

Phase Name	Residential Interior Area Coated (sq ft)	Residential Exterior Area Coated (sq ft)	Non-Residential Interior Area Coated (sq ft)	Non-Residential Exterior Area Coated (sq ft)	Parking Area Coated (sq ft)

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

Phase Name	Material Imported (Cubic Yards)	Material Exported (Cubic Yards)	Acres Graded (acres)	Material Demolished (sq. ft.)	Acres Paved (acres)
Demolition	0.00	0.00	0.00	—	—
Grading	0.00	1,000	43.0	0.00	—
Paving	0.00	0.00	0.00	0.00	0.92

5.6.2. Construction Earthmoving Control Strategies

Control Strategies Applied	Frequency (per day)	PM10 Reduction	PM2.5 Reduction
Water Exposed Area	2	61%	61%
Water Demolished Area	2	36%	36%

5.7. Construction Paving

Land Use	Area Paved (acres)	% Asphalt
Other Asphalt Surfaces	0.92	100%

5.8. Construction Electricity Consumption and Emissions Factors

kWh per Year and Emission Factor (lb/MWh)

Year	kWh per Year	CO2	CH4	N2O
2031	0.00	532	0.03	< 0.005

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

Vegetation Land Use Type	Vegetation Soil Type	Initial Acres	Final Acres

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

Biomass Cover Type	Initial Acres	Final Acres

5.18.2. Sequestration

5.18.2.1. Unmitigated

Tree Type	Number	Electricity Saved (kWh/year)	Natural Gas Saved (btu/year)

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

Cal-Adapt midcentury 2040–2059 average projections for four hazards are reported below for your project location. These are under Representation Concentration Pathway (RCP) 8.5 which assumes GHG emissions will continue to rise strongly through 2050 and then plateau around 2100.

Climate Hazard	Result for Project Location	Unit
Temperature and Extreme Heat	9.96	annual days of extreme heat
Extreme Precipitation	5.90	annual days with precipitation above 20 mm
Sea Level Rise	—	meters of inundation depth
Wildfire	20.5	annual hectares burned

Temperature and Extreme Heat data are for grid cell in which your project are located. The projection is based on the 98th historical percentile of daily maximum/minimum temperatures from observed historical data (32 climate model ensemble from Cal-Adapt, 2040–2059 average under RCP 8.5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Extreme Precipitation data are for the grid cell in which your project are located. The threshold of 20 mm is equivalent to about ¾ an inch of rain, which would be light to moderate rainfall if received over a full day or heavy rain if received over a period of 2 to 4 hours. Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.

Sea Level Rise data are for the grid cell in which your project are located. The projections are from Radke et al. (2017), as reported in Cal-Adapt (Radke et al., 2017, CEC-500-2017-008), and consider inundation location and depth for the San Francisco Bay, the Sacramento-San Joaquin River Delta and California coast resulting different increments of sea level rise coupled with extreme storm events. Users may select from four scenarios to view the range in potential inundation depth for the grid cell. The four scenarios are: No rise, 0.5 meter, 1.0 meter, 1.41 meters
Wildfire data are for the grid cell in which your project are located. The projections are from UC Davis, as reported in Cal-Adapt (2040–2059 average under RCP 8.5), and consider historical data of climate, vegetation, population density, and large (> 400 ha) fire history. Users may select from four model simulations to view the range in potential wildfire probabilities for the grid cell. The four simulations make different assumptions about expected rainfall and temperature are: Warmer/drier (HadGEM2-ES), Cooler/wetter (CNRM-CM5), Average conditions (CanESM2), Range of different rainfall and temperature possibilities (MIROC5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.

6.2. Initial Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	1	0	0	N/A
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	1	0	0	N/A
Wildfire	1	0	0	N/A
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	0	0	0	N/A

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores do not include implementation of climate risk reduction measures.

6.3. Adjusted Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	1	1	1	2
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	1	1	1	2
Wildfire	1	1	1	2
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A

Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	1	1	1	2

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores include implementation of climate risk reduction measures.

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Exposure Indicators	—
AQ-Ozone	—
AQ-PM	—
AQ-DPM	—
Drinking Water	—
Lead Risk Housing	—
Pesticides	—
Toxic Releases	—
Traffic	—
Effect Indicators	—
CleanUp Sites	—
Groundwater	—
Haz Waste Facilities/Generators	—
Impaired Water Bodies	—

Solid Waste	—
Sensitive Population	—
Asthma	—
Cardio-vascular	—
Low Birth Weights	—
Socioeconomic Factor Indicators	—
Education	—
Housing	—
Linguistic	—
Poverty	—
Unemployment	—

7.2. Healthy Places Index Scores

The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Economic	—
Above Poverty	89.34941614
Employed	19.02989863
Median HI	97.69023483
Education	—
Bachelor's or higher	88.59232645
High school enrollment	100
Preschool enrollment	95.7141024
Transportation	—
Auto Access	93.63531374
Active commuting	12.16476325
Social	—

2-parent households	42.29436674
Voting	82.35596048
Neighborhood	—
Alcohol availability	89.4649044
Park access	38.81688695
Retail density	42.06339022
Supermarket access	2.399589375
Tree canopy	71.42307199
Housing	—
Homeownership	65.75131528
Housing habitability	87.501604
Low-inc homeowner severe housing cost burden	64.24996792
Low-inc renter severe housing cost burden	88.91312717
Uncrowded housing	62.10701912
Health Outcomes	—
Insured adults	89.59322469
Arthritis	0.0
Asthma ER Admissions	99.7
High Blood Pressure	0.0
Cancer (excluding skin)	0.0
Asthma	0.0
Coronary Heart Disease	0.0
Chronic Obstructive Pulmonary Disease	0.0
Diagnosed Diabetes	0.0
Life Expectancy at Birth	77.8
Cognitively Disabled	87.2
Physically Disabled	55.6

Heart Attack ER Admissions	99.5
Mental Health Not Good	0.0
Chronic Kidney Disease	0.0
Obesity	0.0
Pedestrian Injuries	93.4
Physical Health Not Good	0.0
Stroke	0.0
Health Risk Behaviors	—
Binge Drinking	0.0
Current Smoker	0.0
No Leisure Time for Physical Activity	0.0
Climate Change Exposures	—
Wildfire Risk	99.5
SLR Inundation Area	38.8
Children	43.1
Elderly	11.5
English Speaking	77.4
Foreign-born	54.6
Outdoor Workers	85.4
Climate Change Adaptive Capacity	—
Impervious Surface Cover	79.5
Traffic Density	81.9
Traffic Access	23.0
Other Indices	—
Hardship	5.4
Other Decision Support	—
2016 Voting	60.6

7.3. Overall Health & Equity Scores

Metric	Result for Project Census Tract
CalEnviroScreen 4.0 Score for Project Location (a)	—
Healthy Places Index Score for Project Location (b)	90.0
Project Located in a Designated Disadvantaged Community (Senate Bill 535)	No
Project Located in a Low-Income Community (Assembly Bill 1550)	No
Project Located in a Community Air Protection Program Community (Assembly Bill 617)	No

a: The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.
b: The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

7.4. Health & Equity Measures

No Health & Equity Measures selected.

7.5. Evaluation Scorecard

Health & Equity Evaluation Scorecard not completed.

7.6. Health & Equity Custom Measures

No Health & Equity Custom Measures created.

8. User Changes to Default Data

Screen	Justification
Construction: Construction Phases	see construction assumptions
Construction: Off-Road Equipment	see construction assumptions
Construction: Trips and VMT	construction mobile calculated outside of CalEEMod.
Construction: Dust From Material Movement	see construction assumptions

Appendix D
Energy Calculations

ESA

P.2-1 Construction Energy Consumption Summary and Calculations

Topanga Restoration Lagoon
Construction Energy Analysis
Option 1
Annual Fuel Summary

	Heavy-Duty Construction Equipment
142,736	Total Project Consumption
35,684	Annual Consumption
	Haul Trucks
582,670	Total Project Consumption
145,668	Annual Consumption
	Vendor Trucks
1,153	Total Project Consumption
288	Annual Consumption
	Workers
43,596	Total Project Consumption
10,899	Annual Consumption
583,824	Project Consumption of diesel for Haul Trucks and Vendors
145,956	Annual Consumption
726,560	Total Gallons Diesel
43,596	Total Gallons Gasoline

4.00	Estimated Project Construction Duration (years)
181,640	Annual Average Gallons Diesel
10,899	Annual Average Gallons Gasoline

Los Angeles County			**Percent of Annual Project Compared to Los Angeles Count**
Source	**Fuel Type**	**Gallons**	
Workers	Gasoline	3,559,000,000	0.0003%
Off-Road/Vendor/Haul Trucks	Diesel	610,204,082	0.030%

Notes:

1 Gasoline and diesel amounts from CEC, 2019. Available: https://www.energy.ca.gov/data-reports/energy-almanac/transportation-energy/california-retail-fuel-outlet-annual-reporting

Topanga Restoration Lagoon
Construction Energy Analysis
Option 2
Annual Fuel Summary

	Heavy-Duty Construction Equipment		
7,507	Total Project Consumption		
7,507	Annual Consumption		
	Haul Trucks		
1,601	Total Project Consumption		
1,601	Annual Consumption		
	Vendor Trucks		
-	Total Project Consumption		
-	Annual Consumption		
	Workers		
6,293	Total Project Consumption		
6,293	Annual Consumption		
1,601	Project Consumption of diesel for Haul Trucks and Vendors		
1,601	Annual Consumption		
9,108	Total Gallons Diesel	735,668	Total with Option1
6,293	Total Gallons Gasoline	49,889	Total with Option1
1.00	Estimated Project Construction Duration (years)		
9,108	Annual Average Gallons Diesel	190,748	Total with Option1
6,293	Annual Average Gallons Gasoline	17,192	Total with Option1

Topanga Restoration Lagoon
Construction Energy Analysis
Option 3
Annual Fuel Summary

	Heavy-Duty Construction Equipment		
30,710	Total Project Consumption		
30,710	Annual Consumption		
	Haul Trucks		
4,708	Total Project Consumption		
4,708	Annual Consumption		
	Vendor Trucks		
-	Total Project Consumption		
-	Annual Consumption		
	Workers		
9,052	Total Project Consumption		
9,052	Annual Consumption		
4,708	Project Consumption of diesel for Haul Trucks and Vendors		
4,708	Annual Consumption		
35,419	Total Gallons Diesel	761,978	Total with Option1
9,052	Total Gallons Gasoline	52,648	Total with Option1

1.0	Estimated Project Construction Duration (years)		
35,419	Annual Average Gallons Diesel	217,059	Total with Option1
9,052	Annual Average Gallons Gasoline	19,951	Total with Option1

Topanga Restoration Lagoon
Construction Energy

Construction Water Energy Estimates

Source	Acreage/Day	Number of Days	Total Construction Water Use (Mgal)	Electricity Demand from Water Conveyance (MWh)	Annual Electricity Demand from Water Conveyance (MWh)
Site Preparation (VS)	0.5	1	0.002	0.0	0.0
Grading (VS)	1.0	4	0.012	0.1	0.0
Demolition (TB)	1.0	60	0.180	1.2	0.3
Grading (TB)	1.0	60	0.180	1.2	0.3
Grading (TB)-TR	1.0	30	0.090	0.6	0.2
Demolition (TB)-TB	0.0	59	0.000	0.0	0.0
Grading (TB)-Lagoon	0.5	214	0.321	2.2	0.5
Site Preparation (TB)	0.5	61	0.092	0.6	0.2
Demolition (Bridge)-NB	0.0	60	0.000	0.0	0.0
Grading (Bridge)-NB	1.0	61	0.183	1.2	0.3
Demolition (Bridge)-SB	0.0	59	0.000	0.0	0.0
Grading (Bridge)-SB	1.0	61	0.183	1.2	0.3
Subtotal - Project			**1.242**	**8.5**	**2.1**
Seepage Pit	**0.5**	**214**	**0.321**	**2.2**	**2.2**
Sewer Connection - Demolition	0.0	59	0.000	0.0	0.0
Sewer Connection - Grading	1.0	61	0.183	1.2	1.2
Subtotal - Option 3			**0.183**	**1.2**	**1.2**
Total			**1.563**	**10.6**	**4.3**

CalEEMod Water Electricity Factors	Electricity Intensity Factor To Supply (kWh/Mgal)	Electricity Intensity Factor To Treat (kWh/Mgal)	Electricity Intensity Factor To Distribute (kWh/Mgal)	Electricity Intensity Factor For Wastewater Treatment (kWh/Mgal)
	3044	725	1537	1501

Construction Water GHG	Electricity Emission (MT CO2e/MWh)	Electricity Emission (lbs CO2e/MWh)
1.68	0.16	348.21

Project	MWh/year	GHG (MT/year)
2027	3.2	0.50
2028	1.2	0.20
2029	1.2	0.20
2030	2.8	0.44
Op2	2.2	0.35
Op3	1.2	0.20

Sources and Assumptions:

CalEEMod Appendix G, Default data tables, G-14 Daily Acres Graded by Equipment Type

-Electricity Intensity Factors - California Emissions Estimator Model (CalEEMod).

-Estimated construction water use assumed to be generally equivalent to landscape irrigation, based on a factor of 20.94 gallons per year per square foot of landscaped area within the Los Angeles area (Mediterranean climate), which assumes high water demand landscaping materials and an irrigation system efficiency of 85%. Factor is therefore (20.94 GAL/SF/year) x (43,560 SF/acre) / (365 days/year) / (0.85) = 2,940 gallons/acre/day, rounded up to 3,000 gallons/acre/day. (U.S. Department of Energy, Energy Efficiency & Renewable Energy, Federal Energy Management Program. "Guidelines for Estimating Unmetered Landscaping Water Use." July 2010. Page 12, Table 4 - Annual Irrigation Factor – Landscaped Areas with High Water Requirements).

MT CO2e/MWh based on CO2, CH4 and N2O factors projected by CalEEMod for utility provider for year 2027

Topanga Restoration Lagoon
Construction Energy Analysis

Temporary Construction Trailer - Electricity

Land Use	Square Feet	Energy Use per year (kWh)	Total Energy Use (kWh)	GHG Emissions/year (MTCO2e)	Total GHG Emissions for Construction Duration	Energy Use per SF	
General Office	2,000	40,936	163,745	6.5	25.9	20.5	Option 1 (Includes O
General Office	2,000	40,936	40,936	6.5	6.5	20.5	Option 3
Note: CalEEMod 2022.1 used to estimate energy use for temporary construction office							
Note: Energy use per sf is derived from CalEEMod User Guide, Appendix G, Table G-28 for the Statewide average for General Office Building land use							

Topanga Restoration Lagoon
Construction Energy Analysis

Off-Road Equipment

Equipment ≤ 100 hp		
pounds diesel fuel/hp-hr (lb/hp-hr):[1]	0.408	lb/hp-hr
diesel density (lb/gal):[1]	7.11	lb/gal
diesel gallons/hp-hr:	0.0574	gal/hp-hr
Total <100	780,519	hp-hr
Total diesel gallons:	44,796	gal
Equipment > 100 hp		
pounds diesel fuel/hp-hr (lb/hp-hr):[1]	0.367	lb/hp-hr
diesel density (lb/gal):[1]	7.11	lb/gal
diesel gallons/hp-hr:	0.0516	gal/hp-hr
Total >100	1,897,124	hp-hr
Total diesel gallons:	97,940	gal
Total diesel gallons (off-road equipment):	**142,736**	**gal**

1. OFFROAD2017 Emission Factor Documentation

Construction Phase	Equipment	Number	Hours/Day	HP	Load	Days	Total hp-hr
Demolition (TB)	Tractors/Loaders/Backhoes	1	8	84	0.37	60	14,918
Demolition (TB)	Rubber Tired Dozers	1	8	367	0.4	60	70,464
Demolition (TB)	Excavators	2	8	36	0.38	60	13,133
Demolition (TB)	Graders	1	8	148	0.41	60	29,126
Demolition (TB)	Pavers	1	8	81	0.42	60	16,330
Demolition (TB)	Rollers	2	8	36	0.38	60	13,133
Demolition (TB)-TB	Tractors/Loaders/Backhoes	1	8	84	0.37	59	14,670
Demolition (TB)-TB	Excavators	2	8	36	0.38	59	12,914
Site Preparation (TB)	Graders	1	8	148	0.41	61	29,612
Site Preparation (TB)	Tractors/Loaders/Backhoes	1	8	84	0.37	61	15,167
Grading (TB)	Graders	1	8	148	0.41	60	29,126
Grading (TB)	Tractors/Loaders/Backhoes	1	8	84	0.37	60	14,918
Grading (TB)	Rubber Tired Dozers	1	8	367	0.4	60	70,464
Grading (TB)	Excavators	1	8	36	0.38	60	6,566
Grading (TB)	Off-Highway Trucks	1	8	376	0.38	60	68,582
Grading (TB)-TR	Tractors/Loaders/Backhoes	1	8	84	0.37	30	7,459
Grading (TB)-TR	Graders	1	8	148	0.41	30	14,563
Grading (TB)-TR	Rubber Tired Dozers	1	8	367	0.4	30	35,232
Grading (TB)-TR	Excavators	1	8	36	0.38	30	3,283
Grading (TB)-TR	Off-Highway Trucks	1	8	376	0.38	30	34,291
Grading (TB)-Lagoon	Graders	1	8	148	0.41	214	103,884
Grading (TB)-Lagoon	Excavators	1	8	36	0.38	214	23,420
Grading (TB)-Lagoon	Off-Highway Trucks	1	8	376	0.38	214	244,611
Building Construction (TB)	Cranes	1	8	367	0.29	124	105,579
Building Construction (TB)	Forklifts	1	8	82	0.2	124	16,269
Building Construction (TB)	Crawler Tractors	1	8	87	0.43	124	37,111
Building Construction (TB)	Generator Sets	1	8	14	0.74	124	10,277
Building Construction (TB)-DBH	Cranes	1	8	367	0.29	31	26,395
Building Construction (TB)-DBH	Forklifts	1	8	82	0.2	31	4,067
Building Construction (TB)-DBH	Generator Sets	1	8	14	0.74	31	2,569
Building Construction (TB)-DBH	Crawler Tractors	1	8	87	0.43	31	9,278
Paving (TB)	Pavers	1	8	81	0.42	60	16,330
Paving (TB)	Rollers	1	8	36	0.38	60	6,566
Paving (TB)	Graders	1	8	148	0.41	60	29,126
Paving (TB)	Rubber Tired Dozers	1	8	367	0.4	60	70,464
Trenching (TB)	Excavators	1	8	36	0.38	182	19,918
Trenching (TB)	Tractors/Loaders/Backhoes	1	8	84	0.37	182	45,252
Demolition (Bridge)-NB	Tractors/Loaders/Backhoes	1	8	84	0.37	60	14,918
Demolition (Bridge)-NB	Excavators	2	8	36	0.38	60	13,133
Grading (Bridge)-NB	Graders	1	8	148	0.41	61	29,612
Grading (Bridge)-NB	Tractors/Loaders/Backhoes	1	8	84	0.37	61	15,167
Grading (Bridge)-NB	Rubber Tired Dozers	1	8	367	0.4	61	71,638

Grading (Bridge)-NB	Excavators	1	8	36	0.38	61	6,676
Grading (Bridge)-NB	Off-Highway Trucks	1	8	376	0.38	61	69,725
Building Construction (Bridge)-NB	Cranes	1	8	367	0.29	214	182,208
Building Construction (Bridge)-NB	Forklifts	1	8	82	0.2	214	28,077
Building Construction (Bridge)-NB	Generator Sets	1	8	14	0.74	214	17,736
Building Construction (Bridge)-NB	Crawler Tractors	1	8	87	0.43	214	64,046
Paving (Bridge)-NB	Rollers	1	8	36	0.38	31	3,393
Paving (Bridge)-NB	Pavers	1	8	81	0.42	31	8,437
Paving (Bridge)-NB	Rubber Tired Dozers	1	8	367	0.4	31	36,406
Paving (Bridge)-NB	Graders	1	8	148	0.41	31	15,049
Demolition (Bridge)-SB	Tractors/Loaders/Backhoes	1	8	84	0.37	59	14,670
Demolition (Bridge)-SB	Excavators	2	8	36	0.38	59	12,914
Grading (Bridge)-SB	Graders	1	8	148	0.41	61	29,612
Grading (Bridge)-SB	Tractors/Loaders/Backhoes	1	8	84	0.37	61	15,167
Grading (Bridge)-SB	Rubber Tired Dozers	1	8	367	0.4	61	71,638
Grading (Bridge)-SB	Excavators	1	8	36	0.38	61	6,676
Grading (Bridge)-SB	Off-Highway Trucks	1	8	376	0.38	61	69,725
Building Construction (Bridge)-SB	Cranes	1	8	367	0.29	214	182,208
Building Construction (Bridge)-SB	Forklifts	1	8	82	0.2	214	28,077
Building Construction (Bridge)-SB	Generator Sets	1	8	14	0.74	214	17,736
Building Construction (Bridge)-SB	Crawler Tractors	1	8	87	0.43	214	64,046
Paving (Bridge)-SB	Pavers	1	8	81	0.42	31	8,437
Paving (Bridge)-SB	Rollers	1	8	36	0.38	31	3,393
Paving (Bridge)-SB	Rubber Tired Dozers	1	8	367	0.4	31	36,406
Paving (Bridge)-SB	Graders	1	8	148	0.41	31	15,049
Site Preparation (VS)	Graders	1	8	148	0.41	1	485
Site Preparation (VS)	Tractors/Loaders/Backhoes	1	8	84	0.37	1	249
Grading (VS)	Graders	1	8	148	0.41	4	1,942
Grading (VS)	Rubber Tired Dozers	1	8	367	0.4	4	4,698
Grading (VS)	Tractors/Loaders/Backhoes	1	8	84	0.37	4	995
Building Construction (VS)	Cranes	1	8	367	0.29	140	119,202
Building Construction (VS)	Forklifts	2	8	82	0.2	140	36,736
Building Construction (VS)	Tractors/Loaders/Backhoes	2	8	84	0.37	140	69,619
Paving (VS)	Tractors/Loaders/Backhoes	1	8	84	0.37	7	1,740
Paving (VS)	Cement and Mortar Mixers	4	8	10	0.56	7	1,254
Paving (VS)	Pavers	1	8	81	0.42	7	1,905
Paving (VS)	Rollers	1	8	36	0.38	7	766
Architectural Coating (VS)	Air Compressors	1	8	37	0.48	7	995

Total >100	1,897,124
Total <100	780,519

Topanga Restoration Lagoon
Construction Energy Analysis
Off-Road Equipment - Wastewater Option 2

Equipment ≤ 100 hp		
pounds diesel fuel/hp-hr (lb/hp-hr):[1]	0.408	lb/hp-hr
diesel density (lb/gal):[1]	7.11	lb/gal
diesel gallons/hp-hr:	0.0574	gal/hp-hr
Total <100	37,356	hp-hr
Total diesel gallons:	2,144	gal
Equipment > 100 hp		
pounds diesel fuel/hp-hr (lb/hp-hr):[1]	0.367	lb/hp-hr
diesel density (lb/gal):[1]	7.11	lb/gal
diesel gallons/hp-hr:	0.0516	gal/hp-hr
Total >100	103,884	hp-hr
Total diesel gallons:	5,363	gal
Total diesel gallons (off-road equipment):	**7,507**	**gal**

1. OFFROAD2017 Emission Factor Documentation

Construction Phase	Equipment	Number	Hours/Day	HP	Load	Days	Total hp-hr
Seepage Pit	Graders	1	8	148	0.41	214	103,884
Seepage Pit	Excavators	1	8	36	0.38	214	23,420
Seepage Pit	Pumps	1	8	11	0.74	214	13,936
						Total >100	103,884
						Total <100	37,356

Topanga Restoration Lagoon
Construction Energy Analysis
Off-Road Equipment - Wastewater Option 3

Equipment ≤ 100 hp		
pounds diesel fuel/hp-hr (lb/hp-hr):[1]	0.408	lb/hp-hr
diesel density (lb/gal):[1]	7.11	lb/gal
diesel gallons/hp-hr:	0.0574	gal/hp-hr
Total <100	171,115	hp-hr
Total diesel gallons:	9,821	gal
Equipment > 100 hp		
pounds diesel fuel/hp-hr (lb/hp-hr):[1]	0.367	lb/hp-hr
diesel density (lb/gal):[1]	7.11	lb/gal
diesel gallons/hp-hr:	0.0516	gal/hp-hr
Total >100	404,639	hp-hr
Total diesel gallons:	20,890	gal
Total diesel gallons (off-road equipment):	**30,710**	**gal**

1. OFFROAD2017 Emission Factor Documentation

Construction Phase	Equipment	Number	Hours/Day	HP	Load	Days	Total hp-hr
Sewer Connection - Demolition	Tractors/Loaders/Backhoes	1	8	84	0.37	59	14,670
Sewer Connection - Demolition	Excavators	2	8	36	0.38	59	12,914
Sewer Connection - Grading	Graders	1	8	148	0.41	61	29,612
Sewer Connection - Grading	Rubber Tired Dozers	1	8	367	0.4	61	71,638
Sewer Connection - Grading	Tractors/Loaders/Backhoes	1	8	84	0.37	61	15,167
Sewer Connection - Grading	Excavators	1	8	36	0.38	61	6,676
Sewer Connection - Grading	Off-Highway Trucks	1	8	376	0.38	61	69,725
Sewer Connection - Building Construc	Cranes	1	8	367	0.29	214	182,208
Sewer Connection - Building Construc	Forklifts	1	8	82	0.2	214	28,077
Sewer Connection - Building Construc	Crawler Tractors	1	8	87	0.43	214	64,046
Sewer Connection - Building Construc	Generator Sets	1	8	14	0.74	214	17,736
Sewer Connection - Paving	Pavers	1	8	81	0.42	31	8,437
Sewer Connection - Paving	Rollers	1	8	36	0.38	31	3,393
Sewer Connection - Paving	Rubber Tired Dozers	1	8	367	0.4	31	36,406
Sewer Connection - Paving	Graders	1	8	148	0.41	31	15,049
						Total >100	404,639
						Total <100	171,115

Topanga Canyon - Temporary Bridge
Total On-Road Fuel Consumption

		gal/mile
2022	Hauling Hauling	0.17004641
2022	Vendor Vendor	0.14160709
2022	Worker Worker	0.03974021
2023	Hauling Hauling	0.16744049
2023	Vendor Vendor	0.1400083
2023	Worker Worker	0.03894266
2024	Hauling Hauling	0.16534457
2024	Vendor Vendor	0.13876713
2024	Worker Worker	0.03808277
2025	Hauling Hauling	0.16305171
2025	Vendor Vendor	0.13736272
2025	Worker Worker	0.03726591
2026	Hauling Hauling	0.16075668
2026	Vendor Vendor	0.1359573
2026	Worker Worker	0.0364859
2027	Hauling Hauling	0.15844728
2027	Vendor Vendor	0.13458703
2027	Worker Worker	0.03577571
2028	Hauling Hauling	0.15595442
2028	Vendor Vendor	0.13307229
2028	Worker Worker	0.03513338
2029	Hauling Hauling	0.15353145
2029	Vendor Vendor	0.13159181
2029	Worker Worker	0.03454545
2030	Hauling Hauling	0.15123834
2030	Vendor Vendor	0.13016679
2030	Worker Worker	0.03400797
2031	Hauling Hauling	0.1489532
2031	Vendor Vendor	0.12871224
2031	Worker Worker	0.03351506

Topanga Canyon - Temporary Bridge
Total On-Road Fuel Consumption

Source	Fuel Type	Total Fuel Use (gal)
Hauling	Diesel	512,505
Vendor	Diesel	0
Worker	Gasoline	23,022

Fuel Type	Total Fuel Use
Diesel	512,505
Gasoline	23,022

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Idling per Day (minutes)	Regional Emissions (gallons) gal/mile	gal/min	gal/day	Total Gallons/yr
Demolition &Temp Parking Prov	2022								
Total Haul Trips	2162								
Hauling	52	42	8	77	15	0.17	0.00E+00	681	28,596
Vendor	0	60	8	10.2	15	0.14	0.00E+00	0	0
Worker	40	60	8	18.5	0	0.04	0.00E+00	29	1,764
Unsuitable Material Replacemer	2027								
Total Haul Trips	5200								
Hauling	124	42	8	77	15	0.16	0.00E+00	1,513	63,540
Vendor	0	60	8	10.2	15	0.13	0.00E+00	0	0
Worker	40	60	8	18.5	0	0.04	0.00E+00	26	1,588
Relocate Utilities	2027								
Total Haul Trips	260								
Hauling	2	130	8	36.5	15	0.16	0.00E+00	12	1,504
Vendor	0	182	8	10.2	15	0.13	0.00E+00	0	0
Worker	40	182	8	18.5	0	0.04	0.00E+00	26	4,818
Construct Temporary Road/Brid	2027								
Total Haul Trips	320								
Hauling	16	22	8	36.5	15	0.16	0.00E+00	93	2,036
Vendor	0	30	8	10.2	15	0.13	0.00E+00	0	0
Worker	40	30	8	18.5	0	0.04	0.00E+00	26	794
Construct Temporary Road/Brid	2027								
Total Haul Trips	208								
Hauling	4	88	8	36.5	15	0.16	0.00E+00	23	2,036
Vendor	0	124	8	10.2	15	0.13	0.00E+00	0	0
Worker	40	124	8	18.5	0	0.04	0.00E+00	26	3,283
Construct Temporary Road/Brid	2027								
Total Haul Trips	0								
Hauling	0	44	8	36.5	15	0.16	0.00E+00	0	0
Vendor	0	60	8	10.2	15	0.13	0.00E+00	0	0
Worker	40	60	8	18.5	0	0.04	0.00E+00	26	1,588
Demolition Temporary Bridge	2030								
Total Haul Trips	0								
Hauling	0	43	8	36.5	15	0.15	0.00E+00	0	0
Vendor	0	59	8	10.2	15	0.13	0.00E+00	0	0
Worker	40	59	8	18.5	0	0.03	0.00E+00	25	1,485
Construct DBH Facilities(Lifeguar	2030								
Total Haul Trips	0								
Hauling	0	21	8	36.5	15	0.15	0.00E+00	0	0
Vendor	0	31	8	10.2	15	0.13	0.00E+00	0	0
Worker	40	31	8	18.5	0	0.03	0.00E+00	25	780
Lagoon Grading	2030								
Total Haul Trips	51200								
Hauling	502	102	8	36.5	15	0.15	0.00E+00	2,771	282,656
Vendor	0	214	8	10.2	15	0.13	0.00E+00	0	0
Worker	40	214	8	18.5	0	0.03	0.00E+00	25	5,386
Restore Beach Area	2030								
Total Haul Trips	0								
Hauling	0	43	8	36.5	15	0.15	0.00E+00	0	0
Vendor	0	61	8	10.2	15	0.13	0.00E+00	0	0
Worker	40	61	8	18.5	0	0.03	0.00E+00	25	1,535
Unsuitable Material Replacemer	2027								
Total Haul Trips	5200								
Hauling	124	42	8	106	15	0.16	0.00E+00	2,083	87,471
Vendor	0	60	8	10.2	15	0.13	0.00E+00	0	0
Worker	0	60	8	18.5	0	0.04	0.00E+00	0	0
Unsuitable Material Replacemer	2027								
Total Haul Trips	2520								
Hauling	60	42	8	20	15	0.16	0.00E+00	190	7,986
Vendor	0	60	8	10.2	15	0.13	0.00E+00	0	0
Worker	0	60	8	18.5	0	0.04	0.00E+00	0	0
Demolition &Temp Parking Prov	2027								
Total Haul Trips	2162								
Hauling	52	42	8	106	15	0.16	0.00E+00	873	36,681
Vendor	0	60	8	10.2	15	0.13	0.00E+00	0	0
Worker	0	60	8	18.5	0	0.04	0.00E+00	0	0

Topanga Canyon - NB/SB Bridge
Total On-Road Fuel Consumption

		gal/mile
2022	Hauling	0.17004641
2022	Vendor	0.14160709
2022	Worker	0.03974021
2023	Hauling	0.16744049
2023	Vendor	0.1400083
2023	Worker	0.03894266
2024	Hauling	0.16534457
2024	Vendor	0.13876713
2024	Worker	0.03808277
2025	Hauling	0.16305171
2025	Vendor	0.13736272
2025	Worker	0.03726591
2026	Hauling	0.16075668
2026	Vendor	0.1359573
2026	Worker	0.0364859
2027	Hauling	0.15844728
2027	Vendor	0.13458703
2027	Worker	0.03577571
2028	Hauling	0.15595442
2028	Vendor	0.13307229
2028	Worker	0.03513338
2029	Hauling	0.15353145
2029	Vendor	0.13159181
2029	Worker	0.03454545
2030	Hauling	0.15123834
2030	Vendor	0.13016679
2030	Worker	0.03400797
2031	Hauling	0.1489532
2031	Vendor	0.12871224
2031	Worker	0.03351506

Topanga Canyon - NB/SB Bridge
Total On-Road Fuel Consumption

Source	Fuel Type	Total Fuel Use (gal)
Hauling	Diesel	70,165
Vendor	Diesel	0
Worker	Gasoline	19,051

Fuel Type	Total Fuel Use
Diesel	70,165
Gasoline	19,051

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Idling per Day (minutes)	Regional Emissions (gallons) gal/mile	gal/min	gal/day	Total Gallons/yr
Demolition NB Road/Bridge	2022								
Total Haul Trips	270								
Hauling	8	42	8	36.5	15	0.17	0.00E+00	50	2,085
Vendor	0	60	8	10.2	15	0.14	0.00E+00	0	0
Worker	40	60	8	18.5	0	0.04	0.00E+00	29	1,764
Construct NB Road/Bridge	2028								
Total Haul Trips	3700								
Hauling	86	43	8	36.5	15	0.16	0.00E+00	490	21,050
Vendor	0	61	8	10.2	15	0.13	0.00E+00	0	0
Worker	40	61	8	18.5	0	0.04	0.00E+00	26	1,586
Construct NB Road/Bridge	2028								
Total Haul Trips	834								
Hauling	6	154	8	36.5	15	0.16	0.00E+00	34	5,260
Vendor	0	214	8	10.2	15	0.13	0.00E+00	0	0
Worker	40	214	8	18.5	0	0.04	0.00E+00	26	5,564
Construct NB Road/Bridge	2028								
Total Haul Trips	0								
Hauling	0	21	8	36.5	15	0.16	0.00E+00	0	0
Vendor	0	31	8	10.2	15	0.13	0.00E+00	0	0
Worker	40	31	8	18.5	0	0.04	0.00E+00	26	806
Demolition SB Road/Bridge	2029								
Total Haul Trips	270								
Hauling	8	43	8	36.5	15	0.15	0.00E+00	45	1,928
Vendor	0	59	8	10.2	15	0.13	0.00E+00	0	0
Worker	40	59	8	18.5	0	0.03	0.00E+00	26	1,508
Construct SB Road/Bridge	2029								
Total Haul Trips	3460								
Hauling	82	43	8	36.5	15	0.15	0.00E+00	460	19,759
Vendor	0	61	8	10.2	15	0.13	0.00E+00	0	0
Worker	40	61	8	18.5	0	0.03	0.00E+00	26	1,559
Construct SB Road/Bridge	2029								
Total Haul Trips	834								
Hauling	6	154	8	36.5	15	0.15	0.00E+00	34	5,178
Vendor	0	214	8	10.2	15	0.13	0.00E+00	0	0
Worker	40	214	8	18.5	0	0.03	0.00E+00	26	5,471
Construct SB Road/Bridge	2029								
Total Haul Trips	0								
Hauling	0	21	8	36.5	15	0.15	0.00E+00	0	0
Vendor	0	31	8	10.2	15	0.13	0.00E+00	0	0
Worker	40	31	8	18.5	0	0.03	0.00E+00	26	792
Construct NB Road/Bridge	2028								
Total Haul Trips	2400								
Hauling	56	43	8	20	15	0.16	0.00E+00	175	7,511
Vendor	0	61	8	10.2	15	0.13	0.00E+00	0	0
Worker	0	61	8	18.5	0	0.04	0.00E+00	0	0
Construct SB Road/Bridge	2029								
Total Haul Trips	2400								
Hauling	56	43	8	20	15	0.15	0.00E+00	172	7,394
Vendor	0	61	8	10.2	15	0.13	0.00E+00	0	0
Worker	0	61	8	18.5	0	0.03	0.00E+00	0	0

Topanga Canyon - VS

Total On-Road Fuel Consumption

		gal/mile
2022	Hauling	0.17004641
2022	Vendor	0.14160709
2022	Worker	0.03974021
2023	Hauling	0.16744049
2023	Vendor	0.1400083
2023	Worker	0.03894266
2024	Hauling	0.16534457
2024	Vendor	0.13876713
2024	Worker	0.03808277
2025	Hauling	0.16305171
2025	Vendor	0.13736272
2025	Worker	0.03726591
2026	Hauling	0.16075668
2026	Vendor	0.1359573
2026	Worker	0.0364859
2027	Hauling	0.15844728
2027	Vendor	0.13458703
2027	Worker	0.03577571
2028	Hauling	0.15595442
2028	Vendor	0.13307229
2028	Worker	0.03513338
2029	Hauling	0.15353145
2029	Vendor	0.13159181
2029	Worker	0.03454545
2030	Hauling	0.15123834
2030	Vendor	0.13016679
2030	Worker	0.03400797
2031	Hauling	0.1489532
2031	Vendor	0.12871224
2031	Worker	0.03351506

Topanga Canyon - VS

Total On-Road Fuel Consumption

Source	Fuel Type	Total Fuel Use (gal)
Hauling	Diesel	0
Vendor	Diesel	1,153
Worker	Gasoline	1,523

Fuel Type	Total Fuel Use
Diesel	1,153
Gasoline	1,523

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Idling per Day (minutes)	Regional Emissions (gallons) gal/mile	gal/min	gal/day	Total Gallons/yr
Site Preparation	2022								
Total Haul Trips	0								
Hauling	0	1	8	36.5	15	0.17	0.00E+00	0	0
Vendor	0	1	8	10.2	15	0.14	0.00E+00	0	0
Worker	10	1	8	18.5	0	0.04	0.00E+00	7	7
Grading	2027								
Total Haul Trips	0								
Hauling	0	4	8	36.5	15	0.16	0.00E+00	0	0
Vendor	0	4	8	10.2	15	0.13	0.00E+00	0	0
Worker	16	4	8	18.5	0	0.04	0.00E+00	11	42
Building Construction	2027								
Total Haul Trips	0								
Hauling	0	140	8	36.5	15	0.16	0.00E+00	0	0
Vendor	6	140	8	10.2	15	0.13	0.00E+00	8	1,153
Worker	14	140	8	18.5	0	0.04	0.00E+00	9	1,297
Paving	2027								
Total Haul Trips	0								
Hauling	0	7	8	36.5	15	0.16	0.00E+00	0	0
Vendor	0	7	8	10.2	15	0.13	0.00E+00	0	0
Worker	36	7	8	18.5	0	0.04	0.00E+00	24	167
Architectural Coating	2027								
Total Haul Trips	0								
Hauling	0	7	8	36.5	15	0.16	0.00E+00	0	0
Vendor	0	7	8	10.2	15	0.13	0.00E+00	0	0
Worker	2	7	8	18.5	0	0.04	0.00E+00	1	9

Topanga Canyon - Op2 and 3

Total On-Road Fuel Consumption

		gal/mile
2022	Hauling Hauling	0.17004641
2022	Vendor Vendor	0.14160709
2022	Worker Worker	0.03974021
2023	Hauling Hauling	0.16744049
2023	Vendor Vendor	0.1400083
2023	Worker Worker	0.03894266
2024	Hauling Hauling	0.16534457
2024	Vendor Vendor	0.13876713
2024	Worker Worker	0.03808277
2025	Hauling Hauling	0.16305171
2025	Vendor Vendor	0.13736272
2025	Worker Worker	0.03726591
2026	Hauling Hauling	0.16075668
2026	Vendor Vendor	0.1359573
2026	Worker Worker	0.0364859
2027	Hauling Hauling	0.15844728
2027	Vendor Vendor	0.13458703
2027	Worker Worker	0.03577571
2028	Hauling Hauling	0.15595442
2028	Vendor Vendor	0.13307229
2028	Worker Worker	0.03513338
2029	Hauling Hauling	0.15353145
2029	Vendor Vendor	0.13159181
2029	Worker Worker	0.03454545
2030	Hauling Hauling	0.15123834
2030	Vendor Vendor	0.13016679
2030	Worker Worker	0.03400797
2031	Hauling Hauling	0.1489532
2031	Vendor Vendor	0.12871224
2031	Worker Worker	0.03351506

Op2

Source	Fuel Type	Total Fuel Use (gal)
Hauling	Diesel	1,601
Vendor	Diesel	0
Worker	Gasoline	6,293

Fuel Type	Total Fuel Use
Diesel	1,601
Gasoline	6,293

Topanga Canyon - Op2 and 3

Total On-Road Fuel Consumption

Op3

Source	Fuel Type	Total Fuel Use (gal)
Hauling	Diesel	4,708
Vendor	Diesel	0
Worker	Gasoline	9,052

Fuel Type	Total Fuel Use
Diesel	4,708
Gasoline	9,052

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Idling per Day (minutes)	Regional Emissions (gallons) gal/mile	gal/min	gal/day	Total Gallons/yr
Grading/Excavation	2022								
Total Haul Trips	200								
Hauling	6	43	8	36.5	15	0.17	0.00E+00	37	1,601
Vendor	0	214	8	10.2	15	0.14	0.00E+00	0	0
Worker	40	214	8	18.5	0	0.04	0.00E+00	29	6,293
Demolition NB Road/Bridge	2031								
Total Haul Trips	0								
Hauling	0	43	8	36.5	15	0.15	0.00E+00	0	0
Vendor	0	59	8	10.2	15	0.13	0.00E+00	0	0
Worker	40	59	8	18.5	0	0.03	0.00E+00	25	1,463
Construct NB Road/Bridge	2031								
Total Haul Trips	200								
Hauling	6	43	8	36.5	15	0.15	0.00E+00	33	1,403
Vendor	0	61	8	10.2	15	0.13	0.00E+00	0	0
Worker	40	61	8	18.5	0	0.03	0.00E+00	25	1,513
Construct NB Road/Bridge	2031								
Total Haul Trips	330								
Hauling	4	152	8	36.5	15	0.15	0.00E+00	22	3,306
Vendor	0	214	8	10.2	15	0.13	0.00E+00	0	0
Worker	40	214	8	18.5	0	0.03	0.00E+00	25	5,307
Construct NB Road/Bridge	2031								
Total Haul Trips	0								
Hauling	0	23	8	36.5	15	0.15	0.00E+00	0	0
Vendor	0	31	8	10.2	15	0.13	0.00E+00	0	0
Worker	40	31	8	18.5	0	0.03	0.00E+00	25	769

Appendix P
GHG Calculations and Modeling

ESA

P.1-1 Construction Assumptions

Topanga Lagoon Restoration

Construction Equipment/Worker/Vendor Truck Schedule and Assumptions

Project Land Uses

Land Use Type	CalEEMod LandUse Type	CalEEMod LandUse Subtype	Amount	Unit	Land Use SF	Notes
Temporary Bridge	Other Asphalt Surfaces		0.31	acres	13,500	Temp bridge is 180 ft long * 75 ft width
Topanga Bridge/Roadway NB	Other Asphalt Surfaces		1.80	acres	78,408	This includes bridge construction (460 ft*75 ft) + roadway improvements. Total acreage of impervious surfaces is 3.6 acres split between NB and SB directions evenly
Topanga Bridge/Roadway SB	Other Asphalt Surfaces		1.80	acres	78,408	
Lifeguard HQ	Office	General Office Building	1.5	KSF	1,500	Estimated on Google Earth
Helipad	Other Nonasphalt Surfaces		2.3	KSF	2,300	Estimated on Google Earth
Visitor Services						
Ranger Office	Office	General Office Building	5.5	KSF	5,500	From PD
Parking Lot	Parking Lot		75	Spaces	29,403	

Added 1 day to end to include end date

	Construction Phase	CalEEMod Phase Type	Start Date	End Date	Workdays (7 days/week)	Worker Vehicles/Day	Workers Trips (In/Out)/Day	Vendor Trips/Day (In/Out)
A	Demolition & Temp Parking Provisions	Demolition	1/1/2027	3/1/2027	60	20	40	
A	Unsuitable Material Replacement	Grading/Excavation	1/1/2027	3/1/2027	60	20	40	
A	Relocate Utilities	Trenching	2/1/2027	8/1/2027	182	20	40	
A	Construct Temporary Road/ Bridge	Grading/Excavation	6/1/2027	6/30/2027	30	20	40	
A	Construct Temporary Road/ Bridge	Building Construction	7/1/2027	11/1/2027	124	20	40	
A	Construct Temporary Road/ Bridge	Paving	11/2/2027	12/31/2027	60	20	40	
B	Demolition NB Road/Bridge	Demolition	1/1/2028	2/29/2028	60	20	40	
B	Construct NB Road/Bridge	Grading/Excavation	3/1/2028	4/30/2028	61	20	40	
B	Construct NB Road/Bridge	Building Construction	5/1/2028	11/30/2028	214	20	40	
B	Construct NB Road/Bridge	Paving	12/1/2028	12/31/2028	31	20	40	
B	Demolition SB Road/Bridge	Demolition	1/1/2029	2/28/2029	59	20	40	
B	Construct SB Road/Bridge	Grading/Excavation	3/1/2029	4/30/2029	61	20	40	
B	Construct SB Road/Bridge	Building Construction	5/1/2029	11/30/2029	214	20	40	
B	Construct SB Road/Bridge	Paving	12/1/2029	12/31/2029	31	20	40	
A	Demolition Temporary Bridge	Demolition	1/1/2030	2/28/2030	59	20	40	
A	Construct DBH Facilities (Lifeguard HQ/Helipad)	Building Construction	3/1/2030	3/31/2030	31	20	40	
A	Lagoon Grading	Grading/Excavation	4/1/2030	10/31/2030	214	20	40	
A	Restore Beach Area	Site Preparation	11/1/2030	12/31/2030	61	20	40	
	Visitor Services							
C	Site Preparation		1/1/2027	1/1/2027	1	5	10	
C	Grading		1/2/2027	1/5/2027	4	8	16	
C	Building Construction		1/6/2027	5/25/2027	140	7	14	6
C	Paving		5/19/2027	5/25/2027	7	18	36	
C	Architectural Coating		5/19/2027	5/25/2027	7	1	2	

Topanga Lagoon Restoration

Construction Haul and Concrete Truck Schedule and Assumptions

Project Land Uses

Land Use Type	CalEEMod LandUse Type	CalEEMod LandUse	Amount	Unit	Land Use SF	Notes
Temporary Bridge	Other Asphalt Surfaces		0.31	acres	13,500	Temp bridge is 180 ft long * 75 ft width
Topanga Bridge/Roadway NB	Other Asphalt Surfaces		1.80	acres	78,408	This includes bridge construction (460 ft*75 ft) + roadway improvements. Total acreage of impervious surfaces is 3.6 acres split between NB and SB directions evenly
Topanga Bridge/Roadway SB	Other Asphalt Surfaces		1.80	acres	78,408	
Lifeguard HQ	Office	General Office	1.5	KSF	1,500	Estimated on Google Earth
Helipad	Other Nonasphalt Surfaces		2.3	KSF	2,300	Estimated on Google Earth
Visitor Services						
Ranger Office	Office	General Office	5.5	KSF	5,500	From PD
Parking Lot	Parking Lot		75	Spaces	29,403	

	Construction Phase	CalEEMod Phase Type	Start Date	End Date	Workdays (5 days/week)		Total Haul (or Concrete) Trips (In/Out)	Total Haul (or Concrete) Trucks/Day	Haul (or Concrete) Trips/Day (In/Out)
A	Demolition & Temp Parking Provisions	Demolition	1/1/2027	3/1/2027	42		2,162	26	52
A	Unsuitable Material Replacement	Grading/Excavation	1/1/2027	3/1/2027	42		7,720	92	184
A	Relocate Utilities	Trenching	2/1/2027	8/1/2027	130		260	1	2
A	Construct Temporary Road/ Bridge	Grading/Excavation	6/1/2027	6/30/2027	22		320	8	16
A	Construct Temporary Road/ Bridge	Building Construction	7/1/2027	11/1/2027	88		208	2	4
A	Construct Temporary Road/ Bridge	Paving	11/2/2027	12/31/2027	44				
B	Demolition NB Road/Bridge	Demolition	1/1/2028	2/29/2028	42		270	4	8
B	Construct NB Road/Bridge	Grading/Excavation	3/1/2028	4/30/2028	43		6,100	71	142
B	Construct NB Road/Bridge	Building Construction	5/1/2028	11/30/2028	154		834	3	6
B	Construct NB Road/Bridge	Paving	12/1/2028	12/31/2028	21				
B	Demolition SB Road/Bridge	Demolition	1/1/2029	2/28/2029	43		270	4	8
B	Construct SB Road/Bridge	Grading/Excavation	3/1/2029	4/30/2029	43		5,860	69	138
B	Construct SB Road/Bridge	Building Construction	5/1/2029	11/30/2029	154		834	3	6
B	Construct SB Road/Bridge	Paving	12/1/2029	12/31/2029	21				
A	Demolition Temporary Bridge	Demolition	1/1/2030	2/28/2030	43				
A	Construct DBH Facilities (Lifeguard HQ/Helipad)	Building Construction	3/1/2030	3/31/2030	21				
A	Lagoon Grading	Grading/Excavation	4/1/2030	10/31/2030	154		51,200	251	502
A	Restore Beach Area	Site Preparation	11/1/2030	12/31/2030	43				
	Visitor Services								
C	Site Preparation		1/1/2027	1/1/2027	1				
C	Grading		1/2/2027	1/5/2027	2				
C	Building Construction		1/6/2027	5/25/2027	100				
C	Paving		5/19/2027	5/25/2027	5				
C	Architectural Coating		5/19/2027	5/25/2027	5				

Demolition Quantities - Structures

Buildings	Amount
Total Demolition Debris (CY)	**10,810**
Haul Truck Capacity (CY)	10
Total Haul Trucks Required	1,081
Total Haul Truck Trips (In/Out)	**2,162**
Total Haul Truck Trips (In/Out) per day	52
Tons of Debris	5,405

Demolition Quantities - NB Bridge

Buildings	Amount
Total Demolition Debris (CY)	**1,350**
Haul Truck Capacity (CY)	10
Total Haul Trucks Required	135
Total Haul Truck Trips (In/Out)	**270**
Total Haul Truck Trips (In/Out) per day	8
Tons of Debris	675

Demolition Quantities - SB Bridge

Buildings	Amount
Total Demolition Debris (	**1,350**
Haul Truck Capacity (CY)	10
Total Haul Trucks Require	135
Total Haul Truck Trips (In	**270**
Total Haul Truck Trips (In/Out) per day	8
Tons of Debris	675

Lagoon Excavation Quantities

Parameters	Amount
Excavation Volume (Export) (CY)	**256,000**
Haul Truck Capacity (CY)	10
Total Haul Trucks Required	25,600
Total Haul Truck Trips (In/Out)	**51,200**
Haul Days	**102**
Daily Haul Amount (CY)	**2,510**
Total Haul Truck Trips (In/Out) per day	502

Sediment Beneficial Reuse Study

8/2/2022

Excavation Quantities - ADL Contaminated Soil

Parameters	Amount		
Excavation Volume (Import) (CY)	**12,600**	2,520	Total Import Truck Trips
Excavation Volume (Export) (CY)	**26,000**	5,200	Total Export Truck Trips
Haul Truck Capacity (CY)	10	60	Daily Import Truck Trips
Total Haul Trucks Required	3,860	124	Daily Export Truck Trips
Total Haul Truck Trips (In/Out)	**7,720**		
Daily Haul Amount (CY)	**920**		
Total Haul Truck Trips (In/Out) per day	184		

Foundations/Concrete Quantities - Temporary Bridge

Foundations	Amount
Total Concrete Volume (C	930
Concrete Truck Capacity (	9
Total Concrete Trucks Rec	104
Total Concrete Truck Trips	208
Daily Max Concrete Amou	**11**
Max Concrete Truck Trips	4
Days Needed	52
Tons of Debris	465

Excavation Quantities - NB Road/Bridge and Roadway Excavation

Parameters	Amount		
Excavation Volume (Import) (CY)	12,000	2,400	Total Import Truck Trips
Excavation Volume (Export) (CY)	18,500	3,700	Total Export Truck Trips
Total Quantity	**30,500**	56	Daily Import Truck Trips
Haul Truck Capacity (CY)	10	86	Daily Export Truck Trips
Total Haul Trucks Required	3,050		
Total Haul Truck Trips (In/Out)	**6,100**		
Daily Haul Amount (CY)	**710**		
Total Haul Truck Trips (In/Out) per day	142		

Excavation Quantities - Temporary Bridge Abutments

Parameters	Amount
Excavation Volume (Import) (CY)	1,600
Excavation Volume (Export) (CY)	0
Total Quantity	**1,600**
Haul Truck Capacity (CY)	10
Total Haul Trucks Required	160
Total Haul Truck Trips (In/Out)	**320**
Daily Haul Amount (CY)	**73**
Total Haul Truck Trips (In/Out) per day	16

Excavation Quantities - SB Road/Bridge

Parameters	Amount		
Excavation Volume (Import) (CY)	12,000	2,400	Total Import Truck Trips
Excavation Volume (Export) (CY)	17,300	3,460	Total Export Truck Trips
Total Quantity	**29,300**	56	Daily Import Truck Trips
Haul Truck Capacity (CY)	10	82	Daily Export Truck Trips
Total Haul Trucks Required	2,930		
Total Haul Truck Trips (In/Out)	**5,860**		
Daily Haul Amount (CY)	**682**		
Total Haul Truck Trips (In/Out) per day	138		

Foundations/Concrete Quantities - NB Bridge

Foundations	Amount
Total Concrete Volume (CY)	3,750
Concrete Truck Capacity (CY)	9
Total Concrete Trucks Required	417
Total Concrete Truck Trips (In/Out	834
Daily Max Concrete Amount (CY)	**25**
Max Concrete Truck Trips (In/Out)	6
Days Needed	139

Foundations/Concrete Quantities - SB Bridge

Foundations	Amount
Total Concrete Volume (CY)	3,750
Concrete Truck Capacity (CY)	9
Total Concrete Trucks Required	417
Total Concrete Truck Trips (In/Out)	834
Daily Max Concrete Amount (CY)	**25**
Max Concrete Truck Trips (In/Out) per Day	6
Days Needed	139

Topanga Lagoon Restoration
Air Quality and Greenhouse Gas Assessment - Construction Assumptions
Off-Road Heavy-Duty Construction Equipment - Maximum

Construction Phase	CalEEMod Phase Type	Heavy-Duty Equipment	No. of Heavy-Duty Equipment	No. of hours/day	Hours of Operation/Week Per Equipment	Emissions Tier Rating (After Mitigation if needed) >100	Notes/Comments
Bridge Construction							
Demolition &Temp Parking Provisions	**Demolition**	Excavator	1	8	40		From Sequencing Report (bridge demo + roadway paving)
		Excavator w/ Hoe Ram	1	8	40		
		Loader	1	8	40		
		Dozer	1	8	40	Tier 4 Final	
		Grader	1	8	40	Tier 4 Final	
		Paver	1	8	40		
		Roller	2	8	40		
Unsuitable Material Replacement	**Grading/Excavation**	Excavator	1	8	40		From Sequencing Report (earthwork)
		Water Truck	1	8	40	Tier 4 Final	
		Loader	1	8	40		
		Dozer	1	8	40	Tier 4 Final	
		Grader	1	8	40	Tier 4 Final	
Relocate Utilities	**Trenching**	Excavator	1	8	40		Assumptions based on previous like-sized project
		Dump Truck	1	8	40		modeled as haul trip outside of CalEEMod
		Loader	1	8	40		
Construct Temporary Road/Bridge	**Grading/Excavation**	Excavator	1	8	40		From Sequencing Report (earthwork)
		Water Truck	1	8	40	Tier 4 Final	
		Loader	1	8	40		
		Dozer	1	8	40	Tier 4 Final	
		Grader	1	8	40	Tier 4 Final	
Construct Temporary Road/Bridge	**Building Construction**	Jackhammer	1	8	40		From Sequencing Report (bridge construction) - modeled as generator
		Heavy Duty Forklift	1	8	40		
		Crane	1	8	40	Tier 4 Final	
		Crawler Tractor	1	8	40		
		Generator	1	8	40		for Jackhammer above
Construct Temporary Road/Bridge	**Paving**	Dozer	1	8	40	Tier 4 Final	From Sequencing Report (roadway paving)
		Grader	1	8	40	Tier 4 Final	
		Paver	1	8	40		
		Roller	1	8	40		
Demolition NB Road/Bridge	**Demolition**	Excavator	1	8	40		From Sequencing Report (bridge demo)
		Excavator w/ Hoe Ram	1	8	40		
		Loader	1	8	40		
Construct NB Road/Bridge	**Grading/Excavation**	Excavator	1	8	40		From Sequencing Report (earthwork)
		Water Truck	1	8	40	Tier 4 Final	
		Loader	1	8	40		
		Dozer	1	8	40	Tier 4 Final	
		Grader	1	8	40	Tier 4 Final	
Construct NB Road/Bridge	**Building Construction**	Jackhammer	1	8	40		From Sequencing Report (bridge construction) - modeled as generator
		Heavy Duty Forklift	1	8	40		
		Crane	1	8	40	Tier 4 Final	
		Crawler Tractor	1	8	40		
		Generator	1	8	40		for Jackhammer above
Construct NB Road/Bridge	**Paving**	Dozer	1	8	40	Tier 4 Final	From Sequencing Report (roadway paving)
		Grader	1	8	40	Tier 4 Final	
		Paver	1	8	40		
		Roller	1	8	40		
Demolition SB Road/Bridge	**Demolition**	Excavator	1	8	40		From Sequencing Report (bridge demo)
		Excavator w/ Hoe Ram	1	8	40		
		Loader	1	8	40		
Construct SB Road/Bridge	**Grading/Excavation**	Excavator	1	8	40		From Sequencing Report (earthwork)
		Water Truck	1	8	40	Tier 4 Final	
		Loader	1	8	40		
		Dozer	1	8	40	Yes	
		Grader	1	8	40	Yes	
Construct SB Road/Bridge	**Building Construction**	Jackhammer	1	8	40		From Sequencing Report (bridge construction) - modeled as generator
		Heavy Duty Forklift	1	8	40		
		Crane	1	8	40	Yes	
		Crawler Tractor	1	8	40		
		Generator	1	8	40		for Jackhammer above
Construct SB Road/Bridge	**Paving**						
		Dozer	1	8	40	Yes	From Sequencing Report (roadway paving)
		Grader	1	8	40	Yes	
		Paver	1	8	40		
		Roller	1	8	40		
Demolition Temporary Bridge	**Demolition**	Excavator	1	8	40		From Sequencing Report (bridge demo)
		Excavator w/ Hoe Ram	1	8	40		
		Loader	1	8	40		
Construct DBH Facilities(Lifeguard HQ/Helipad)	**Building Construction**	Jackhammer	1	8	40		From Sequencing Report (bridge construction) - modeled as generator
		Heavy Duty Forklift	1	8	40		
		Crane	1	8	40	Yes	
		Crawler Tractor	1	8	40		
		Generator	1	8	40		for Jackhammer above
Lagoon Grading	**Grading/Excavation**	Excavator	1	8	40		From Sediment Reuse Report (Option 4)
		Grader	1	8	40	Yes	
		Water Truck	1	8	40	Yes	
Restore Beach Area	**Site Preparation**	Tractors/Loaders/Backhoes	1	8	40		CalEEMod Defaults
		Graders	1	8	40	Yes	
Visitor Services							
	Site Preparation	Tractors/Loaders/Backhoes	1	8	40		CalEEMod Defaults
		Graders	1	8	40	Yes	
	Grading	Graders	1	8	40	Yes	CalEEMod Defaults
		Rubber Tired Dozer	1	8	40	Yes	
		Tractors/Loaders/Backhoes	1	8	40		
	Building Construction	Cranes	1	8	40	Yes	CalEEMod Defaults
		Forklifts	2	8	40		
		Tractors/Loaders/Backhoes	2	8	40		
	Paving	Cement and Mortar Mixers	4	8	40		CalEEMod Defaults
		Pavers	1	8	40		
		Rollers	1	8	40		
		Tractors/Loaders/Backhoes	1	8	40		
	Architectural Coating	Air Compressors	1	8	40		

Topanga Lagoon Restoration
Air Quality and Greenhouse Gas Assessment - Construction Assumptions Opt 2
Off-Road Heavy-Duty Construction Equipment - Maximum

Construction Phase	CalEEMod Phase Type	Heavy-Duty Equipment	No. of Heavy-Duty Equipment	No. of hours/day	Hours of Operation/Week Per Equipment	Emissions Tier Rating (After Mitigation if needed)	Notes/Comments
Seepage Pit	**Grading/Excavation**	Excavator	1	8	40		Assumptions
		Grader	1	8	40	Tier 4 Final	
		Pump	1	8	40		

LandUseSubType	LandUseUnitAmount	LandUseSizeMetric
Other Non-Asphalt Surfaces	8	1000sqft

Construction Equipment/Worker/Vendor Truck Schedule and Assumptions

Construction Phase	CalEEMod Phase Type	Start Date	End Date	Workdays (7 days/week)	Worker Vehicles/Day	Workers Trips (In/Out)/Day	Vendor Trips/Day (In/Out)
Seepage Pit	Grading/Excavation	4/1/2030	10/31/2030	214	20	40	0

Topanga Lagoon Restoration
Air Quality and Greenhouse Gas Assessment - Construction Assumptions Opt 2

LandUseSubType	LandUseUnitAmount	LandUseSizeMetric
Other Non-Asphalt Surfaces	8	1000sqft

Grading Excavation Quantities

Parameters	Amount
Excavation Volume (Export) (CY)	**1,000**
Haul Truck Capacity (CY)	10
Total Haul Trucks Required	100
Total Haul Truck Trips (In/Out)	**200**
Haul Days	**43**
Daily Haul Amount (CY)	**24**
Total Haul Truck Trips (In/Out) per day	6

Construction Haul and Concrete Truck Schedule and Assumptions

Construction Phase	CalEEMod Phase Type	Start Date	End Date	Workdays (5 days/week)	Total Haul (or Concrete) Trips (In/Out)	Total Haul (or Concrete) Trucks/Day	Haul (or Concrete) Trips/Day (In/Out)
Seepage Pit	Grading/Excavation	4/1/2030	10/31/2030	154	200	3	6

Topanga Lagoon Restoration
Air Quality and Greenhouse Gas Assessment - Construction Assumptions Opt 3
Off-Road Heavy-Duty Construction Equipment - Maximum

Construction Phase	CalEEMod Phase Type	Heavy-Duty Equipment	No. of Heavy-Duty Equipment	No. of hours/day	Hours of Operation/Week Per Equipment	Emissions Tier Rating (After Mitigation if needed)	Notes/Comments
Sewer - Option 3	**Demolition**	Excavator	1	8	40		Assumptions based on Option 3
		Excavator w/ Hoe Ram	1	8	40		
		Loader	1	8	40		
Sewer - Option 3	**Grading/Excavation**	Excavator	1	8	40		Assumptions based on Option 3
		Water Truck	1	8	40	Tier 4 Final	
		Loader	1	8	40		
		Dozer	1	8	40	Tier 4 Final	
		Grader	1	8	40	Tier 4 Final	
Sewer - Option 3	**Building Construction**	Jackhammer	1	8	40		Assumptions based on Option 3 - modeled as a gene
		Heavy Duty Forklift	1	8	40		
		Crane	1	8	40	Tier 4 Final	
		Crawler Tractor	1	8	40		
		Generator	1	8	40		for Jackhammer above
Sewer - Option 3	**Paving**	Dozer	1	8	40	Tier 4 Final	Assumptions based on Option 3
		Grader	1	8	40	Tier 4 Final	
		Paver	1	8	40		
		Roller	1	8	40		

Construction Equipment/Worker/Vendor Truck Schedule and Assumptions

LandUseSubType	LandUseUnitAmount	LandUseSizeMetric
Other Asphalt Surfaces	40	1000sqft

Construction Phase	CalEEMod Phase Type	Start Date	End Date	Workdays (7 days/week)	Worker Vehicles/Day	Workers Trips (In/Out)/Day	Vendor Trips/Day (In/Out)
Demolition NB Road/Bridge	Demolition	1/1/2031	2/28/2031	59	20	40	0
Construct NB Road/Bridge	Grading/Excavation	3/1/2031	4/30/2031	61	20	40	0
Construct NB Road/Bridge	Building Construction	5/1/2031	11/30/2031	214	20	40	0
Construct NB Road/Bridge	Paving	12/1/2031	12/31/2031	31	20	40	0

P.2-1 Construction GHG Emissions Summary and Calculations

Topanga Lagoon
Construction Annual GHG

	Metric Tons/Year			
Year	**On-Road Mobile Sources**	**CalEEMod**	**Water + Construction Office**	**Total**
2027	2,392	560	6.96	2,959
2028	434	388	6.66	829
2029	410	308	6.66	725
2030	2,895	261	6.91	3,162
Total	**6,131**	**1,516**	**27**	**7,675**
Wastewater Option 2	54	77	0.35	132
Total with Option 2	**6,185**	**1,594**	**28**	**7,806**
Wastewater Option 3	**101**	**308**	6.66	**415**
Total with Option 3	**6,232**	**1,824**	34	**8,090**
Amortized - 30 years (Maximum)	**208**	**61**	**1**	**270**

Topanga Restoration Lagoon
Construction Energy

Construction Water Energy Estimates

Source	Acreage/Day	Number of Days	Total Construction Water Use (Mgal)	Electricity Demand from Water Conveyance (MWh)	Annual Electricity Demand from Water Conveyance (MWh)
Site Preparation (VS)	0.5	1	0.002	0.0	0.0
Grading (VS)	1.0	4	0.012	0.1	0.0
Demolition (TB)	1.0	60	0.180	1.2	0.3
Grading (TB)	1.0	60	0.180	1.2	0.3
Grading (TB)-TR	1.0	30	0.090	0.6	0.2
Demolition (TB)-TB	0.0	59	0.000	0.0	0.0
Grading (TB)-Lagoon	0.5	214	0.321	2.2	0.5
Site Preparation (TB)	0.5	61	0.092	0.6	0.2
Demolition (Bridge)-NB	0.0	60	0.000	0.0	0.0
Grading (Bridge)-NB	1.0	61	0.183	1.2	0.3
Demolition (Bridge)-SB	0.0	59	0.000	0.0	0.0
Grading (Bridge)-SB	1.0	61	0.183	1.2	0.3
Subtotal - Project			**1.242**	**8.5**	**2.1**
Seepage Pit	**0.5**	**214**	**0.321**	**2.2**	**2.2**
Sewer Connection - Demolition	0.0	59	0.000	0.0	0.0
Sewer Connection - Grading	1.0	61	0.183	1.2	1.2
Subtotal - Option 3			**0.183**	**1.2**	**1.2**
Total			**1.563**	**10.6**	**4.3**

CalEEMod Water Electricity Factors	Electricity Intensity Factor To Supply (kWh/Mgal)	Electricity Intensity Factor To Treat (kWh/Mgal)	Electricity Intensity Factor To Distribute (kWh/Mgal)	Electricity Intensity Factor For Wastewater Treatment (kWh/Mgal)
	3044	725	1537	1501

Construction Water GHG	Electricity Emission (MT CO2e/MWh)	Electricity Emission (lbs CO2e/MWh)
1.68	0.16	348.21

Project	MWh/year	GHG (MT/year)
2027	3.2	0.50
2028	1.2	0.20
2029	1.2	0.20
2030	2.8	0.44
Op2	2.2	0.35
Op3	1.2	0.20

Sources and Assumptions:

CalEEMod Appendix G, Default data tables, G-14 Daily Acres Graded by Equipment Type

-Electricity Intensity Factors - California Emissions Estimator Model (CalEEMod).

-Estimated construction water use assumed to be generally equivalent to landscape irrigation, based on a factor of 20.94 gallons per year per square foot of landscaped area within the Los Angeles area (Mediterranean climate), which assumes high water demand landscaping materials and an irrigation system efficiency of 85%. Factor is therefore (20.94 GAL/SF/year) x (43,560 SF/acre) / (365 days/year) / (0.85) = 2,940 gallons/acre/day, rounded up to 3,000 gallons/acre/day. (U.S. Department of Energy, Energy Efficiency & Renewable Energy, Federal Energy Management Program. "Guidelines for Estimating Unmetered Landscaping Water Use." July 2010. Page 12, Table 4 - Annual Irrigation Factor – Landscaped Areas with High Water Requirements).

MT CO2e/MWh based on CO2, CH4 and N2O factors projected by CalEEMod for utility provider for year 2027

Topanga Restoration Lagoon
Construction Energy Analysis

Temporary Construction Trailer - Electricity

Land Use	Square Feet	Energy Use per year (kWh)	Total Energy Use (kWh)	GHG Emissions/year (MTCO2e)	Total GHG Emissions for Construction Duration	Energy Use per SF	
General Office	2,000	40,936	163,745	6.5	25.9	20.5	Option 1 (Includes O
General Office	2,000	40,936	40,936	6.5	6.5	20.5	Option 3
Note: CalEEMod 2022.1 used to estimate energy use for temporary construction office							
Note: Energy use per sf is derived from CalEEMod User Guide, Appendix G, Table G-28 for the Statewide average for General Office Building land use							

P.3-1 Project Construction GHG Mobile Emissions

Topanga Canyon - Temporary Bridge
Total Emissions

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Idling per Day (minutes)	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10 Dust	PM10 Exh	Total PM10	PM2.5 Dust	PM2.5 Exh	Total PM2.5	(MT/yr) Total CO2e
Demolition &Temp Parking Provisions	2027	Export	SCAB													
Total Haul Trips	2,162															
Hauling	52	42	8	77	15	0.25	15.54	6.08	0.12	3.70	0.20	3.91	0.99	0.19	1.18	263.27
Vendor	0	60	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	18.5	0	0.12	0.12	1.74	0.00	0.52	0.00	0.52	0.13	0.00	0.13	12.90
					Total	0.36	15.66	7.81	0.13	4.22	0.20	4.43	1.12	0.20	1.31	276.16
Unsuitable Material Replacement	2027	Export	SCAB		Workers+Vendors	0.12	0.12	1.74	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	5,200															
Hauling	124	42	8	77	15	0.59	37.05	14.49	0.29	8.83	0.48	9.31	2.36	0.46	2.82	633.20
Vendor	0	60	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	18.5	0	0.12	0.12	1.74	0.00	0.52	0.00	0.52	0.13	0.00	0.13	12.90
					Total	0.70	37.17	16.23	0.29	9.35	0.48	9.83	2.49	0.46	2.95	646.10
Relocate Utilities	2027				Workers+Vendors	0.12	0.12	1.74	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	260															
Hauling	2	130	8	36.5	15	0.01	0.32	0.15	0.00	0.07	0.00	0.07	0.02	0.00	0.02	15.41
Vendor	0	182	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	182	8	18.5	0	0.12	0.12	1.74	0.00	0.52	0.00	0.52	0.13	0.00	0.13	39.12
					Total	0.12	0.44	1.89	0.01	0.58	0.01	0.59	0.15	0.01	0.15	54.53
Construct Temporary Road/Bridge	2027	Grading/Excavation			Workers+Vendors	0.12	0.12	1.74	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	320															
Hauling	16	22	8	36.5	15	0.06	2.56	1.22	0.02	0.54	0.03	0.57	0.14	0.03	0.17	18.97
Vendor	0	30	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	30	8	18.5	0	0.12	0.12	1.74	0.00	0.52	0.00	0.52	0.13	0.00	0.13	6.45
					Total	0.17	2.69	2.96	0.02	1.06	0.03	1.09	0.27	0.03	0.30	25.41
Construct Temporary Road/Bridge	2027	Building Construction			Workers+Vendors	0.12	0.12	1.74	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	208															
Hauling	4	88	8	36.5	15	0.01	0.64	0.31	0.00	0.14	0.01	0.14	0.04	0.01	0.04	12.33
Vendor	0	124	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	124	8	18.5	0	0.12	0.12	1.74	0.00	0.52	0.00	0.52	0.13	0.00	0.13	26.65
					Total	0.13	0.76	2.04	0.01	0.65	0.01	0.66	0.16	0.01	0.17	38.98
Construct Temporary Road/Bridge	2027	Paving			Workers+Vendors	0.12	0.12	1.74	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	0															
Hauling	0	44	8	36.5	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	60	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	18.5	0	0.12	0.12	1.74	0.00	0.52	0.00	0.52	0.13	0.00	0.13	12.90
					Total	0.12	0.12	1.74	0.00	0.52	0.00	0.52	0.13	0.00	0.13	12.90
Demolition Temporary Bridge	2030				Workers+Vendors	0.12	0.12	1.74	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	0															
Hauling	0	43	8	36.5	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	59	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	18.5	0	0.10	0.10	1.47	0.00	0.52	0.00	0.52	0.13	0.00	0.13	11.91
					Total	0.10	0.10	1.47	0.00	0.52	0.00	0.52	0.13	0.00	0.13	11.91
Construct DBH Facilities(Lifeguard HQ/Helipad)	2030				Workers+Vendors	0.10	0.10	1.47	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	0															
Hauling	0	21	8	36.5	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0	0.10	0.10	1.47	0.00	0.52	0.00	0.52	0.13	0.00	0.13	6.26
					Total	0.10	0.10	1.47	0.00	0.52	0.00	0.52	0.13	0.00	0.13	6.26
Lagoon Grading	2030				Workers+Vendors	0.10	0.10	1.47	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	51,200															
Hauling	502	102	8	36.5	15	1.70	72.19	35.91	0.53	16.96	0.89	17.85	4.53	0.85	5.38	2820.96
Vendor	0	214	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0	0.10	0.10	1.47	0.00	0.52	0.00	0.52	0.13	0.00	0.13	43.18
					Total	1.80	72.28	37.37	0.53	17.48	0.89	18.37	4.66	0.85	5.51	2864.15
Restore Beach Area	2030				Workers+Vendors	0.10	0.10	1.47	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	0															
Hauling	0	43	8	36.5	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	61	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0	0.10	0.10	1.47	0.00	0.52	0.00	0.52	0.13	0.00	0.13	12.31
					Total	0.10	0.10	1.47	0.00	0.52	0.00	0.52	0.13	0.00	0.13	12.31
Unsuitable Material Replacement	2027	Export	SJVAB		Workers+Vendors	0.10	0.10	1.47	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	5200															
Hauling	124	42	8	106	15	0.69	49.36	18.10	0.39	12.16	0.66	12.82	3.24	0.63	3.88	865.92
Vendor	0	60	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	60	8	18.5	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
					Total	0.69	49.36	18.10	0.39	12.16	0.66	12.82	3.24	0.63	3.88	865.92
Unsuitable Material Replacement	2027	Import			Workers+Vendors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Total Haul Trips	2520															
Hauling	60	42	8	20	15	0.19	6.21	3.58	0.04	1.11	0.06	1.17	0.30	0.06	0.35	85.19
Vendor	0	60	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	60	8	18.5	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
					Total	0.19	6.21	3.58	0.04	1.11	0.06	1.17	0.30	0.06	0.35	85.19
Demolition &Temp Parking Provisions	2027	Export	SJVAB		Workers+Vendors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Total Haul Trips	2,162															
Hauling	52	42	8	106	15	0.29	20.70	7.59	0.17	5.10	0.28	5.38	1.36	0.27	1.63	360.02
Vendor	0	60	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	60	8	18.5	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
					Total	0.29	20.70	7.59	0.17	5.10	0.28	5.38	1.36	0.27	1.63	360.02
					Workers+Vendors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

Topanga Canyon - Temporary Bridge
Running Emissions

		Running Emissions Factor (grams/mile)						Running Emissions Factor (grams/mile)		
		ROG_RUNEX	NOx_RUNEX	CO_RUNEX	SOx_RUNEX	PM10_RUNEX	PM2.5_RUNEX	CO2_RUNEX	CH4_RUNEX	N2O_RUNEX
2027	2027Hauling Hauling	0.013128	1.553518611	0.45473657	0.01336714	0.02273486	0.02174732	1471.80075	0.0608523	0.23462364
2027	2027Vendor Vendor	0.01570588	1.102331968	0.36327753	0.01214871	0.01475662	0.01411185	1311.1435	0.03509759	0.18307889
2027	2027Worker Worker	0.01447264	0.062492418	0.90233334	0.00281062	0.00150729	0.0013867	284.320587	0.00354266	0.00566149
2028	2028Hauling Hauling	0.01261339	1.493718015	0.43877031	0.01305596	0.02247317	0.02149714	1438.29866	0.05768159	0.22931835
2028	2028Vendor Vendor	0.01417298	1.038868065	0.3360531	0.01185313	0.01426835	0.01364491	1280.01295	0.03342244	0.17922194
2028	2028Worker Worker	0.01314756	0.057035459	0.85167037	0.00274948	0.00140448	0.00129194	278.134904	0.00325313	0.00533773
2029	2029Hauling Hauling	0.01213472	1.434866903	0.4224926	0.01273534	0.0221686	0.0212059	1403.60667	0.05465536	0.22381566
2029	2029Vendor Vendor	0.0128196	0.978781777	0.31101237	0.01152628	0.01380314	0.01320005	1245.46404	0.03180989	0.17489835
2029	2029Worker Worker	0.01192021	0.051957034	0.80464317	0.00269297	0.00130724	0.00120239	272.417637	0.00298654	0.00503952
2030	2030Hauling Hauling	0.01169729	1.381905725	0.40596438	0.01241489	0.02183595	0.02088778	1368.72007	0.05170538	0.2182712
2030	2030Vendor Vendor	0.01168751	0.9252091	0.28941545	0.01117412	0.01336285	0.01277903	1208.11234	0.03023265	0.17022289
2030	2030Worker Worker	0.01081241	0.047255061	0.76242747	0.00264062	0.00121547	0.00111789	267.121939	0.00274623	0.00476556
2031	2031Hauling Hauling	0.01126827	1.331771303	0.38663416	0.01209496	0.02148002	0.02054741	1333.31591	0.04842446	0.21262163
2031	2031Vendor Vendor	0.01070694	0.874998281	0.26868024	0.01079467	0.01293916	0.01237394	1167.57711	0.02847022	0.16520071
2031	2031Worker Worker	0.00977403	0.042746598	0.72305591	0.00259298	0.00112929	0.00103861	262.302837	0.0025216	0.00450761
0	GWP	N/A	N/A	N/A	N/A	N/A	N/A	1	25	298

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day)						Regional Emissions (MT/year)			
					ROG	NOX	CO	SO2	PM10	PM2.5	CO2	CH4	N2O	CO2e
Demolition &Temp Parking	2027													
Total Haul Trips	2162													
Hauling	52	42	8	77	0.12	13.71	4.01	0.12	0.20	0.19	245.02	0.25	11.64	256.91
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	18.5	0.02	0.10	1.47	0.00	0.00	0.00	12.62	0.00	0.07	12.70
Unsuitable Material Replac	2027													
Total Haul Trips	5200													
Hauling	124	42	8	77	0.28	32.70	9.57	0.28	0.48	0.46	589.31	0.61	28.00	617.91
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	18.5	0.02	0.10	1.47	0.00	0.00	0.00	12.62	0.00	0.07	12.70
Relocate Utilities	2027													
Total Haul Trips	260													
Hauling	2	130	8	36.5	0.00	0.25	0.07	0.00	0.00	0.00	13.97	0.01	0.66	14.65
Vendor	0	182	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	182	8	18.5	0.02	0.10	1.47	0.00	0.00	0.00	38.29	0.01	0.23	38.53
Construct Temporary Road/	2027													
Total Haul Trips	320													
Hauling	16	22	8	36.5	0.02	2.00	0.59	0.02	0.03	0.03	17.19	0.02	0.82	18.03
Vendor	0	30	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	30	8	18.5	0.02	0.10	1.47	0.00	0.00	0.00	6.31	0.00	0.04	6.35
Construct Temporary Road/	2027													
Total Haul Trips	208													
Hauling	4	88	8	36.5	0.00	0.50	0.15	0.00	0.01	0.01	11.17	0.01	0.53	11.72
Vendor	0	124	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	124	8	18.5	0.02	0.10	1.47	0.00	0.00	0.00	26.09	0.01	0.15	26.25
Construct Temporary Road/	2027													
Total Haul Trips	0													
Hauling	0	44	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	18.5	0.02	0.10	1.47	0.00	0.00	0.00	12.62	0.00	0.07	12.70
Demolition Temporary Brid	2030													
Total Haul Trips	0													
Hauling	0	43	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	59	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	18.5	0.02	0.08	1.24	0.00	0.00	0.00	11.66	0.00	0.06	11.73
Construct DBH Facilities(Life	2030													
Total Haul Trips	0													
Hauling	0	21	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0.02	0.08	1.24	0.00	0.00	0.00	6.13	0.00	0.03	6.16
Lagoon Grading	2030													
Total Haul Trips	51200													
Hauling	502	102	8	36.5	0.47	55.82	16.40	0.50	0.88	0.84	2557.86	2.42	121.56	2681.84
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.02	0.08	1.24	0.00	0.00	0.00	42.30	0.01	0.22	42.54
Restore Beach Area	2030													
Total Haul Trips	0													
Hauling	0	43	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0.02	0.08	1.24	0.00	0.00	0.00	12.06	0.00	0.06	12.13
Unsuitable Material Replac	2027													
Total Haul Trips	5200													
Hauling	124	42	8	106	0.38	45.02	13.18	0.39	0.66	0.63	811.26	0.84	38.54	850.63
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	60	8	18.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Unsuitable Material Replac	2027													
Total Haul Trips	2520													
Hauling	60	42	8	20	0.03	4.11	1.20	0.04	0.06	0.06	74.18	0.08	3.52	77.78
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	60	8	18.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Demolition &Temp Parking	2027													
Total Haul Trips	2162													
Hauling	52	42	8	106	0.16	18.88	5.53	0.16	0.28	0.26	337.30	0.35	16.02	353.67
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	60	8	18.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Topanga Canyon - Temporary Bridge
Start Emissions

		Start Emissions Factor (grams/trip)						Start Emissions Factor (grams/trip)		
		ROG_STREX	NOX_STREX	CO_STREX	SOx_STREX	PM10_STREX	PM2.5_STREX	CO2_STREX	CH4_STREX	N2O_STREX
2027	2027Hauling Hauling	0.00060894	2.672142352	0.00302137	3.16557E-07	5.30481E-07	4.87758E-07	0.03202066	7.5498E-08	7.36611E-06
2027	2027Vendor Vendor	0.080213538	1.961946447	0.60365405	5.50826E-05	6.07836E-05	5.58883E-05	5.57177064	0.005494835	0.004037678
2027	2027Worker Worker	1.038950633	0.251050817	3.01934346	0.000691936	0.002053348	0.001887978	69.9913431	0.06616369	0.030829475
2028	2028Hauling Hauling	0.000490696	2.636914961	0.00257595	2.71845E-07	4.29594E-07	3.94995E-07	0.02749789	6.56178E-08	5.97594E-06
2028	2028Vendor Vendor	0.075419112	1.927915654	0.55968909	5.22383E-05	5.76932E-05	5.30468E-05	5.28405692	0.005169504	0.003780947
2028	2028Worker Worker	0.997046953	0.239560346	2.85187017	0.000675557	0.001941969	0.001785569	68.3345653	0.062483886	0.030029939
2029	2029Hauling Hauling	0.000383539	2.591170334	0.00214107	2.33546E-07	3.28727E-07	3.02252E-07	0.02362391	5.62127E-08	4.65545E-06
2029	2029Vendor Vendor	0.069289941	1.883995908	0.51714657	4.94212E-05	5.46034E-05	5.02058E-05	4.99909929	0.004852786	0.003548842
2029	2029Worker Worker	0.945798618	0.229251267	2.69630558	0.000660221	0.001832244	0.00168468	66.7833	0.059077063	0.029313823
2030	2030Hauling Hauling	0.00027279	2.546881303	0.00161285	1.92445E-07	2.06187E-07	1.89581E-07	0.01946637	4.71315E-08	4.0595E-06
2030	2030Vendor Vendor	0.063656597	1.839529651	0.47865041	4.67001E-05	5.18671E-05	4.76899E-05	4.72385215	0.004565454	0.003322989
2030	2030Worker Worker	0.901632052	0.219772527	2.55165593	0.00064583	0.001725708	0.001586724	65.3276344	0.055883281	0.028658371
2031	2031Hauling Hauling	0.000210057	2.503276097	0.00139863	1.66951E-07	1.58801E-07	1.46012E-07	0.01688763	4.13015E-08	2.64568E-06
2031	2031Vendor Vendor	0.059141215	1.792713918	0.44197461	4.38654E-05	4.91716E-05	4.52115E-05	4.43711805	0.004280254	0.003105544
2031	2031Worker Worker	0.857879142	0.211029605	2.41545051	0.000632455	0.001621689	0.001491083	63.974738	0.052892816	0.028060877
	GWP		N/A					1	25	298

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10	PM2.5	Regional Emissions (MT/year) CO2	CH4	N2O	CO2e
Demolition &Temp Parking	2027													
Total Haul Trips	2162													
Hauling	52	42	8	77	0.00	0.31	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.16
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	18.5	0.09	0.02	0.27	0.00	0.00	0.00	0.17	0.00	0.00	0.19
Unsuitable Material Replac	2027													
Total Haul Trips	5200													
Hauling	124	42	8	77	0.00	0.73	0.00	0.00	0.00	0.00	0.37	0.00	0.00	0.39
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	18.5	0.09	0.02	0.27	0.00	0.00	0.00	0.17	0.00	0.00	0.19
Relocate Utilities	2027													
Total Haul Trips	260													
Hauling	2	130	8	36.5	0.00	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.02
Vendor	0	182	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	182	8	18.5	0.09	0.02	0.27	0.00	0.00	0.00	0.51	0.00	0.00	0.59
Construct Temporary Road/	2027													
Total Haul Trips	320													
Hauling	16	22	8	36.5	0.00	0.09	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.02
Vendor	0	30	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	30	8	18.5	0.09	0.02	0.27	0.00	0.00	0.00	0.08	0.00	0.00	0.10
Construct Temporary Road/	2027													
Total Haul Trips	208													
Hauling	4	88	8	36.5	0.00	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02
Vendor	0	124	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	124	8	18.5	0.09	0.02	0.27	0.00	0.00	0.00	0.35	0.00	0.00	0.40
Construct Temporary Road/	2027													
Total Haul Trips	0													
Hauling	0	44	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	18.5	0.09	0.02	0.27	0.00	0.00	0.00	0.17	0.00	0.00	0.19
Demolition Temporary Brid	2030													
Total Haul Trips	0													
Hauling	0	43	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	59	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	18.5	0.08	0.02	0.23	0.00	0.00	0.00	0.15	0.00	0.00	0.18
Construct DBH Facilities(Life	2030													
Total Haul Trips	0													
Hauling	0	21	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0.08	0.02	0.23	0.00	0.00	0.00	0.08	0.00	0.00	0.09
Lagoon Grading	2030													
Total Haul Trips	51200													
Hauling	502	102	8	36.5	0.00	2.82	0.00	0.00	0.00	0.00	2.20	0.00	0.00	2.33
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.08	0.02	0.23	0.00	0.00	0.00	0.56	0.00	0.00	0.64
Restore Beach Area	2030													
Total Haul Trips	0													
Hauling	0	43	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0.08	0.02	0.23	0.00	0.00	0.00	0.16	0.00	0.00	0.18
Unsuitable Material Replac	2027													
Total Haul Trips	5200													
Hauling	124	42	8	106	0.00	0.73	0.00	0.00	0.00	0.00	0.37	0.00	0.00	0.39
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	60	8	18.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Unsuitable Material Replac	2027													
Total Haul Trips	2520													
Hauling	60	42	8	20	0.00	0.35	0.00	0.00	0.00	0.00	0.18	0.00	0.00	0.19
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	60	8	18.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Demolition &Temp Parking	2027													
Total Haul Trips	2162													
Hauling	52	42	8	106	0.00	0.31	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.16
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	60	8	18.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Topanga Canyon - Temporary Bridge
Idling Emissions

		Idling Emissions Factor (grams/minute)						Idling Emissions Factor (grams/minute)		
		ROG_IDLEX	NOx_IDLEX	CO_IDLEX	SOx_IDLEX	PM10_IDLEX	PM2.5_IDLEX	CO2_IDLEX	CH4_IDLEX	N2O_IDLEX
2027	2027Hauling Hauling	0.07592279	0.881696127	1.19921987	0.00159973	0.00047074	0.00044926	181.442358	0.03427011	0.02916541
2027	2027Vendor Vendor	0.05529965	0.899602458	1.04932075	0.00167506	0.00086494	0.00082645	186.589554	0.03155173	0.02918792
2027	2027Worker Worker	0	0	0	0	0	0	0	0	0
2028	2028Hauling Hauling	0.07529788	0.857767875	1.19214339	0.00156045	0.00045204	0.00043133	177.300744	0.03377364	0.02851321
2028	2028Vendor Vendor	0.05432839	0.863093228	1.0395891	0.00163993	0.00074988	0.00071632	182.978932	0.03134729	0.02865517
2028	2028Worker Worker	0	0	0	0	0	0	0	0	0
2029	2029Hauling Hauling	0.07461794	0.835480721	1.18399992	0.00152188	0.00043143	0.00041158	173.194944	0.03323976	0.02786481
2029	2029Vendor Vendor	0.05333308	0.827999465	1.02749811	0.0016013	0.00065239	0.00062302	178.951612	0.03104801	0.02805443
2029	2029Worker Worker	0	0	0	0	0	0	0	0	0
2030	2030Hauling Hauling	0.07391144	0.816007794	1.17493744	0.0014846	0.00041331	0.00039421	169.186161	0.03269373	0.0272299
2030	2030Vendor Vendor	0.05232472	0.795299763	1.01321823	0.00155966	0.00057171	0.0005458	174.561724	0.03067462	0.02739395
2030	2030Worker Worker	0	0	0	0	0	0	0	0	0
2031	2031Hauling Hauling	0.0732853	0.799579641	1.1664382	0.00145061	0.00039768	0.00037924	165.457521	0.03205186	0.02663599
2031	2031Vendor Vendor	0.05130878	0.763402339	0.99683404	0.00151522	0.00050437	0.00048136	169.805962	0.03011968	0.02667472
2031	2031Worker Worker	0	0	0	0	0	0	0	0	0
	GWP	N/A	N/A	N/A	N/A	N/A	N/A	1	25	298

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	Idling minutes per Day	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10	PM2.5	Regional Emissions (MT/year) CO2	CH4	N2O	CO2e
Demolition &Temp Parking	2027													
Total Haul Trips	2162													
Hauling	52	42	8	15	0.13	1.52	2.06	0.00	0.00	0.00	5.88	0.03	0.28	6.19
Vendor	0	60	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Unsuitable Material Replac	2027													
Total Haul Trips	5200													
Hauling	124	42	8	15	0.31	3.62	4.92	0.01	0.00	0.00	14.15	0.07	0.68	14.90
Vendor	0	60	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Relocate Utilities	2027													
Total Haul Trips	260													
Hauling	2	130	8	15	0.01	0.06	0.08	0.00	0.00	0.00	0.71	0.00	0.03	0.74
Vendor	0	182	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	182	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct Temporary Road/	2027													
Total Haul Trips	320													
Hauling	16	22	8	15	0.04	0.47	0.63	0.00	0.00	0.00	0.87	0.00	0.04	0.92
Vendor	0	30	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	30	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct Temporary Road/	2027													
Total Haul Trips	208													
Hauling	4	88	8	15	0.01	0.12	0.16	0.00	0.00	0.00	0.57	0.00	0.03	0.60
Vendor	0	124	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	124	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct Temporary Road/	2027													
Total Haul Trips	0													
Hauling	0	44	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	60	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Demolition Temporary Brid	2030													
Total Haul Trips	0													
Hauling	0	43	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	59	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct DBH Facilities(Life	2030													
Total Haul Trips	0													
Hauling	0	21	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lagoon Grading	2030													
Total Haul Trips	51200													
Hauling	502	102	8	15	1.23	13.55	19.50	0.02	0.01	0.01	129.93	0.63	6.23	136.79
Vendor	0	214	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Restore Beach Area	2030													
Total Haul Trips	0													
Hauling	0	43	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	61	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Unsuitable Material Replac	2027													
Total Haul Trips	5200													
Hauling	124	42	8	15	0.31	3.62	4.92	0.01	0.00	0.00	14.15	0.07	0.68	14.90
Vendor	0	60	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	60	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Unsuitable Material Replac	2027													
Total Haul Trips	2520													
Hauling	60	42	8	15	0.15	1.75	2.38	0.00	0.00	0.00	6.86	0.03	0.33	7.22
Vendor	0	60	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	60	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Demolition &Temp Parking	2027													
Total Haul Trips	2162													
Hauling	52	42	8	15	0.13	1.52	2.06	0.00	0.00	0.00	5.88	0.03	0.28	6.19
Vendor	0	60	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	60	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Topanga Canyon - Temporary Bridge
Road Dust, Break Wear, and Tire wear Emissions

		Emission Factors (grams/mile)					
		PM10			PM2.5		
		RD	PM10_PMBW	PM10_PMTW	RD	PM2.5_PMBW	PM2.5_PMTW
2027	2027Hauling Hauling	0.29984991	0.084297987	0.03545106	0.07359952	0.0295043	0.00886277
2027	2027Vendor Vendor	0.29984991	0.063623189	0.02372553	0.07359952	0.02226812	0.00593138
2027	2027Worker Worker	0.29984991	0.009305649	0.008	0.07359952	0.00325698	0.002
2028	2028Hauling Hauling	0.29984991	0.084486989	0.03545475	0.07359952	0.02957045	0.00886369
2028	2028Vendor Vendor	0.29984991	0.063544145	0.02372738	0.07359952	0.02224045	0.00593184
2028	2028Worker Worker	0.29984991	0.009284129	0.008	0.07359952	0.00324945	0.002
2029	2029Hauling Hauling	0.29984991	0.084584422	0.03545835	0.07359952	0.02960455	0.00886459
2029	2029Vendor Vendor	0.29984991	0.063359545	0.02372918	0.07359952	0.02217584	0.00593229
2029	2029Worker Worker	0.29984991	0.00926272	0.008	0.07359952	0.00324195	0.002
2030	2030Hauling Hauling	0.29984991	0.08460378	0.03546191	0.07359952	0.02961132	0.00886548
2030	2030Vendor Vendor	0.29984991	0.063078834	0.02373095	0.07359952	0.02207759	0.00593274
2030	2030Worker Worker	0.29984991	0.00924132	0.008	0.07359952	0.00323446	0.002
2031	2031Hauling Hauling	0.29984991	0.084504548	0.03546578	0.07359952	0.02957659	0.00886644
2031	2031Vendor Vendor	0.29984991	0.062682863	0.02373289	0.07359952	0.021939	0.00593322
2031	2031Worker Worker	0.29984991	0.009221285	0.008	0.07359952	0.00322745	0.002

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day) PM10 RD	PM10 BW	PM10 TW	PM2.5 RD	PM2.5 BW	PM2.5 TW
Demolition &Temp Parking	2027									
Total Haul Trips	2162									
Hauling	52	42	8	77	2.65	0.74	0.31	0.65	0.26	0.08
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Unsuitable Material Replac	2027									
Total Haul Trips	5200									
Hauling	124	42	8	77	6.31	1.77	0.75	1.55	0.62	0.19
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Relocate Utilities	2027									
Total Haul Trips	260									
Hauling	2	130	8	36.5	0.05	0.01	0.01	0.01	0.00	0.00
Vendor	0	182	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	182	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Construct Temporary Road/	2027									
Total Haul Trips	320									
Hauling	16	22	8	36.5	0.39	0.11	0.05	0.09	0.04	0.01
Vendor	0	30	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	30	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Construct Temporary Road/	2027									
Total Haul Trips	208									
Hauling	4	88	8	36.5	0.10	0.03	0.01	0.02	0.01	0.00
Vendor	0	124	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	124	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Construct Temporary Road/	2027									
Total Haul Trips	0									
Hauling	0	44	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Demolition Temporary Brid	2030									
Total Haul Trips	0									
Hauling	0	43	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	59	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Construct DBH Facilities(Life	2030									
Total Haul Trips	0									
Hauling	0	21	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Lagoon Grading	2030									
Total Haul Trips	51200									
Hauling	502	102	8	36.5	12.11	3.42	1.43	2.97	1.20	0.36
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Restore Beach Area	2030									
Total Haul Trips	0									
Hauling	0	43	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Unsuitable Material Replac	2027									
Total Haul Trips	5200									
Hauling	124	42	8	106	8.69	2.44	1.03	2.13	0.85	0.26
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	60	8	18.5	0.00	0.00	0.00	0.00	0.00	0.00
Unsuitable Material Replac	2027									
Total Haul Trips	2520									
Hauling	60	42	8	20	0.79	0.22	0.09	0.19	0.08	0.02
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	60	8	18.5	0.00	0.00	0.00	0.00	0.00	0.00
Demolition &Temp Parking	2027									
Total Haul Trips	2162									
Hauling	52	42	8	106	3.64	1.02	0.43	0.89	0.36	0.11
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	60	8	18.5	0.00	0.00	0.00	0.00	0.00	0.00

Topanga Canyon - Temporary Bridge
Road Dust

Paved Road Dust Emission Factors (Assumes No Precipitation)

Formula: $EF_{Dust,P} = (k\ (sL)^{0.91} \times (W)^{1.02})$

Where:

- $EF_{Dust,P}$ = Paved Road Dust Emission Factor (having the same units as k)
- k = particle size multiplier
- sL = road surface silt loading (g/m^2)
- W = average fleet vehicle weight (tons) (CARB uses 2.4 tons as a fleet average vehicle weight factor)

	Emission Factor (grams per VMT)	
	PM10	PM2.5
k	0.9979	0.2449
sL	0.1	0.1
W	2.4	2.4
$EF_{Dust,P}$	3.00E-01	7.36E-02

Unpaved Road Dust Emission Factors (Assumes No Precipitation)

Formula: $EF_{Dust,U} = (k\ (\ s / 12)^{1} \times (Sp / 30)^{0.5} / (M / 0.5)^{0.2}) - C)$

Where:

- $EF_{Dust,U}$ = Unpaved Road Dust Emission Factor (having the same units as k)
- k = particle size multiplier
- s = surface material silt content (%)
- Sp = mean vehicle speed (mph)
- M = surface material moisture content (%)
- C = Emission Factor for 1980s vehicle fleet exhaust, brake wear, and tire wear

	Emission Factor (grams per VMT)	
	PM10	PM2.5
k	816.47	81.65
s	4.3%	4.3%
Sp	15	15
M	0.5%	0.5%
C	0.00047	0.00036
$EF_{Dust,U}$	5.20E+00	5.19E-01

Sources:

SCAQMD, CalEEMod, Version 2022.1.
CARB, *Entrained Dust from Paved Road Travel: Emission Estimation Methodology Background Document* , (1997).
USEPA, *AP-42* , Fifth Edition, Volume I, Chapter 13.2.1 - Paved Roads, (2011).
ESA, 2023.

Topanga Canyon - NB/SB Bridge
Total Emissions

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Idling per Day (minutes)	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10 Dust	PM10 Exh	Total PM10	PM2.5 Dust	PM2.5 Exh	Total PM2.5	(MT/yr) Total CO2e
Demolition NB Road/Bridge	2028															
Total Haul Trips	270															
Hauling	8	42	8	36.5	15	0.03	1.24	0.60	0.01	0.27	0.01	0.28	0.07	0.01	0.09	15.64
Vendor	0	60	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	18.5	0	0.11	0.11	1.64	0.00	0.52	0.00	0.52	0.13	0.00	0.13	12.61
					Total	0.14	1.35	2.24	0.01	0.79	0.02	0.80	0.20	0.02	0.22	28.25
Construct NB Road/Bridge	2028	Grading/Excavation		Export	Workers+Ver	0.11	0.11	1.64	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	3,700															
Hauling	86	43	8	36.5	15	0.30	13.28	6.43	0.09	2.91	0.16	3.06	0.78	0.15	0.93	214.26
Vendor	0	61	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0	0.11	0.11	1.64	0.00	0.52	0.00	0.52	0.13	0.00	0.13	12.82
					Total	0.41	13.39	8.07	0.10	3.42	0.16	3.58	0.90	0.15	1.06	227.09
Construct NB Road/Bridge	2028	Building Construction			Workers+Ver	0.11	0.11	1.64	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	834															
Hauling	6	154	8	36.5	15	0.02	0.93	0.45	0.01	0.20	0.01	0.21	0.05	0.01	0.06	48.30
Vendor	0	214	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0	0.11	0.11	1.64	0.00	0.52	0.00	0.52	0.13	0.00	0.13	44.99
					Total	0.13	1.04	2.09	0.01	0.72	0.01	0.73	0.18	0.01	0.20	93.28
Construct NB Road/Bridge	2028	Paving			Workers+Ver	0.11	0.11	1.64	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	0															
Hauling	0	21	8	36.5	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0	0.11	0.11	1.64	0.00	0.52	0.00	0.52	0.13	0.00	0.13	6.52
					Total	0.11	0.11	1.64	0.00	0.52	0.00	0.52	0.13	0.00	0.13	6.52
Demolition SB Road/Bridge	2029				Workers+Ver	0.11	0.11	1.64	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	270															
Hauling	8	43	8	36.5	15	0.03	1.19	0.59	0.01	0.27	0.01	0.28	0.07	0.01	0.09	15.26
Vendor	0	59	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	18.5	0	0.10	0.10	1.55	0.00	0.52	0.00	0.52	0.13	0.00	0.13	12.14
					Total	0.13	1.30	2.14	0.01	0.79	0.02	0.80	0.20	0.02	0.22	27.40
Construct SB Road/Bridge	2029	Grading/Excavation		Export	Workers+Ver	0.10	0.10	1.55	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	3,460															
Hauling	82	43	8	36.5	15	0.28	12.20	6.00	0.09	2.77	0.15	2.92	0.74	0.14	0.88	195.51
Vendor	0	61	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0	0.10	0.10	1.55	0.00	0.52	0.00	0.52	0.13	0.00	0.13	12.56
					Total	0.39	12.31	7.55	0.09	3.29	0.15	3.44	0.87	0.14	1.01	208.07
Construct SB Road/Bridge	2029	Building Construction			Workers+Ver	0.10	0.10	1.55	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	834															
Hauling	6	154	8	36.5	15	0.02	0.89	0.44	0.01	0.20	0.01	0.21	0.05	0.01	0.06	47.13
Vendor	0	214	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0	0.10	0.10	1.55	0.00	0.52	0.00	0.52	0.13	0.00	0.13	44.05
					Total	0.12	1.00	1.99	0.01	0.72	0.01	0.73	0.18	0.01	0.20	91.17
Construct SB Road/Bridge	2029	Paving			Workers+Ver	0.10	0.10	1.55	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	0															
Hauling	0	21	8	36.5	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0	0.10	0.10	1.55	0.00	0.52	0.00	0.52	0.13	0.00	0.13	6.38
					Total	0.10	0.10	1.55	0.00	0.52	0.00	0.52	0.13	0.00	0.13	6.38
Construct NB Road/Bridge	2028	Grading/Excavation		Import	Workers+Ver	0.10	0.10	1.55	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	2,400															
Hauling	56	43	8	20	15	0.17	5.60	3.29	0.04	1.04	0.06	1.09	0.28	0.05	0.33	79.26
Vendor	0	61	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	61	8	18.5	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
					Total	0.17	5.60	3.29	0.04	1.04	0.06	1.09	0.28	0.05	0.33	79.26
Construct SB Road/Bridge	2029	Grading/Excavation		Import	Workers+Ver	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Total Haul Trips	2400															
Hauling	56	43	8	20	15	0.17	5.41	3.24	0.03	1.04	0.06	1.09	0.28	0.05	0.33	77.34
Vendor	0	61	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	61	8	18.5	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
					Total	0.17	5.41	3.24	0.03	1.04	0.06	1.09	0.28	0.05	0.33	77.34
					Workers+Ver	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

Topanga Canyon - NB/SB Bridge
Running Emissions

		Running Emissions Factor (grams/mile)						Running Emissions Factor (grams/mile)		
		ROG_RUNEX	NOx_RUNEX	CO_RUNEX	SOx_RUNEX	PM10_RUNEX	PM2.5_RUNEX	CO2_RUNEX	CH4_RUNEX	N2O_RUNEX
2027	2027Hauling Hauling	0.013128	1.553518611	0.45473657	0.01336714	0.02273486	0.02174732	1471.80075	0.0608523	0.23462364
2027	2027Vendor Vendor	0.01570588	1.102331968	0.36327753	0.01214871	0.01475662	0.01411185	1311.1435	0.03509759	0.18307889
2027	2027Worker Worker	0.01447264	0.062492418	0.90233334	0.00281062	0.00150729	0.0013867	284.320587	0.00354266	0.00566149
2028	2028Hauling Hauling	0.01261339	1.493718015	0.43877031	0.01305596	0.02247317	0.02149714	1438.29866	0.05768159	0.22931835
2028	2028Vendor Vendor	0.01417298	1.038868065	0.3360531	0.01185313	0.01426835	0.01364491	1280.01295	0.03342244	0.17922194
2028	2028Worker Worker	0.01314756	0.057035459	0.85167037	0.00274948	0.00140448	0.00129194	278.134904	0.00325313	0.00533773
2029	2029Hauling Hauling	0.01213472	1.434866903	0.4224926	0.01273534	0.0221686	0.0212059	1403.60667	0.05465536	0.22381566
2029	2029Vendor Vendor	0.0128196	0.978781777	0.31101237	0.01152628	0.01380314	0.01320005	1245.46404	0.03180989	0.17489835
2029	2029Worker Worker	0.01192021	0.051957034	0.80464317	0.00269297	0.00130724	0.00120239	272.417637	0.00298654	0.00503952
2030	2030Hauling Hauling	0.01169729	1.381905725	0.40596438	0.01241489	0.02183595	0.02088778	1368.72007	0.05170538	0.2182712
2030	2030Vendor Vendor	0.01168751	0.9252091	0.28941545	0.01117412	0.01336285	0.01277903	1208.11234	0.03023265	0.17022289
2030	2030Worker Worker	0.01081241	0.047255061	0.76242747	0.00264062	0.00121547	0.00111789	267.121939	0.00274623	0.00476556
2031	2031Hauling Hauling	0.01126827	1.331771303	0.38663416	0.01209496	0.02148002	0.02054741	1333.31591	0.04842446	0.21262163
2031	2031Vendor Vendor	0.01070694	0.874998281	0.26868024	0.01079467	0.01293916	0.01237394	1167.57711	0.02847022	0.16520071
2031	2031Worker Worker	0.00977403	0.042746598	0.72305591	0.00259298	0.00112929	0.00103861	262.302837	0.0025216	0.00450761
0	GWP	N/A	N/A	N/A	N/A	N/A	N/A	1	25	298

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10	PM2.5	Regional Emissions (MT/year) CO2	CH4	N2O	CO2e
Demolition NB Road/Bridge	2028													
Total Haul Trips	270													
Hauling	8	42	8	36.5	0.01	0.96	0.28	0.01	0.01	0.01	14.17	0.01	0.67	14.86
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	18.5	0.02	0.09	1.39	0.00	0.00	0.00	12.35	0.00	0.07	12.42
Construct NB Road/Bridge	2028													
Total Haul Trips	3700													
Hauling	86	43	8	36.5	0.09	10.34	3.04	0.09	0.16	0.15	194.24	0.19	9.23	203.67
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0.02	0.09	1.39	0.00	0.00	0.00	12.56	0.00	0.07	12.63
Construct NB Road/Bridge	2028													
Total Haul Trips	834													
Hauling	6	154	8	36.5	0.01	0.72	0.21	0.01	0.01	0.01	43.78	0.04	2.08	45.91
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.02	0.09	1.39	0.00	0.00	0.00	44.05	0.01	0.25	44.31
Construct NB Road/Bridge	2028													
Total Haul Trips	0													
Hauling	0	21	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0.02	0.09	1.39	0.00	0.00	0.00	6.38	0.00	0.04	6.42
Demolition SB Road/Bridge	2029													
Total Haul Trips	270													
Hauling	8	43	8	36.5	0.01	0.92	0.27	0.01	0.01	0.01	13.83	0.01	0.66	14.50
Vendor	0	59	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	18.5	0.02	0.08	1.31	0.00	0.00	0.00	11.89	0.00	0.07	11.96
Construct SB Road/Bridge	2029													
Total Haul Trips	3460													
Hauling	82	43	8	36.5	0.08	9.47	2.79	0.08	0.15	0.14	177.26	0.17	8.42	185.86
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0.02	0.08	1.31	0.00	0.00	0.00	12.30	0.00	0.07	12.37
Construct SB Road/Bridge	2029													
Total Haul Trips	834													
Hauling	6	154	8	36.5	0.01	0.69	0.20	0.01	0.01	0.01	42.73	0.04	2.03	44.80
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.02	0.08	1.31	0.00	0.00	0.00	43.14	0.01	0.24	43.39
Construct SB Road/Bridge	2029													
Total Haul Trips	0													
Hauling	0	21	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0.02	0.08	1.31	0.00	0.00	0.00	6.25	0.00	0.03	6.29
Construct NB Road/Bridge	2028													
Total Haul Trips	2400													
Hauling	56	43	8	20	0.03	3.69	1.08	0.03	0.06	0.05	69.04	0.07	3.28	72.39
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	61	8	18.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct SB Road/Bridge	2029													
Total Haul Trips	2400													
Hauling	56	43	8	20	0.03	3.54	1.04	0.03	0.05	0.05	67.37	0.07	3.20	70.64
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	61	8	18.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Topanga Canyon - NB/SB Bridge
Start Emissions

			Start Emissions Factor (grams/trip)						Start Emissions Factor (grams/trip)		
			ROG_STREX	NOX_STREX	CO_STREX	SOx_STREX	PM10_STREX	PM2.5_STREX	CO2_STREX	CH4_STREX	N2O_STREX
2027	2027Hauling	Hauling	0.00060894	2.672142352	0.00302137	3.16557E-07	5.30481E-07	4.87758E-07	0.03202066	7.5498E-08	7.36611E-06
2027	2027Vendor	Vendor	0.080213538	1.961946447	0.60365405	5.50826E-05	6.07836E-05	5.58883E-05	5.57177064	0.005494835	0.004037678
2027	2027Worker	Worker	1.038950633	0.251050817	3.01934346	0.000691936	0.002053348	0.001887978	69.9913431	0.06616369	0.030829475
2028	2028Hauling	Hauling	0.000490696	2.636914961	0.00257595	2.71845E-07	4.29594E-07	3.94995E-07	0.02749789	6.56178E-08	5.97594E-06
2028	2028Vendor	Vendor	0.075419112	1.927915654	0.55968909	5.22383E-05	5.76932E-05	5.30468E-05	5.28405692	0.005169504	0.003780947
2028	2028Worker	Worker	0.997046953	0.239560346	2.85187017	0.000675557	0.001941969	0.001785569	68.3345653	0.062483886	0.030029939
2029	2029Hauling	Hauling	0.000383539	2.591170334	0.00214107	2.33546E-07	3.28727E-07	3.02252E-07	0.02362391	5.62127E-08	4.65545E-06
2029	2029Vendor	Vendor	0.069289941	1.883995908	0.51714657	4.94212E-05	5.46034E-05	5.02058E-05	4.99909929	0.004852786	0.003548842
2029	2029Worker	Worker	0.945798618	0.229251267	2.69630558	0.000660221	0.001832244	0.00168468	66.7833	0.059077063	0.029313823
2030	2030Hauling	Hauling	0.00027279	2.546881303	0.00161285	1.92445E-07	2.06187E-07	1.89581E-07	0.01946637	4.71315E-08	4.0595E-06
2030	2030Vendor	Vendor	0.063656597	1.839529651	0.47865041	4.67001E-05	5.18671E-05	4.76899E-05	4.72385215	0.004565454	0.003322989
2030	2030Worker	Worker	0.901632052	0.219772527	2.55165593	0.00064583	0.001725708	0.001586724	65.3276344	0.055883281	0.028658371
2031	2031Hauling	Hauling	0.000210057	2.503276097	0.00139863	1.66951E-07	1.58801E-07	1.46012E-07	0.01688763	4.13015E-08	2.64568E-06
2031	2031Vendor	Vendor	0.059141215	1.792713918	0.44197461	4.38654E-05	4.91716E-05	4.52115E-05	4.43711805	0.004280254	0.003105544
2031	2031Worker	Worker	0.857879142	0.211029605	2.41545051	0.000632455	0.001621689	0.001491083	63.974738	0.052892816	0.028060877
	GWP			N/A					1	25	298

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10	PM2.5	Regional Emissions (MT/year) CO2	CH4	N2O	CO2e
Demolition NB Road/Bridg	2028													
Total Haul Trips	270													
Hauling	8	42	8	36.5	0.00	0.05	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.02
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	18.5	0.09	0.02	0.25	0.00	0.00	0.00	0.16	0.00	0.00	0.19
Construct NB Road/Bridge	2028													
Total Haul Trips	3700													
Hauling	86	43	8	36.5	0.00	0.50	0.00	0.00	0.00	0.00	0.22	0.00	0.00	0.24
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0.09	0.02	0.25	0.00	0.00	0.00	0.17	0.00	0.00	0.19
Construct NB Road/Bridge	2028													
Total Haul Trips	834													
Hauling	6	154	8	36.5	0.00	0.03	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.05
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.09	0.02	0.25	0.00	0.00	0.00	0.58	0.00	0.00	0.67
Construct NB Road/Bridge	2028													
Total Haul Trips	0													
Hauling	0	21	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0.09	0.02	0.25	0.00	0.00	0.00	0.08	0.00	0.00	0.10
Demolition SB Road/Bridge	2029													
Total Haul Trips	270													
Hauling	8	43	8	36.5	0.00	0.05	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01
Vendor	0	59	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	18.5	0.08	0.02	0.24	0.00	0.00	0.00	0.16	0.00	0.00	0.18
Construct SB Road/Bridge	2029													
Total Haul Trips	3460													
Hauling	82	43	8	36.5	0.00	0.47	0.00	0.00	0.00	0.00	0.18	0.00	0.00	0.19
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0.08	0.02	0.24	0.00	0.00	0.00	0.16	0.00	0.00	0.19
Construct SB Road/Bridge	2029													
Total Haul Trips	834													
Hauling	6	154	8	36.5	0.00	0.03	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.05
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.08	0.02	0.24	0.00	0.00	0.00	0.57	0.00	0.00	0.66
Construct SB Road/Bridge	2029													
Total Haul Trips	0													
Hauling	0	21	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0.08	0.02	0.24	0.00	0.00	0.00	0.08	0.00	0.00	0.10
Construct NB Road/Bridge	2028													
Total Haul Trips	2400													
Hauling	56	43	8	20	0.00	0.33	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.15
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	61	8	18.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct SB Road/Bridge	2029													
Total Haul Trips	2400													
Hauling	56	43	8	20	0.00	0.32	0.00	0.00	0.00	0.00	0.12	0.00	0.00	0.13
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	61	8	18.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Topanga Canyon - NB/SB Bridge
Idling Emissions

			Idling Emissions Factor (grams/minute)						Idling Emissions Factor (grams/minute)		
			ROG_IDLEX	NOx_IDLEX	CO_IDLEX	SOx_IDLEX	PM10_IDLEX	PM2.5_IDLEX	CO2_IDLEX	CH4_IDLEX	N2O_IDLEX
2027	2027Hauling	Hauling	0.07592279	0.881696127	1.19921987	0.00159973	0.00047074	0.00044926	181.442358	0.03427011	0.02916541
2027	2027Vendor	Vendor	0.05529965	0.899602458	1.04932075	0.00167506	0.00086494	0.00082645	186.589554	0.03155173	0.02918792
2027	2027Worker	Worker	0	0	0	0	0	0	0	0	0
2028	2028Hauling	Hauling	0.07529788	0.857767875	1.19214339	0.00156045	0.00045204	0.00043133	177.300744	0.03377364	0.02851321
2028	2028Vendor	Vendor	0.05432839	0.863093228	1.0395891	0.00163993	0.00074988	0.00071632	182.978932	0.03134729	0.02865517
2028	2028Worker	Worker	0	0	0	0	0	0	0	0	0
2029	2029Hauling	Hauling	0.07461794	0.835480721	1.18399992	0.00152188	0.00043143	0.00041158	173.194944	0.03323976	0.02786481
2029	2029Vendor	Vendor	0.05333308	0.827999465	1.02749811	0.0016013	0.00065239	0.00062302	178.951612	0.03104801	0.02805443
2029	2029Worker	Worker	0	0	0	0	0	0	0	0	0
2030	2030Hauling	Hauling	0.07391144	0.816007794	1.17493744	0.0014846	0.00041331	0.00039421	169.186161	0.03269373	0.0272299
2030	2030Vendor	Vendor	0.05232472	0.795299763	1.01321823	0.00155966	0.00057171	0.0005458	174.561724	0.03067462	0.02739395
2030	2030Worker	Worker	0	0	0	0	0	0	0	0	0
2031	2031Hauling	Hauling	0.0732853	0.799579641	1.1664382	0.00145061	0.00039768	0.00037924	165.457521	0.03205186	0.02663599
2031	2031Vendor	Vendor	0.05130878	0.763402339	0.99683404	0.00151522	0.00050437	0.00048136	169.805962	0.03011968	0.02667472
2031	2031Worker	Worker	0	0	0	0	0	0	0	0	0
	GWP		N/A	N/A	N/A	N/A	N/A	N/A	1	25	298

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	Idling minutes per Day	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10	PM2.5	Regional Emissions (MT/year) CO2	CH4	N2O	CO2e
Demolition NB Road/Bridge	2028													
Total Haul Trips	270													
Hauling	8	42	8	15	0.02	0.23	0.32	0.00	0.00	0.00	0.72	0.00	0.03	0.76
Vendor	0	60	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct NB Road/Bridge	2028													
Total Haul Trips	3700													
Hauling	86	43	8	15	0.21	2.44	3.39	0.00	0.00	0.00	9.84	0.05	0.47	10.36
Vendor	0	61	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct NB Road/Bridge	2028													
Total Haul Trips	834													
Hauling	6	154	8	15	0.01	0.17	0.24	0.00	0.00	0.00	2.22	0.01	0.11	2.33
Vendor	0	214	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct NB Road/Bridge	2028													
Total Haul Trips	0													
Hauling	0	21	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Demolition SB Road/Bridge	2029													
Total Haul Trips	270													
Hauling	8	43	8	15	0.02	0.22	0.31	0.00	0.00	0.00	0.70	0.00	0.03	0.74
Vendor	0	59	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct SB Road/Bridge	2029													
Total Haul Trips	3460													
Hauling	82	43	8	15	0.20	2.27	3.21	0.00	0.00	0.00	8.99	0.04	0.43	9.46
Vendor	0	61	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct SB Road/Bridge	2029													
Total Haul Trips	834													
Hauling	6	154	8	15	0.01	0.17	0.23	0.00	0.00	0.00	2.17	0.01	0.10	2.28
Vendor	0	214	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct SB Road/Bridge	2029													
Total Haul Trips	0													
Hauling	0	21	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct NB Road/Bridge	2028													
Total Haul Trips	2400													
Hauling	56	43	8	15	0.14	1.59	2.21	0.00	0.00	0.00	6.38	0.03	0.31	6.72
Vendor	0	61	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	61	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct SB Road/Bridge	2029													
Total Haul Trips	2400													
Hauling	56	43	8	15	0.14	1.55	2.19	0.00	0.00	0.00	6.24	0.03	0.30	6.56
Vendor	0	61	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	61	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Topanga Canyon - NB/SB Bridge
Road Dust, Break Wear, and Tire wear Emissions

		Emission Factors (grams/mile)					
		PM10			PM2.5		
		RD	PM10_PMBW	PM10_PMTW	RD	PM2.5_PMBW	PM2.5_PMTW
2027	2027Hauling Hauling	0.29984991	0.084297987	0.03545106	0.07359952	0.0295043	0.00886277
2027	2027Vendor Vendor	0.29984991	0.063623189	0.02372553	0.07359952	0.02226812	0.00593138
2027	2027Worker Worker	0.29984991	0.009305649	0.008	0.07359952	0.00325698	0.002
2028	2028Hauling Hauling	0.29984991	0.084486989	0.03545475	0.07359952	0.02957045	0.00886369
2028	2028Vendor Vendor	0.29984991	0.063544145	0.02372738	0.07359952	0.02224045	0.00593184
2028	2028Worker Worker	0.29984991	0.009284129	0.008	0.07359952	0.00324945	0.002
2029	2029Hauling Hauling	0.29984991	0.084584422	0.03545835	0.07359952	0.02960455	0.00886459
2029	2029Vendor Vendor	0.29984991	0.063359545	0.02372918	0.07359952	0.02217584	0.00593229
2029	2029Worker Worker	0.29984991	0.00926272	0.008	0.07359952	0.00324195	0.002
2030	2030Hauling Hauling	0.29984991	0.08460378	0.03546191	0.07359952	0.02961132	0.00886548
2030	2030Vendor Vendor	0.29984991	0.063078834	0.02373095	0.07359952	0.02207759	0.00593274
2030	2030Worker Worker	0.29984991	0.00924132	0.008	0.07359952	0.00323446	0.002
2031	2031Hauling Hauling	0.29984991	0.084504548	0.03546578	0.07359952	0.02957659	0.00886644
2031	2031Vendor Vendor	0.29984991	0.062682863	0.02373289	0.07359952	0.021939	0.00593322
2031	2031Worker Worker	0.29984991	0.009221285	0.008	0.07359952	0.00322745	0.002

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day)					
						PM10			PM2.5	
					RD	BW	TW	RD	BW	TW
Demolition NB Road/Bridge	2028									
Total Haul Trips	270									
Hauling	8	42	8	36.5	0.19	0.05	0.02	0.05	0.02	0.01
Vendor	0	60	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	60	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Construct NB Road/Bridge	2028									
Total Haul Trips	3700									
Hauling	86	43	8	36.5	2.08	0.58	0.25	0.51	0.20	0.06
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Construct NB Road/Bridge	2028									
Total Haul Trips	834									
Hauling	6	154	8	36.5	0.14	0.04	0.02	0.04	0.01	0.00
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Construct NB Road/Bridge	2028									
Total Haul Trips	0									
Hauling	0	21	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Demolition SB Road/Bridge	2029									
Total Haul Trips	270									
Hauling	8	43	8	36.5	0.19	0.05	0.02	0.05	0.02	0.01
Vendor	0	59	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Construct SB Road/Bridge	2029									
Total Haul Trips	3460									
Hauling	82	43	8	36.5	1.98	0.56	0.23	0.49	0.20	0.06
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Construct SB Road/Bridge	2029									
Total Haul Trips	834									
Hauling	6	154	8	36.5	0.14	0.04	0.02	0.04	0.01	0.00
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Construct SB Road/Bridge	2029									
Total Haul Trips	0									
Hauling	0	21	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Construct NB Road/Bridge	2028									
Total Haul Trips	2400									
Hauling	56	43	8	20	0.74	0.21	0.09	0.18	0.07	0.02
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	61	8	18.5	0.00	0.00	0.00	0.00	0.00	0.00
Construct SB Road/Bridge	2029									
Total Haul Trips	2400									
Hauling	56	43	8	20	0.74	0.21	0.09	0.18	0.07	0.02
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	0	61	8	18.5	0.00	0.00	0.00	0.00	0.00	0.00

Topanga Canyon - NB/SB Bridge
Road Dust

Paved Road Dust Emission Factors (Assumes No Precipitation)

Formula: $EF_{Dust,P} = (k\ (sL)^{0.91} \times (W)^{1.02})$

Where:

$EF_{Dust,P}$ =	Paved Road Dust Emission Factor (having the same units as k)
k =	particle size multiplier
sL =	road surface silt loading (g/m^2)
W =	average fleet vehicle weight (tons) (CARB uses 2.4 tons as a fleet average vehicle weight factor)

	Emission Factor (grams per VMT)	
	PM10	PM2.5
k	0.9979	0.2449
sL	0.1	0.1
W	2.4	2.4
$EF_{Dust,P}$	3.00E-01	7.36E-02

Unpaved Road Dust Emission Factors (Assumes No Precipitation)

Formula: $EF_{Dust,U} = (k\ (\ s / 12)^{1} \times (Sp / 30)^{0.5} / (M / 0.5)^{0.2}) - C)$

Where:

$EF_{Dust,U}$ =	Unpaved Road Dust Emission Factor (having the same units as k)
k =	particle size multiplier
s =	surface material silt content (%)
Sp =	mean vehicle speed (mph)
M =	surface material moisture content (%)
C =	Emission Factor for 1980s vehicle fleet exhaust, brake wear, and tire wear

	Emission Factor (grams per VMT)	
	PM10	PM2.5
k	816.47	81.65
s	4.3%	4.3%
Sp	15	15
M	0.5%	0.5%
C	0.00047	0.00036
$EF_{Dust,U}$	5.20E+00	5.19E-01

Sources:

SCAQMD, CalEEMod, Version 2022.1.

CARB, *Entrained Dust from Paved Road Travel: Emission Estimation Methodology Background Document* , (1997).

USEPA, *AP-42* , Fifth Edition, Volume I, Chapter 13.2.1 - Paved Roads, (2011).

ESA, 2023.

Topanga Canyon - VS
Total Emissions

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Idling per Day (minutes)	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10 Dust	PM10 Exh	Total PM10	PM2.5 Dust	PM2.5 Exh	Total PM2.5	(MT/yr) Total CO2e
Site Preparation	2027															
Total Haul Trips	0															
Hauling	0	1	8	36.5	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	1	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	10	1	8	18.5	0	0.03	0.03	0.43	0.00	0.13	0.00	0.13	0.03	0.00	0.03	0.05
					Total	0.03	0.03	0.43	0.00	0.13	0.00	0.13	0.03	0.00	0.03	0.05
Grading	2027				Workers+Ver	0.03	0.03	0.43	0.00	0.13	0.00	0.13	0.03	0.00	0.03	
Total Haul Trips	0															
Hauling	0	4	8	36.5	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	4	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	16	4	8	18.5	0	0.05	0.05	0.70	0.00	0.21	0.00	0.21	0.05	0.00	0.05	0.34
					Total	0.05	0.05	0.70	0.00	0.21	0.00	0.21	0.05	0.00	0.05	0.34
Building Construction	2027				Workers+Ver	0.05	0.05	0.70	0.00	0.21	0.00	0.21	0.05	0.00	0.05	
Total Haul Trips	0															
Hauling	0	140	8	36.5	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	6	140	8	10.2	15	0.01	0.35	0.27	0.00	0.05	0.00	0.05	0.01	0.00	0.02	14.19
Worker	14	140	8	18.5	0	0.04	0.04	0.61	0.00	0.18	0.00	0.18	0.05	0.00	0.05	10.53
					Total	0.05	0.40	0.87	0.00	0.23	0.00	0.24	0.06	0.00	0.06	24.72
Paving	2027				Workers+Ver	0.05	0.40	0.87	0.00	0.23	0.00	0.24	0.06	0.00	0.06	
Total Haul Trips	0															
Hauling	0	7	8	36.5	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	7	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	36	7	8	18.5	0	0.10	0.11	1.56	0.00	0.47	0.00	0.47	0.12	0.00	0.12	1.35
					Total	0.10	0.11	1.56	0.00	0.47	0.00	0.47	0.12	0.00	0.12	1.35
Architectural Coating	2027				Workers+Ver	0.10	0.11	1.56	0.00	0.47	0.00	0.47	0.12	0.00	0.12	
Total Haul Trips	0															
Hauling	0	7	8	36.5	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	7	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	2	7	8	18.5	0	0.01	0.01	0.09	0.00	0.03	0.00	0.03	0.01	0.00	0.01	0.08
					Total	0.01	0.01	0.09	0.00	0.03	0.00	0.03	0.01	0.00	0.01	0.08
					Workers+Ver	0.01	0.01	0.09	0.00	0.03	0.00	0.03	0.01	0.00	0.01	

Topanga Canyon - VS
Running Emissions

		Running Emissions Factor (grams/mile)						Running Emissions Factor (grams/mile)		
		ROG_RUNEX	NOx_RUNEX	CO_RUNEX	SOx_RUNEX	PM10_RUNEX	PM2.5_RUNEX	CO2_RUNEX	CH4_RUNEX	N2O_RUNEX
2027	2027Hauling Hauling	0.013128	1.553518611	0.45473657	0.01336714	0.02273486	0.02174732	1471.80075	0.0608523	0.23462364
2027	2027Vendor Vendor	0.01570588	1.102331968	0.36327753	0.01214871	0.01475662	0.01411185	1311.1435	0.03509759	0.18307889
2027	2027Worker Worker	0.01447264	0.062492418	0.90233334	0.00281062	0.00150729	0.0013867	284.320587	0.00354266	0.00566149
2028	2028Hauling Hauling	0.01261339	1.493718015	0.43877031	0.01305596	0.02247317	0.02149714	1438.29866	0.05768159	0.22931835
2028	2028Vendor Vendor	0.01417298	1.038868065	0.3360531	0.01185313	0.01426835	0.01364491	1280.01295	0.03342244	0.17922194
2028	2028Worker Worker	0.01314756	0.057035459	0.85167037	0.00274948	0.00140448	0.00129194	278.134904	0.00325313	0.00533773
2029	2029Hauling Hauling	0.01213472	1.434866903	0.4224926	0.01273534	0.0221686	0.0212059	1403.60667	0.05465536	0.22381566
2029	2029Vendor Vendor	0.0128196	0.978781777	0.31101237	0.01152628	0.01380314	0.01320005	1245.46404	0.03180989	0.17489835
2029	2029Worker Worker	0.01192021	0.051957034	0.80464317	0.00269297	0.00130724	0.00120239	272.417637	0.00298654	0.00503952
2030	2030Hauling Hauling	0.01169729	1.381905725	0.40596438	0.01241489	0.02183595	0.02088778	1368.72007	0.05170538	0.2182712
2030	2030Vendor Vendor	0.01168751	0.9252091	0.28941545	0.01117412	0.01336285	0.01277903	1208.11234	0.03023265	0.17022289
2030	2030Worker Worker	0.01081241	0.047255061	0.76242747	0.00264062	0.00121547	0.00111789	267.121939	0.00274623	0.00476556
2031	2031Hauling Hauling	0.01126827	1.331771303	0.38663416	0.01209496	0.02148002	0.02054741	1333.31591	0.04842446	0.21262163
2031	2031Vendor Vendor	0.01070694	0.874998281	0.26868024	0.01079467	0.01293916	0.01237394	1167.57711	0.02847022	0.16520071
2031	2031Worker Worker	0.00977403	0.042746598	0.72305591	0.00259298	0.00112929	0.00103861	262.302837	0.0025216	0.00450761
0	GWP	N/A	N/A	N/A	N/A	N/A	N/A	1	25	298

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10	PM2.5	Regional Emissions (MT/year) CO2	CH4	N2O	CO2e
Site Preparation	2027													
Total Haul Trips	0													
Hauling	0	1	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	1	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	10	1	8	18.5	0.01	0.03	0.37	0.00	0.00	0.00	0.05	0.00	0.00	0.05
Grading	2027													
Total Haul Trips	0													
Hauling	0	4	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	4	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	16	4	8	18.5	0.01	0.04	0.59	0.00	0.00	0.00	0.34	0.00	0.00	0.34
Building Construction	2027													
Total Haul Trips	0													
Hauling	0	140	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	6	140	8	10.2	0.00	0.15	0.05	0.00	0.00	0.00	11.23	0.01	0.47	11.71
Worker	14	140	8	18.5	0.01	0.04	0.52	0.00	0.00	0.00	10.31	0.00	0.06	10.37
Paving	2027													
Total Haul Trips	0													
Hauling	0	7	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	7	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	36	7	8	18.5	0.02	0.09	1.32	0.00	0.00	0.00	1.33	0.00	0.01	1.33
Architectural Coating	2027													
Total Haul Trips	0													
Hauling	0	7	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	7	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	2	7	8	18.5	0.00	0.01	0.07	0.00	0.00	0.00	0.07	0.00	0.00	0.07

Topanga Canyon - VS
Start Emissions

			Start Emissions Factor (grams/trip)						Start Emissions Factor (grams/trip)		
			ROG_STREX	NOX_STREX	CO_STREX	SOx_STREX	PM10_STREX	PM2.5_STREX	CO2_STREX	CH4_STREX	N2O_STREX
2027	2027Hauling	Hauling	0.00060894	2.672142352	0.00302137	3.16557E-07	5.30481E-07	4.87758E-07	0.03202066	7.5498E-08	7.36611E-06
2027	2027Vendor	Vendor	0.080213538	1.961946447	0.60365405	5.50826E-05	6.07836E-05	5.58883E-05	5.57177064	0.005494835	0.004037678
2027	2027Worker	Worker	1.038950633	0.251050817	3.01934346	0.000691936	0.002053348	0.001887978	69.9913431	0.06616369	0.030829475
2028	2028Hauling	Hauling	0.000490696	2.636914961	0.00257595	2.71845E-07	4.29594E-07	3.94995E-07	0.02749789	6.56178E-08	5.97594E-06
2028	2028Vendor	Vendor	0.075419112	1.927915654	0.55968909	5.22383E-05	5.76932E-05	5.30468E-05	5.28405692	0.005169504	0.003780947
2028	2028Worker	Worker	0.997046953	0.239560346	2.85187017	0.000675557	0.001941969	0.001785569	68.3345653	0.062483886	0.030029939
2029	2029Hauling	Hauling	0.000383539	2.591170334	0.00214107	2.33546E-07	3.28727E-07	3.02252E-07	0.02362391	5.62127E-08	4.65545E-06
2029	2029Vendor	Vendor	0.069289941	1.883995908	0.51714657	4.94212E-05	5.46034E-05	5.02058E-05	4.99909929	0.004852786	0.003548842
2029	2029Worker	Worker	0.945798618	0.229251267	2.69630558	0.000660221	0.001832244	0.00168468	66.7833	0.059077063	0.029313823
2030	2030Hauling	Hauling	0.00027279	2.546881303	0.00161285	1.92445E-07	2.06187E-07	1.89581E-07	0.01946637	4.71315E-08	4.0595E-06
2030	2030Vendor	Vendor	0.063656597	1.839529651	0.47865041	4.67001E-05	5.18671E-05	4.76899E-05	4.72385215	0.004565454	0.003322989
2030	2030Worker	Worker	0.901632052	0.219772527	2.55165593	0.00064583	0.001725708	0.001586724	65.3276344	0.055883281	0.028658371
2031	2031Hauling	Hauling	0.000210057	2.503276097	0.00139863	1.66951E-07	1.58801E-07	1.46012E-07	0.01688763	4.13015E-08	2.64568E-06
2031	2031Vendor	Vendor	0.059141215	1.792713918	0.44197461	4.38654E-05	4.91716E-05	4.52115E-05	4.43711805	0.004280254	0.003105544
2031	2031Worker	Worker	0.857879142	0.211029605	2.41545051	0.000632455	0.001621689	0.001491083	63.974738	0.052892816	0.028060877
	GWP			N/A					1	25	298

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10	PM2.5	Regional Emissions (MT/year) CO2	CH4	N2O	CO2e
Site Preparation	2027													
Total Haul Trips	0													
Hauling	0	1	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	1	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	10	1	8	18.5	0.02	0.01	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grading	2027													
Total Haul Trips	0													
Hauling	0	4	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	4	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	16	4	8	18.5	0.04	0.01	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Building Construction	2027													
Total Haul Trips	0													
Hauling	0	140	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	6	140	8	10.2	0.00	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Worker	14	140	8	18.5	0.03	0.01	0.09	0.00	0.00	0.00	0.14	0.00	0.00	0.16
Paving	2027													
Total Haul Trips	0													
Hauling	0	7	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	7	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	36	7	8	18.5	0.08	0.02	0.24	0.00	0.00	0.00	0.02	0.00	0.00	0.02
Architectural Coating	2027													
Total Haul Trips	0													
Hauling	0	7	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	7	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	2	7	8	18.5	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Topanga Canyon - VS
Idling Emissions

			Idling Emissions Factor (grams/minute)						Idling Emissions Factor (grams/minute)		
			ROG_IDLEX	NOx_IDLEX	CO_IDLEX	SOx_IDLEX	PM10_IDLEX	PM2.5_IDLEX	CO2_IDLEX	CH4_IDLEX	N2O_IDLEX
2027	2027Hauling	Hauling	0.07592279	0.881696127	1.19921987	0.00159973	0.00047074	0.00044926	181.442358	0.03427011	0.02916541
2027	2027Vendor	Vendor	0.05529965	0.899602458	1.04932075	0.00167506	0.00086494	0.00082645	186.589554	0.03155173	0.02918792
2027	2027Worker	Worker	0	0	0	0	0	0	0	0	0
2028	2028Hauling	Hauling	0.07529788	0.857767875	1.19214339	0.00156045	0.00045204	0.00043133	177.300744	0.03377364	0.02851321
2028	2028Vendor	Vendor	0.05432839	0.863093228	1.0395891	0.00163993	0.00074988	0.00071632	182.978932	0.03134729	0.02865517
2028	2028Worker	Worker	0	0	0	0	0	0	0	0	0
2029	2029Hauling	Hauling	0.07461794	0.835480721	1.18399992	0.00152188	0.00043143	0.00041158	173.194944	0.03323976	0.02786481
2029	2029Vendor	Vendor	0.05333308	0.827999465	1.02749811	0.0016013	0.00065239	0.00062302	178.951612	0.03104801	0.02805443
2029	2029Worker	Worker	0	0	0	0	0	0	0	0	0
2030	2030Hauling	Hauling	0.07391144	0.816007794	1.17493744	0.0014846	0.00041331	0.00039421	169.186161	0.03269373	0.0272299
2030	2030Vendor	Vendor	0.05232472	0.795299763	1.01321823	0.00155966	0.00057171	0.0005458	174.561724	0.03067462	0.02739395
2030	2030Worker	Worker	0	0	0	0	0	0	0	0	0
2031	2031Hauling	Hauling	0.0732853	0.799579641	1.1664382	0.00145061	0.00039768	0.00037924	165.457521	0.03205186	0.02663599
2031	2031Vendor	Vendor	0.05130878	0.763402339	0.99683404	0.00151522	0.00050437	0.00048136	169.805962	0.03011968	0.02667472
2031	2031Worker	Worker	0	0	0	0	0	0	0	0	0
		GWP	N/A	N/A	N/A	N/A	N/A	N/A	1	25	298

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	Idling minutes per Day	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10	PM2.5	Regional Emissions (MT/year) CO2	CH4	N2O	CO2e
Site Preparation	2027													
Total Haul Trips	0													
Hauling	0	1	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	1	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	10	1	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grading	2027													
Total Haul Trips	0													
Hauling	0	4	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	4	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	16	4	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Building Construction	2027													
Total Haul Trips	0													
Hauling	0	140	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	6	140	8	15	0.01	0.18	0.21	0.00	0.00	0.00	2.35	0.01	0.11	2.47
Worker	14	140	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving	2027													
Total Haul Trips	0													
Hauling	0	7	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	7	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	36	7	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Architectural Coating	2027													
Total Haul Trips	0													
Hauling	0	7	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	7	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	2	7	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Topanga Canyon - VS
Road Dust, Break Wear, and Tire wear Emissions

		Emission Factors (grams/mile)					
			PM10			PM2.5	
		RD	PM10_PMBW	PM10_PMTW	RD	PM2.5_PMBW	PM2.5_PMTW
2027	2027Hauling Hauling	0.29984991	0.084297987	0.03545106	0.07359952	0.0295043	0.00886277
2027	2027Vendor Vendor	0.29984991	0.063623189	0.02372553	0.07359952	0.02226812	0.00593138
2027	2027Worker Worker	0.29984991	0.009305649	0.008	0.07359952	0.00325698	0.002
2028	2028Hauling Hauling	0.29984991	0.084486989	0.03545475	0.07359952	0.02957045	0.00886369
2028	2028Vendor Vendor	0.29984991	0.063544145	0.02372738	0.07359952	0.02224045	0.00593184
2028	2028Worker Worker	0.29984991	0.009284129	0.008	0.07359952	0.00324945	0.002
2029	2029Hauling Hauling	0.29984991	0.084584422	0.03545835	0.07359952	0.02960455	0.00886459
2029	2029Vendor Vendor	0.29984991	0.063359545	0.02372918	0.07359952	0.02217584	0.00593229
2029	2029Worker Worker	0.29984991	0.00926272	0.008	0.07359952	0.00324195	0.002
2030	2030Hauling Hauling	0.29984991	0.08460378	0.03546191	0.07359952	0.02961132	0.00886548
2030	2030Vendor Vendor	0.29984991	0.063078834	0.02373095	0.07359952	0.02207759	0.00593274
2030	2030Worker Worker	0.29984991	0.00924132	0.008	0.07359952	0.00323446	0.002
2031	2031Hauling Hauling	0.29984991	0.084504548	0.03546578	0.07359952	0.02957659	0.00886644
2031	2031Vendor Vendor	0.29984991	0.062682863	0.02373289	0.07359952	0.021939	0.00593322
2031	2031Worker Worker	0.29984991	0.009221285	0.008	0.07359952	0.00322745	0.002

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day)					
						PM10			PM2.5	
					RD	BW	TW	RD	BW	TW
Site Preparation	2027									
Total Haul Trips	0									
Hauling	0	1	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	1	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	10	1	8	18.5	0.12	0.00	0.00	0.03	0.00	0.00
Grading	2027									
Total Haul Trips	0									
Hauling	0	4	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	4	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	16	4	8	18.5	0.20	0.01	0.01	0.05	0.00	0.00
Building Construction	2027									
Total Haul Trips	0									
Hauling	0	140	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	6	140	8	10.2	0.04	0.01	0.00	0.01	0.00	0.00
Worker	14	140	8	18.5	0.17	0.01	0.00	0.04	0.00	0.00
Paving	2027									
Total Haul Trips	0									
Hauling	0	7	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	7	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	36	7	8	18.5	0.44	0.01	0.01	0.11	0.00	0.00
Architectural Coating	2027									
Total Haul Trips	0									
Hauling	0	7	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	7	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	2	7	8	18.5	0.02	0.00	0.00	0.01	0.00	0.00

Topanga Canyon - VS
Road Dust

Paved Road Dust Emission Factors (Assumes No Precipitation)

Formula: $EF_{Dust,P} = (k\ (sL)^{0.91} \times (W)^{1.02})$

Where:

$EF_{Dust,P}$ =	Paved Road Dust Emission Factor (having the same units as k)
k =	particle size multiplier
sL =	road surface silt loading (g/m^2)
W =	average fleet vehicle weight (tons) (CARB uses 2.4 tons as a fleet average vehicle weight factor)

	Emission Factor (grams per VMT)	
	PM10	PM2.5
k	0.9979	0.2449
sL	0.1	0.1
W	2.4	2.4
$EF_{Dust,P}$	3.00E-01	7.36E-02

Unpaved Road Dust Emission Factors (Assumes No Precipitation)

Formula: $EF_{Dust,U} = (k\ (\ s / 12)^{1} \times (Sp / 30)^{0.5} / (M / 0.5)^{0.2}) - C)$

Where:

$EF_{Dust,U}$ =	Unpaved Road Dust Emission Factor (having the same units as k)
k =	particle size multiplier
s =	surface material silt content (%)
Sp =	mean vehicle speed (mph)
M =	surface material moisture content (%)
C =	Emission Factor for 1980s vehicle fleet exhaust, brake wear, and tire wear

	Emission Factor (grams per VMT)	
	PM10	PM2.5
k	816.47	81.65
s	4.3%	4.3%
Sp	15	15
M	0.5%	0.5%
C	0.00047	0.00036
$EF_{Dust,U}$	5.20E+00	5.19E-01

Sources:

SCAQMD, CalEEMod, Version 2022.1.
CARB, *Entrained Dust from Paved Road Travel: Emission Estimation Methodology Background Document* , (1997).
USEPA, *AP-42* , Fifth Edition, Volume I, Chapter 13.2.1 - Paved Roads, (2011).
ESA, 2023.

P.3-2 Project Construction Modeling

Topanga-Temp Bridge-Con Detailed Report

Table of Contents

1. Basic Project Information

1.1. Basic Project Information

1.2. Land Use Types

1.3. User-Selected Emission Reduction Measures by Emissions Sector

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

2.2. Construction Emissions by Year, Unmitigated

3. Construction Emissions Details

3.1. Demo + Parking Provisions (2027) - Unmitigated

3.3. Demo Temp Bridge (2030) - Unmitigated

3.5. Restore Beach Area (2030) - Unmitigated

3.7. Unsuitable Material Replacement (2027) - Unmitigated

3.9. Construct Temp Bridge - Grading (2027) - Unmitigated

3.11. Lagoon Grading (2030) - Unmitigated

3.13. Construct Temp Bridge - BC (2027) - Unmitigated

3.15. Construct DBH Facilities (2030) - Unmitigated

3.17. Construct Temp Bridge - Paving (2027) - Unmitigated

3.19. Relocate Utilities (2027) - Unmitigated

4. Operations Emissions Details

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

5. Activity Data

5.1. Construction Schedule

5.2. Off-Road Equipment

5.2.1. Unmitigated

5.3. Construction Vehicles

5.3.1. Unmitigated

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

5.5. Architectural Coatings

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

5.6.2. Construction Earthmoving Control Strategies

5.7. Construction Paving

5.8. Construction Electricity Consumption and Emissions Factors

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

5.18.2. Sequestration

5.18.2.1. Unmitigated

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

6.2. Initial Climate Risk Scores

6.3. Adjusted Climate Risk Scores

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

7.2. Healthy Places Index Scores

7.3. Overall Health & Equity Scores

7.4. Health & Equity Measures

7.5. Evaluation Scorecard

7.6. Health & Equity Custom Measures

8. User Changes to Default Data

1. Basic Project Information

1.1. Basic Project Information

Data Field	Value
Project Name	Topanga-Temp Bridge-Con
Construction Start Date	1/1/2027
Lead Agency	—
Land Use Scale	Project/site
Analysis Level for Defaults	County
Windspeed (m/s)	2.70
Precipitation (days)	4.60
Location	18711 Pacific Coast Hwy, Malibu, CA 90265, USA
County	Los Angeles-South Coast
City	Unincorporated
Air District	South Coast AQMD
Air Basin	South Coast
TAZ	3802
EDFZ	7
Electric Utility	Southern California Edison
Gas Utility	Southern California Gas
App Version	2022.1.1.21

1.2. Land Use Types

Land Use Subtype	Size	Unit	Lot Acreage	Building Area (sq ft)	Landscape Area (sq ft)	Special Landscape Area (sq ft)	Population	Description
Other Asphalt Surfaces	13.5	1000sqft	0.31	0.00	0.00	—	—	—

General Office Building	1.50	1000sqft	0.03	1,500	0.00	—	—	—
Other Non-Asphalt Surfaces	2.30	1000sqft	0.05	0.00	0.00	—	—	—

1.3. User-Selected Emission Reduction Measures by Emissions Sector

No measures selected

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Un/Mit.	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	2.41	2.03	16.5	19.4	0.04	0.68	2.76	3.44	0.62	1.34	1.96	—	4,145	4,145	0.17	0.03	0.00	4,159
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	4.64	3.90	32.7	37.9	0.07	1.38	4.03	5.41	1.27	1.53	2.79	—	7,265	7,265	0.29	0.06	0.01	7,289
Average Daily (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	1.63	1.37	11.6	13.3	0.02	0.51	0.91	1.42	0.47	0.37	0.83	—	2,602	2,602	0.10	0.02	0.03	2,611
Annual (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.30	0.25	2.12	2.42	< 0.005	0.09	0.17	0.26	0.08	0.07	0.15	—	431	431	0.02	< 0.005	< 0.005	432

2.2. Construction Emissions by Year, Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Year	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily - Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2027	2.41	2.03	16.5	19.4	0.04	0.68	2.76	3.44	0.62	1.34	1.96	—	4,145	4,145	0.17	0.03	0.00	4,159
2030	0.93	0.78	4.64	7.57	0.02	0.19	0.23	0.43	0.18	0.03	0.20	—	2,045	2,045	0.08	0.02	0.00	2,052
Daily - Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2027	4.64	3.90	32.7	37.9	0.07	1.38	4.03	5.41	1.27	1.53	2.79	—	7,265	7,265	0.29	0.06	0.01	7,289
2030	0.93	0.78	5.87	7.57	0.02	0.27	0.23	0.43	0.24	0.03	0.24	—	2,045	2,045	0.08	0.02	0.00	2,052
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2027	1.63	1.37	11.6	13.3	0.02	0.51	0.91	1.42	0.47	0.37	0.83	—	2,602	2,602	0.10	0.02	0.03	2,611
2030	0.73	0.62	4.10	6.60	0.01	0.16	0.19	0.35	0.15	0.02	0.17	—	1,570	1,570	0.06	0.01	0.00	1,576
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2027	0.30	0.25	2.12	2.42	< 0.005	0.09	0.17	0.26	0.08	0.07	0.15	—	431	431	0.02	< 0.005	< 0.005	432
2030	0.13	0.11	0.75	1.20	< 0.005	0.03	0.03	0.06	0.03	< 0.005	0.03	—	260	260	0.01	< 0.005	0.00	261

3. Construction Emissions Details

3.1. Demo + Parking Provisions (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	2.23	1.88	16.3	18.5	0.03	0.70	—	0.70	0.65	—	0.65	—	3,120	3,120	0.13	0.03	—	3,131
Demolition	—	—	—	—	—	—	1.25	1.25	—	0.19	0.19	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.37	0.31	2.67	3.04	< 0.005	0.12	—	0.12	0.11	—	0.11	—	513	513	0.02	< 0.005	—	515
Demolition	—	—	—	—	—	—	0.21	0.21	—	0.03	0.03	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.07	0.06	0.49	0.56	< 0.005	0.02	—	0.02	0.02	—	0.02	—	84.9	84.9	< 0.005	< 0.005	—	85.2
Demolition	—	—	—	—	—	—	0.04	0.04	—	0.01	0.01	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.3. Demo Temp Bridge (2030) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.30	0.25	2.51	3.94	0.01	0.05	—	0.05	0.05	—	0.05	—	574	574	0.02	< 0.005	—	576
Demolition	—	—	—	—	—	—	0.11	0.11	—	0.02	0.02	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.05	0.04	0.41	0.64	< 0.005	0.01	—	0.01	0.01	—	0.01	—	92.8	92.8	< 0.005	< 0.005	—	93.1

Demolitio	—	—	—	—	—	—	0.02	0.02	—	< 0.005	< 0.005	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.01	0.01	0.07	0.12	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	15.4	15.4	< 0.005	< 0.005	—	15.4
Demolitio n	—	—	—	—	—	—	< 0.005	< 0.005	—	< 0.005	< 0.005	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.5. Restore Beach Area (2030) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.43	0.36	2.81	5.58	0.01	0.13	—	0.13	0.12	—	0.12	—	858	858	0.03	0.01	—	861
Dust From Material Movement	—	—	—	—	—	—	0.21	0.21	—	0.02	0.02	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.07	0.06	0.47	0.93	< 0.005	0.02	—	0.02	0.02	—	0.02	—	143	143	0.01	< 0.005	—	144
Dust From Material Movement	—	—	—	—	—	—	0.03	0.03	—	< 0.005	< 0.005	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.01	0.01	0.09	0.17	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	23.8	23.8	< 0.005	< 0.005	—	23.8

Dust From Material Movement	—	—	—	—	—	—	0.01	0.01	—	< 0.005	< 0.005	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.7. Unsuitable Material Replacement (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	2.19	1.84	14.7	16.4	0.03	0.62	—	0.62	0.57	—	0.57	—	3,713	3,713	0.15	0.03	—	3,725
Dust From Material Movement	—	—	—	—	—	—	2.78	2.78	—	1.34	1.34	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.36	0.30	2.41	2.70	0.01	0.10	—	0.10	0.09	—	0.09	—	610	610	0.02	< 0.005	—	612
Dust From Material Movement	—	—	—	—	—	—	0.46	0.46	—	0.22	0.22	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.07	0.06	0.44	0.49	< 0.005	0.02	—	0.02	0.02	—	0.02	—	101	101	< 0.005	< 0.005	—	101
Dust From Material Movement	—	—	—	—	—	—	0.08	0.08	—	0.04	0.04	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.9. Construct Temp Bridge - Grading (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	2.19	1.84	14.7	16.4	0.03	0.62	—	0.62	0.57	—	0.57	—	3,713	3,713	0.15	0.03	—	3,725

Dust From Material Movement	—	—	—	—	—	—	2.76	2.76	—	1.34	1.34	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.18	0.15	1.21	1.35	< 0.005	0.05	—	0.05	0.05	—	0.05	—	305	305	0.01	< 0.005	—	306
Dust From Material Movement	—	—	—	—	—	—	0.23	0.23	—	0.11	0.11	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.03	0.03	0.22	0.25	< 0.005	0.01	—	0.01	0.01	—	0.01	—	50.5	50.5	< 0.005	< 0.005	—	50.7
Dust From Material Movement	—	—	—	—	—	—	0.04	0.04	—	0.02	0.02	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.11. Lagoon Grading (2030) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.93	0.78	4.64	7.57	0.02	0.19	—	0.19	0.18	—	0.18	—	2,045	2,045	0.08	0.02	—	2,052
Dust From Material Movement	—	—	—	—	—	—	0.23	0.23	—	0.03	0.03	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipment	0.93	0.78	4.64	7.57	0.02	0.19	—	0.19	0.18	—	0.18	—	2,045	2,045	0.08	0.02	—	2,052
Dust From Material Movement	—	—	—	—	—	—	0.23	0.23	—	0.03	0.03	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.54	0.46	2.72	4.44	0.01	0.11	—	0.11	0.10	—	0.10	—	1,199	1,199	0.05	0.01	—	1,203
Dust From Material Movement	—	—	—	—	—	—	0.14	0.14	—	0.02	0.02	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.10	0.08	0.50	0.81	< 0.005	0.02	—	0.02	0.02	—	0.02	—	198	198	0.01	< 0.005	—	199
Dust From Material Movement	—	—	—	—	—	—	0.03	0.03	—	< 0.005	< 0.005	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.13. Construct Temp Bridge - BC (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.92	0.78	6.87	7.04	0.02	0.33	—	0.33	0.31	—	0.31	—	1,595	1,595	0.06	0.01	—	1,601
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipment	0.92	0.78	6.87	7.04	0.02	0.33	—	0.33	0.31	—	0.31	—	1,595	1,595	0.06	0.01	—	1,601
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.31	0.26	2.34	2.39	0.01	0.11	—	0.11	0.10	—	0.10	—	542	542	0.02	< 0.005	—	544
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.06	0.05	0.43	0.44	< 0.005	0.02	—	0.02	0.02	—	0.02	—	89.7	89.7	< 0.005	< 0.005	—	90.0
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.15. Construct DBH Facilities (2030) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.82	0.69	5.87	6.97	0.02	0.27	—	0.27	0.24	—	0.24	—	1,596	1,596	0.06	0.01	—	1,601
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.07	0.06	0.50	0.59	< 0.005	0.02	—	0.02	0.02	—	0.02	—	136	136	0.01	< 0.005	—	136
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.01	0.01	0.09	0.11	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	22.4	22.4	< 0.005	< 0.005	—	22.5
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.17. Construct Temp Bridge - Paving (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipment	1.75	1.47	12.8	13.6	0.02	0.59	—	0.59	0.55	—	0.55	—	2,405	2,405	0.10	0.02	—	2,413
Paving	—	0.01	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.29	0.24	2.10	2.23	< 0.005	0.10	—	0.10	0.09	—	0.09	—	395	395	0.02	< 0.005	—	397
Paving	—	< 0.005	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.05	0.04	0.38	0.41	< 0.005	0.02	—	0.02	0.02	—	0.02	—	65.4	65.4	< 0.005	< 0.005	—	65.7
Paving	—	< 0.005	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.04	0.03	0.04	0.51	0.00	0.00	0.13	0.13	0.00	0.03	0.03	—	126	126	< 0.005	< 0.005	0.01	127
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.01	0.09	0.00	0.00	0.02	0.02	0.00	0.01	0.01	—	21.0	21.0	< 0.005	< 0.005	0.03	21.3
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	< 0.005	0.02	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	3.48	3.48	< 0.005	< 0.005	< 0.005	3.52
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.19. Relocate Utilities (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.22	0.19	1.80	2.93	< 0.005	0.05	—	0.05	0.05	—	0.05	—	432	432	0.02	< 0.005	—	434
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.22	0.19	1.80	2.93	< 0.005	0.05	—	0.05	0.05	—	0.05	—	432	432	0.02	< 0.005	—	434
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.11	0.09	0.90	1.46	< 0.005	0.03	—	0.03	0.02	—	0.02	—	215	215	0.01	< 0.005	—	216
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipment	0.02	0.02	0.16	0.27	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	35.7	35.7	< 0.005	< 0.005	—	35.8
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

4. Operations Emissions Details

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Vegetation	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Species	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Sequest	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

5. Activity Data

5.1. Construction Schedule

Phase Name	Phase Type	Start Date	End Date	Days Per Week	Work Days per Phase	Phase Description
Demo + Parking Provisions	Demolition	1/1/2027	3/1/2027	7.00	60.0	—
Demo Temp Bridge	Demolition	1/1/2030	2/28/2030	7.00	59.0	—
Restore Beach Area	Site Preparation	11/1/2030	12/31/2030	7.00	61.0	—
Unsuitable Material Replacement	Grading	1/1/2027	3/1/2027	7.00	60.0	—
Construct Temp Bridge - Grading	Grading	6/1/2027	6/30/2027	7.00	30.0	—
Lagoon Grading	Grading	4/1/2030	10/31/2030	7.00	214	—
Construct Temp Bridge - BC	Building Construction	7/1/2027	11/1/2027	7.00	124	—
Construct DBH Facilities	Building Construction	3/1/2030	3/31/2030	7.00	31.0	—
Construct Temp Bridge - Paving	Paving	11/2/2027	12/31/2027	7.00	60.0	—
Relocate Utilities	Trenching	2/1/2027	8/1/2027	7.00	182	—

5.2. Off-Road Equipment

5.2.1. Unmitigated

Phase Name	Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor
Demo + Parking Provisions	Tractors/Loaders/Backhoes	Diesel	Average	1.00	8.00	84.0	0.37
Demo + Parking Provisions	Rubber Tired Dozers	Diesel	Average	1.00	8.00	367	0.40
Demo + Parking Provisions	Excavators	Diesel	Average	2.00	8.00	36.0	0.38
Demo + Parking Provisions	Graders	Diesel	Average	1.00	8.00	148	0.41
Demo + Parking Provisions	Pavers	Diesel	Average	1.00	8.00	81.0	0.42
Demo + Parking Provisions	Rollers	Diesel	Average	2.00	8.00	36.0	0.38
Demo Temp Bridge	Tractors/Loaders/Backhoes	Diesel	Average	1.00	8.00	84.0	0.37
Demo Temp Bridge	Excavators	Diesel	Average	2.00	8.00	36.0	0.38
Restore Beach Area	Graders	Diesel	Average	1.00	8.00	148	0.41
Restore Beach Area	Tractors/Loaders/Backhoes	Diesel	Average	1.00	8.00	84.0	0.37
Unsuitable Material Replacement	Graders	Diesel	Average	1.00	8.00	148	0.41
Unsuitable Material Replacement	Tractors/Loaders/Backhoes	Diesel	Average	1.00	8.00	84.0	0.37
Unsuitable Material Replacement	Rubber Tired Dozers	Diesel	Average	1.00	8.00	367	0.40
Unsuitable Material Replacement	Excavators	Diesel	Average	1.00	8.00	36.0	0.38
Unsuitable Material Replacement	Off-Highway Trucks	Diesel	Average	1.00	8.00	376	0.38
Construct Temp Bridge - Grading	Tractors/Loaders/Backhoes	Diesel	Average	1.00	8.00	84.0	0.37
Construct Temp Bridge - Grading	Graders	Diesel	Average	1.00	8.00	148	0.41

Construct Temp Bridge - Grading	Rubber Tired Dozers	Diesel	Average	1.00	8.00	367	0.40
Construct Temp Bridge - Grading	Excavators	Diesel	Average	1.00	8.00	36.0	0.38
Construct Temp Bridge - Grading	Off-Highway Trucks	Diesel	Average	1.00	8.00	376	0.38
Lagoon Grading	Graders	Diesel	Average	1.00	8.00	148	0.41
Lagoon Grading	Excavators	Diesel	Average	1.00	8.00	36.0	0.38
Lagoon Grading	Off-Highway Trucks	Diesel	Average	1.00	8.00	376	0.38
Construct Temp Bridge - BC	Cranes	Diesel	Average	1.00	8.00	367	0.29
Construct Temp Bridge - BC	Forklifts	Diesel	Average	1.00	8.00	82.0	0.20
Construct Temp Bridge - BC	Crawler Tractors	Diesel	Average	1.00	8.00	87.0	0.43
Construct Temp Bridge - BC	Generator Sets	Diesel	Average	1.00	8.00	14.0	0.74
Construct DBH Facilities	Cranes	Diesel	Average	1.00	8.00	367	0.29
Construct DBH Facilities	Forklifts	Diesel	Average	1.00	8.00	82.0	0.20
Construct DBH Facilities	Generator Sets	Diesel	Average	1.00	8.00	14.0	0.74
Construct DBH Facilities	Crawler Tractors	Diesel	Average	1.00	8.00	87.0	0.43
Construct Temp Bridge - Paving	Pavers	Diesel	Average	1.00	8.00	81.0	0.42
Construct Temp Bridge - Paving	Rollers	Diesel	Average	1.00	8.00	36.0	0.38
Construct Temp Bridge - Paving	Graders	Diesel	Average	1.00	8.00	148	0.41
Construct Temp Bridge - Paving	Rubber Tired Dozers	Diesel	Average	1.00	8.00	367	0.40

Relocate Utilities	Excavators	Diesel	Average	1.00	8.00	36.0	0.38
Relocate Utilities	Tractors/Loaders/Backhoes	Diesel	Average	1.00	8.00	84.0	0.37

5.3. Construction Vehicles

5.3.1. Unmitigated

Phase Name	Trip Type	One-Way Trips per Day	Miles per Trip	Vehicle Mix
Demo + Parking Provisions	—	—	—	—
Demo + Parking Provisions	Worker	0.00	18.5	LDA,LDT1,LDT2
Demo + Parking Provisions	Vendor	—	10.2	HHDT,MHDT
Demo + Parking Provisions	Hauling	0.00	20.0	HHDT
Demo + Parking Provisions	Onsite truck	—	—	HHDT
Unsuitable Material Replacement	—	—	—	—
Unsuitable Material Replacement	Worker	0.00	18.5	LDA,LDT1,LDT2
Unsuitable Material Replacement	Vendor	—	10.2	HHDT,MHDT
Unsuitable Material Replacement	Hauling	0.00	20.0	HHDT
Unsuitable Material Replacement	Onsite truck	—	—	HHDT
Relocate Utilities	—	—	—	—
Relocate Utilities	Worker	0.00	18.5	LDA,LDT1,LDT2
Relocate Utilities	Vendor	—	10.2	HHDT,MHDT
Relocate Utilities	Hauling	0.00	20.0	HHDT
Relocate Utilities	Onsite truck	—	—	HHDT
Construct Temp Bridge - Grading	—	—	—	—
Construct Temp Bridge - Grading	Worker	0.00	18.5	LDA,LDT1,LDT2
Construct Temp Bridge - Grading	Vendor	—	10.2	HHDT,MHDT
Construct Temp Bridge - Grading	Hauling	0.00	20.0	HHDT
Construct Temp Bridge - Grading	Onsite truck	—	—	HHDT

Construct Temp Bridge - BC	—	—	—	—
Construct Temp Bridge - BC	Worker	0.00	18.5	LDA,LDT1,LDT2
Construct Temp Bridge - BC	Vendor	0.00	10.2	HHDT,MHDT
Construct Temp Bridge - BC	Hauling	0.00	20.0	HHDT
Construct Temp Bridge - BC	Onsite truck	—	—	HHDT
Demo Temp Bridge	—	—	—	—
Demo Temp Bridge	Worker	0.00	18.5	LDA,LDT1,LDT2
Demo Temp Bridge	Vendor	—	10.2	HHDT,MHDT
Demo Temp Bridge	Hauling	0.00	20.0	HHDT
Demo Temp Bridge	Onsite truck	—	—	HHDT
Restore Beach Area	—	—	—	—
Restore Beach Area	Worker	0.00	18.5	LDA,LDT1,LDT2
Restore Beach Area	Vendor	—	10.2	HHDT,MHDT
Restore Beach Area	Hauling	0.00	20.0	HHDT
Restore Beach Area	Onsite truck	—	—	HHDT
Lagoon Grading	—	—	—	—
Lagoon Grading	Worker	0.00	18.5	LDA,LDT1,LDT2
Lagoon Grading	Vendor	—	10.2	HHDT,MHDT
Lagoon Grading	Hauling	0.00	20.0	HHDT
Lagoon Grading	Onsite truck	—	—	HHDT
Construct DBH Facilities	—	—	—	—
Construct DBH Facilities	Worker	0.00	18.5	LDA,LDT1,LDT2
Construct DBH Facilities	Vendor	0.00	10.2	HHDT,MHDT
Construct DBH Facilities	Hauling	0.00	20.0	HHDT
Construct DBH Facilities	Onsite truck	—	—	HHDT
Construct Temp Bridge - Paving	—	—	—	—
Construct Temp Bridge - Paving	Worker	10.0	18.5	LDA,LDT1,LDT2

Construct Temp Bridge - Paving	Vendor	—	10.2	HHDT,MHDT
Construct Temp Bridge - Paving	Hauling	0.00	20.0	HHDT
Construct Temp Bridge - Paving	Onsite truck	—	—	HHDT

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

Non-applicable. No control strategies activated by user.

5.5. Architectural Coatings

Phase Name	Residential Interior Area Coated (sq ft)	Residential Exterior Area Coated (sq ft)	Non-Residential Interior Area Coated (sq ft)	Non-Residential Exterior Area Coated (sq ft)	Parking Area Coated (sq ft)

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

Phase Name	Material Imported (Cubic Yards)	Material Exported (Cubic Yards)	Acres Graded (acres)	Material Demolished (Ton of Debris)	Acres Paved (acres)
Demo + Parking Provisions	0.00	0.00	0.00	5,405	—
Demo Temp Bridge	0.00	0.00	0.00	465	—
Restore Beach Area	0.00	0.00	21.5	0.00	—
Unsuitable Material Replacement	12,600	26,000	42.0	0.00	—
Construct Temp Bridge - Grading	1,600	0.00	22.0	0.00	—
Lagoon Grading	0.00	256,000	77.0	0.00	—
Construct Temp Bridge - Paving	0.00	0.00	0.00	0.00	0.36

5.6.2. Construction Earthmoving Control Strategies

Control Strategies Applied	Frequency (per day)	PM10 Reduction	PM2.5 Reduction
Water Exposed Area	2	61%	61%
Water Demolished Area	2	36%	36%

5.7. Construction Paving

Land Use	Area Paved (acres)	% Asphalt
Other Asphalt Surfaces	0.31	100%
General Office Building	0.00	0%
Other Non-Asphalt Surfaces	0.05	0%

5.8. Construction Electricity Consumption and Emissions Factors

kWh per Year and Emission Factor (lb/MWh)

Year	kWh per Year	CO2	CH4	N2O
2027	0.00	532	0.03	< 0.005
2030	0.00	532	0.03	< 0.005

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

Vegetation Land Use Type	Vegetation Soil Type	Initial Acres	Final Acres

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

Biomass Cover Type	Initial Acres	Final Acres

5.18.2. Sequestration

5.18.2.1. Unmitigated

Tree Type	Number	Electricity Saved (kWh/year)	Natural Gas Saved (btu/year)

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

Cal-Adapt midcentury 2040–2059 average projections for four hazards are reported below for your project location. These are under Representation Concentration Pathway (RCP) 8.5 which assumes GHG emissions will continue to rise strongly through 2050 and then plateau around 2100.

Climate Hazard	Result for Project Location	Unit
Temperature and Extreme Heat	9.96	annual days of extreme heat
Extreme Precipitation	5.90	annual days with precipitation above 20 mm
Sea Level Rise	—	meters of inundation depth
Wildfire	20.5	annual hectares burned

Temperature and Extreme Heat data are for grid cell in which your project are located. The projection is based on the 98th historical percentile of daily maximum/minimum temperatures from observed historical data (32 climate model ensemble from Cal-Adapt, 2040–2059 average under RCP 8.5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Extreme Precipitation data are for the grid cell in which your project are located. The threshold of 20 mm is equivalent to about ¾ an inch of rain, which would be light to moderate rainfall if received over a full day or heavy rain if received over a period of 2 to 4 hours. Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Sea Level Rise data are for the grid cell in which your project are located. The projections are from Radke et al. (2017), as reported in Cal-Adapt (Radke et al., 2017, CEC-500-2017-008), and consider inundation location and depth for the San Francisco Bay, the Sacramento-San Joaquin River Delta and California coast resulting different increments of sea level rise coupled with extreme storm events. Users may select from four scenarios to view the range in potential inundation depth for the grid cell. The four scenarios are: No rise, 0.5 meter, 1.0 meter, 1.41 meters
Wildfire data are for the grid cell in which your project are located. The projections are from UC Davis, as reported in Cal-Adapt (2040–2059 average under RCP 8.5), and consider historical data of climate, vegetation, population density, and large (> 400 ha) fire history. Users may select from four model simulations to view the range in potential wildfire probabilities for the grid cell. The four simulations make different assumptions about expected rainfall and temperature are: Warmer/drier (HadGEM2-ES), Cooler/wetter (CNRM-CM5), Average conditions (CanESM2), Range of different rainfall and temperature possibilities (MIROC5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.

6.2. Initial Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	1	0	0	N/A
Extreme Precipitation	N/A	N/A	N/A	N/A

Sea Level Rise	1	0	0	N/A
Wildfire	1	0	0	N/A
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	0	0	0	N/A

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores do not include implementation of climate risk reduction measures.

6.3. Adjusted Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	1	1	1	2
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	1	1	1	2
Wildfire	1	1	1	2
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	1	1	1	2

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores include implementation of climate risk reduction measures.

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Exposure Indicators	—
AQ-Ozone	—
AQ-PM	—
AQ-DPM	—
Drinking Water	—
Lead Risk Housing	—
Pesticides	—
Toxic Releases	—
Traffic	—
Effect Indicators	—
CleanUp Sites	—
Groundwater	—
Haz Waste Facilities/Generators	—
Impaired Water Bodies	—
Solid Waste	—
Sensitive Population	—
Asthma	—
Cardio-vascular	—
Low Birth Weights	—
Socioeconomic Factor Indicators	—
Education	—
Housing	—

Linguistic	—
Poverty	—
Unemployment	—

7.2. Healthy Places Index Scores

The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Economic	—
Above Poverty	89.34941614
Employed	19.02989863
Median HI	97.69023483
Education	—
Bachelor's or higher	88.59232645
High school enrollment	100
Preschool enrollment	95.7141024
Transportation	—
Auto Access	93.63531374
Active commuting	12.16476325
Social	—
2-parent households	42.29436674
Voting	82.35596048
Neighborhood	—
Alcohol availability	89.4649044
Park access	38.81688695
Retail density	42.06339022
Supermarket access	2.399589375
Tree canopy	71.42307199

Housing	—
Homeownership	65.75131528
Housing habitability	87.501604
Low-inc homeowner severe housing cost burden	64.24996792
Low-inc renter severe housing cost burden	88.91312717
Uncrowded housing	62.10701912
Health Outcomes	—
Insured adults	89.59322469
Arthritis	0.0
Asthma ER Admissions	99.7
High Blood Pressure	0.0
Cancer (excluding skin)	0.0
Asthma	0.0
Coronary Heart Disease	0.0
Chronic Obstructive Pulmonary Disease	0.0
Diagnosed Diabetes	0.0
Life Expectancy at Birth	77.8
Cognitively Disabled	87.2
Physically Disabled	55.6
Heart Attack ER Admissions	99.5
Mental Health Not Good	0.0
Chronic Kidney Disease	0.0
Obesity	0.0
Pedestrian Injuries	93.4
Physical Health Not Good	0.0
Stroke	0.0
Health Risk Behaviors	—

Binge Drinking	0.0
Current Smoker	0.0
No Leisure Time for Physical Activity	0.0
Climate Change Exposures	—
Wildfire Risk	99.5
SLR Inundation Area	38.8
Children	43.1
Elderly	11.5
English Speaking	77.4
Foreign-born	54.6
Outdoor Workers	85.4
Climate Change Adaptive Capacity	—
Impervious Surface Cover	79.5
Traffic Density	81.9
Traffic Access	23.0
Other Indices	—
Hardship	5.4
Other Decision Support	—
2016 Voting	60.6

7.3. Overall Health & Equity Scores

Metric	Result for Project Census Tract
CalEnviroScreen 4.0 Score for Project Location (a)	—
Healthy Places Index Score for Project Location (b)	90.0
Project Located in a Designated Disadvantaged Community (Senate Bill 535)	No
Project Located in a Low-Income Community (Assembly Bill 1550)	No
Project Located in a Community Air Protection Program Community (Assembly Bill 617)	No

a: The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.
b: The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

7.4. Health & Equity Measures

No Health & Equity Measures selected.

7.5. Evaluation Scorecard

Health & Equity Evaluation Scorecard not completed.

7.6. Health & Equity Custom Measures

No Health & Equity Custom Measures created.

8. User Changes to Default Data

Screen	Justification
Construction: Construction Phases	see construction assumptions
Construction: Off-Road Equipment	see construction assumptions
Construction: Trips and VMT	construction mobile emissions calculated outside of CalEEMod
Construction: Dust From Material Movement	see construction assumptions

Topanga-NB Bridge-Con Detailed Report

Table of Contents

1. Basic Project Information

1.1. Basic Project Information

1.2. Land Use Types

1.3. User-Selected Emission Reduction Measures by Emissions Sector

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

2.2. Construction Emissions by Year, Unmitigated

3. Construction Emissions Details

3.1. NB Road/Bridge - Demo (2028) - Unmitigated

3.3. NB Road/Bridge - Grading (2028) - Unmitigated

3.5. NB Road/Bridge - BC (2028) - Unmitigated

3.7. NB Road/Bridge - Paving (2028) - Unmitigated

4. Operations Emissions Details

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

5. Activity Data

5.1. Construction Schedule

5.2. Off-Road Equipment

5.2.1. Unmitigated

5.3. Construction Vehicles

5.3.1. Unmitigated

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

5.5. Architectural Coatings

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

5.6.2. Construction Earthmoving Control Strategies

5.7. Construction Paving

5.8. Construction Electricity Consumption and Emissions Factors

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

5.18.2. Sequestration

5.18.2.1. Unmitigated

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

6.2. Initial Climate Risk Scores

6.3. Adjusted Climate Risk Scores

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

7.2. Healthy Places Index Scores

7.3. Overall Health & Equity Scores

7.4. Health & Equity Measures

7.5. Evaluation Scorecard

7.6. Health & Equity Custom Measures

8. User Changes to Default Data

1. Basic Project Information

1.1. Basic Project Information

Data Field	Value
Project Name	Topanga-NB Bridge-Con
Construction Start Date	1/1/2028
Lead Agency	—
Land Use Scale	Project/site
Analysis Level for Defaults	County
Windspeed (m/s)	2.70
Precipitation (days)	4.60
Location	18711 Pacific Coast Hwy, Malibu, CA 90265, USA
County	Los Angeles-South Coast
City	Unincorporated
Air District	South Coast AQMD
Air Basin	South Coast
TAZ	3802
EDFZ	7
Electric Utility	Southern California Edison
Gas Utility	Southern California Gas
App Version	2022.1.1.21

1.2. Land Use Types

Land Use Subtype	Size	Unit	Lot Acreage	Building Area (sq ft)	Landscape Area (sq ft)	Special Landscape Area (sq ft)	Population	Description
Other Asphalt Surfaces	78.4	1000sqft	1.80	78,408	0.00	—	—	—

1.3. User-Selected Emission Reduction Measures by Emissions Sector

No measures selected

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Un/Mit.	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	2.15	1.81	14.1	16.4	0.03	0.60	2.77	3.37	0.55	1.34	1.88	—	3,714	3,714	0.15	0.08	2.20	3,727
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	2.15	1.81	14.1	16.4	0.03	0.60	2.77	3.37	0.55	1.34	1.88	—	3,714	3,714	0.15	0.08	0.06	3,727
Average Daily (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	1.16	0.98	7.90	9.75	0.02	0.34	0.81	1.14	0.31	0.30	0.61	—	2,322	2,322	0.09	0.06	0.56	2,342
Annual (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.21	0.18	1.44	1.78	< 0.005	0.06	0.15	0.21	0.06	0.06	0.11	—	384	384	0.01	0.01	0.09	388

2.2. Construction Emissions by Year, Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Year	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily - Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

2028	2.15	1.81	14.1	16.4	0.03	0.60	2.77	3.37	0.55	1.34	1.88	—	3,714	3,714	0.15	0.08	2.20	3,727
Daily - Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2028	2.15	1.81	14.1	16.4	0.03	0.60	2.77	3.37	0.55	1.34	1.88	—	3,714	3,714	0.15	0.08	0.06	3,727
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2028	1.16	0.98	7.90	9.75	0.02	0.34	0.81	1.14	0.31	0.30	0.61	—	2,322	2,322	0.09	0.06	0.56	2,342
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2028	0.21	0.18	1.44	1.78	< 0.005	0.06	0.15	0.21	0.06	0.06	0.11	—	384	384	0.01	0.01	0.09	388

3. Construction Emissions Details

3.1. NB Road/Bridge - Demo (2028) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.32	0.27	2.57	3.95	0.01	0.07	—	0.07	0.06	—	0.06	—	574	574	0.02	< 0.005	—	576
Demolition	—	—	—	—	—	—	0.16	0.16	—	0.02	0.02	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipment	0.05	0.04	0.42	0.65	< 0.005	0.01	—	0.01	0.01	—	0.01	—	94.3	94.3	< 0.005	< 0.005	—	94.6
Demolition	—	—	—	—	—	—	0.03	0.03	—	< 0.005	< 0.005	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.01	0.01	0.08	0.12	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	15.6	15.6	< 0.005	< 0.005	—	15.7
Demolition	—	—	—	—	—	—	< 0.005	< 0.005	—	< 0.005	< 0.005	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.3. NB Road/Bridge - Grading (2028) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	2.15	1.81	14.1	16.4	0.03	0.60	—	0.60	0.55	—	0.55	—	3,714	3,714	0.15	0.03	—	3,727
Dust From Material Movement	—	—	—	—	—	—	2.77	2.77	—	1.34	1.34	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	2.15	1.81	14.1	16.4	0.03	0.60	—	0.60	0.55	—	0.55	—	3,714	3,714	0.15	0.03	—	3,727
Dust From Material Movement	—	—	—	—	—	—	2.77	2.77	—	1.34	1.34	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.36	0.30	2.36	2.75	0.01	0.10	—	0.10	0.09	—	0.09	—	621	621	0.03	0.01	—	623
Dust From Material Movement	—	—	—	—	—	—	0.46	0.46	—	0.22	0.22	—	—	—	—	—	—	—

Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.07	0.06	0.43	0.50	< 0.005	0.02	—	0.02	0.02	—	0.02	—	103	103	< 0.005	< 0.005	—	103
Dust From Material Movement	—	—	—	—	—	—	0.08	0.08	—	0.04	0.04	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.5. NB Road/Bridge - BC (2028) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.88	0.74	6.40	7.03	0.02	0.30	—	0.30	0.28	—	0.28	—	1,596	1,596	0.06	0.01	—	1,601
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.88	0.74	6.40	7.03	0.02	0.30	—	0.30	0.28	—	0.28	—	1,596	1,596	0.06	0.01	—	1,601
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.52	0.43	3.75	4.12	0.01	0.18	—	0.18	0.16	—	0.16	—	936	936	0.04	0.01	—	939
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.09	0.08	0.68	0.75	< 0.005	0.03	—	0.03	0.03	—	0.03	—	155	155	0.01	< 0.005	—	155
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.13	0.11	0.11	1.86	0.00	0.00	0.43	0.43	0.00	0.10	0.10	—	430	430	< 0.005	0.02	1.23	436
Vendor	0.03	0.01	0.40	0.19	< 0.005	< 0.005	0.11	0.11	< 0.005	0.03	0.03	—	384	384	0.01	0.05	0.97	401
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.13	0.11	0.13	1.58	0.00	0.00	0.43	0.43	0.00	0.10	0.10	—	408	408	0.01	0.02	0.03	412
Vendor	0.03	0.01	0.42	0.20	< 0.005	< 0.005	0.11	0.11	< 0.005	0.03	0.03	—	384	384	0.01	0.05	0.03	401
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.07	0.07	0.07	0.97	0.00	0.00	0.25	0.25	0.00	0.06	0.06	—	242	242	< 0.005	0.01	0.31	246
Vendor	0.01	0.01	0.25	0.11	< 0.005	< 0.005	0.06	0.07	< 0.005	0.02	0.02	—	225	225	0.01	0.03	0.24	235
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.01	0.18	0.00	0.00	0.05	0.05	0.00	0.01	0.01	—	40.1	40.1	< 0.005	< 0.005	0.05	40.7
Vendor	< 0.005	< 0.005	0.05	0.02	< 0.005	< 0.005	0.01	0.01	< 0.005	< 0.005	< 0.005	—	37.3	37.3	< 0.005	0.01	0.04	38.9
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.7. NB Road/Bridge - Paving (2028) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.71	1.44	12.4	13.6	0.02	0.56	—	0.56	0.52	—	0.52	—	2,405	2,405	0.10	0.02	—	2,414
Paving	—	0.15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.15	0.12	1.05	1.16	< 0.005	0.05	—	0.05	0.04	—	0.04	—	204	204	0.01	< 0.005	—	205
Paving	—	0.01	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.03	0.02	0.19	0.21	< 0.005	0.01	—	0.01	0.01	—	0.01	—	33.8	33.8	< 0.005	< 0.005	—	33.9
Paving	—	< 0.005	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

4. Operations Emissions Details

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Vegetation	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Species	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

5. Activity Data

5.1. Construction Schedule

Phase Name	Phase Type	Start Date	End Date	Days Per Week	Work Days per Phase	Phase Description
NB Road/Bridge - Demo	Demolition	1/1/2028	2/29/2028	7.00	60.0	—
NB Road/Bridge - Grading	Grading	3/1/2028	4/30/2028	7.00	61.0	—
NB Road/Bridge - BC	Building Construction	5/1/2028	11/30/2028	7.00	214	—
NB Road/Bridge - Paving	Paving	12/1/2028	12/31/2028	7.00	31.0	—

5.2. Off-Road Equipment

5.2.1. Unmitigated

Phase Name	Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor
NB Road/Bridge - Demo	Tractors/Loaders/Backhoes	Diesel	Average	1.00	8.00	84.0	0.37
NB Road/Bridge - Demo	Excavators	Diesel	Average	2.00	8.00	36.0	0.38
NB Road/Bridge - Grading	Graders	Diesel	Average	1.00	8.00	148	0.41
NB Road/Bridge - Grading	Tractors/Loaders/Backhoes	Diesel	Average	1.00	8.00	84.0	0.37
NB Road/Bridge - Grading	Rubber Tired Dozers	Diesel	Average	1.00	8.00	367	0.40
NB Road/Bridge - Grading	Excavators	Diesel	Average	1.00	8.00	36.0	0.38
NB Road/Bridge - Grading	Off-Highway Trucks	Diesel	Average	1.00	8.00	376	0.38
NB Road/Bridge - BC	Cranes	Diesel	Average	1.00	8.00	367	0.29
NB Road/Bridge - BC	Forklifts	Diesel	Average	1.00	8.00	82.0	0.20
NB Road/Bridge - BC	Generator Sets	Diesel	Average	1.00	8.00	14.0	0.74
NB Road/Bridge - BC	Crawler Tractors	Diesel	Average	1.00	8.00	87.0	0.43
NB Road/Bridge - Paving	Rollers	Diesel	Average	1.00	8.00	36.0	0.38
NB Road/Bridge - Paving	Pavers	Diesel	Average	1.00	8.00	81.0	0.42
NB Road/Bridge - Paving	Rubber Tired Dozers	Diesel	Average	1.00	8.00	367	0.40
NB Road/Bridge - Paving	Graders	Diesel	Average	1.00	8.00	148	0.41

5.3. Construction Vehicles

5.3.1. Unmitigated

Phase Name	Trip Type	One-Way Trips per Day	Miles per Trip	Vehicle Mix
NB Road/Bridge - Demo	—	—	—	—
NB Road/Bridge - Demo	Worker	0.00	18.5	LDA,LDT1,LDT2
NB Road/Bridge - Demo	Vendor	—	10.2	HHDT,MHDT
NB Road/Bridge - Demo	Hauling	0.00	20.0	HHDT
NB Road/Bridge - Demo	Onsite truck	—	—	HHDT
NB Road/Bridge - Grading	—	—	—	—
NB Road/Bridge - Grading	Worker	0.00	18.5	LDA,LDT1,LDT2
NB Road/Bridge - Grading	Vendor	—	10.2	HHDT,MHDT
NB Road/Bridge - Grading	Hauling	0.00	20.0	HHDT
NB Road/Bridge - Grading	Onsite truck	—	—	HHDT
NB Road/Bridge - BC	—	—	—	—
NB Road/Bridge - BC	Worker	32.9	18.5	LDA,LDT1,LDT2
NB Road/Bridge - BC	Vendor	12.9	10.2	HHDT,MHDT
NB Road/Bridge - BC	Hauling	0.00	20.0	HHDT
NB Road/Bridge - BC	Onsite truck	—	—	HHDT
NB Road/Bridge - Paving	—	—	—	—
NB Road/Bridge - Paving	Worker	0.00	18.5	LDA,LDT1,LDT2
NB Road/Bridge - Paving	Vendor	—	10.2	HHDT,MHDT
NB Road/Bridge - Paving	Hauling	0.00	20.0	HHDT
NB Road/Bridge - Paving	Onsite truck	—	—	HHDT

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

Non-applicable. No control strategies activated by user.

5.5. Architectural Coatings

Phase Name	Residential Interior Area Coated (sq ft)	Residential Exterior Area Coated (sq ft)	Non-Residential Interior Area Coated (sq ft)	Non-Residential Exterior Area Coated (sq ft)	Parking Area Coated (sq ft)

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

Phase Name	Material Imported (Cubic Yards)	Material Exported (Cubic Yards)	Acres Graded (acres)	Material Demolished (Ton of Debris)	Acres Paved (acres)
NB Road/Bridge - Demo	0.00	0.00	0.00	675	—
NB Road/Bridge - Grading	12,000	18,500	43.0	0.00	—
NB Road/Bridge - Paving	0.00	0.00	0.00	0.00	1.80

5.6.2. Construction Earthmoving Control Strategies

Control Strategies Applied	Frequency (per day)	PM10 Reduction	PM2.5 Reduction
Water Exposed Area	2	61%	61%
Water Demolished Area	2	36%	36%

5.7. Construction Paving

Land Use	Area Paved (acres)	% Asphalt
Other Asphalt Surfaces	1.80	100%

5.8. Construction Electricity Consumption and Emissions Factors

kWh per Year and Emission Factor (lb/MWh)

Year	kWh per Year	CO2	CH4	N2O
2028	0.00	532	0.03	< 0.005

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

Vegetation Land Use Type	Vegetation Soil Type	Initial Acres	Final Acres

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

Biomass Cover Type	Initial Acres	Final Acres

5.18.2. Sequestration

5.18.2.1. Unmitigated

Tree Type	Number	Electricity Saved (kWh/year)	Natural Gas Saved (btu/year)

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

Cal-Adapt midcentury 2040–2059 average projections for four hazards are reported below for your project location. These are under Representation Concentration Pathway (RCP) 8.5 which assumes GHG emissions will continue to rise strongly through 2050 and then plateau around 2100.

Climate Hazard	Result for Project Location	Unit
Temperature and Extreme Heat	9.96	annual days of extreme heat
Extreme Precipitation	5.90	annual days with precipitation above 20 mm

Sea Level Rise	—	meters of inundation depth
Wildfire	20.5	annual hectares burned

Temperature and Extreme Heat data are for grid cell in which your project are located. The projection is based on the 98th historical percentile of daily maximum/minimum temperatures from observed historical data (32 climate model ensemble from Cal-Adapt, 2040–2059 average under RCP 8.5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Extreme Precipitation data are for the grid cell in which your project are located. The threshold of 20 mm is equivalent to about ¾ an inch of rain, which would be light to moderate rainfall if received over a full day or heavy rain if received over a period of 2 to 4 hours. Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Sea Level Rise data are for the grid cell in which your project are located. The projections are from Radke et al. (2017), as reported in Cal-Adapt (Radke et al., 2017, CEC-500-2017-008), and consider inundation location and depth for the San Francisco Bay, the Sacramento-San Joaquin River Delta and California coast resulting different increments of sea level rise coupled with extreme storm events. Users may select from four scenarios to view the range in potential inundation depth for the grid cell. The four scenarios are: No rise, 0.5 meter, 1.0 meter, 1.41 meters
Wildfire data are for the grid cell in which your project are located. The projections are from UC Davis, as reported in Cal-Adapt (2040–2059 average under RCP 8.5), and consider historical data of climate, vegetation, population density, and large (> 400 ha) fire history. Users may select from four model simulations to view the range in potential wildfire probabilities for the grid cell. The four simulations make different assumptions about expected rainfall and temperature are: Warmer/drier (HadGEM2-ES), Cooler/wetter (CNRM-CM5), Average conditions (CanESM2), Range of different rainfall and temperature possibilities (MIROC5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.

6.2. Initial Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	1	0	0	N/A
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	1	0	0	N/A
Wildfire	1	0	0	N/A
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	0	0	0	N/A

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores do not include implementation of climate risk reduction measures.

6.3. Adjusted Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score

Temperature and Extreme Heat	1	1	1	2
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	1	1	1	2
Wildfire	1	1	1	2
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	1	1	1	2

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores include implementation of climate risk reduction measures.

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Exposure Indicators	—
AQ-Ozone	—
AQ-PM	—
AQ-DPM	—
Drinking Water	—
Lead Risk Housing	—
Pesticides	—
Toxic Releases	—

Traffic	—
Effect Indicators	—
CleanUp Sites	—
Groundwater	—
Haz Waste Facilities/Generators	—
Impaired Water Bodies	—
Solid Waste	—
Sensitive Population	—
Asthma	—
Cardio-vascular	—
Low Birth Weights	—
Socioeconomic Factor Indicators	—
Education	—
Housing	—
Linguistic	—
Poverty	—
Unemployment	—

7.2. Healthy Places Index Scores

The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Economic	—
Above Poverty	89.34941614
Employed	19.02989863
Median HI	97.69023483
Education	—
Bachelor's or higher	88.59232645

High school enrollment	100
Preschool enrollment	95.7141024
Transportation	—
Auto Access	93.63531374
Active commuting	12.16476325
Social	—
2-parent households	42.29436674
Voting	82.35596048
Neighborhood	—
Alcohol availability	89.4649044
Park access	38.81688695
Retail density	42.06339022
Supermarket access	2.399589375
Tree canopy	71.42307199
Housing	—
Homeownership	65.75131528
Housing habitability	87.501604
Low-inc homeowner severe housing cost burden	64.24996792
Low-inc renter severe housing cost burden	88.91312717
Uncrowded housing	62.10701912
Health Outcomes	—
Insured adults	89.59322469
Arthritis	0.0
Asthma ER Admissions	99.7
High Blood Pressure	0.0
Cancer (excluding skin)	0.0
Asthma	0.0

Coronary Heart Disease	0.0
Chronic Obstructive Pulmonary Disease	0.0
Diagnosed Diabetes	0.0
Life Expectancy at Birth	77.8
Cognitively Disabled	87.2
Physically Disabled	55.6
Heart Attack ER Admissions	99.5
Mental Health Not Good	0.0
Chronic Kidney Disease	0.0
Obesity	0.0
Pedestrian Injuries	93.4
Physical Health Not Good	0.0
Stroke	0.0
Health Risk Behaviors	—
Binge Drinking	0.0
Current Smoker	0.0
No Leisure Time for Physical Activity	0.0
Climate Change Exposures	—
Wildfire Risk	99.5
SLR Inundation Area	38.8
Children	43.1
Elderly	11.5
English Speaking	77.4
Foreign-born	54.6
Outdoor Workers	85.4
Climate Change Adaptive Capacity	—
Impervious Surface Cover	79.5

Traffic Density	81.9
Traffic Access	23.0
Other Indices	—
Hardship	5.4
Other Decision Support	—
2016 Voting	60.6

7.3. Overall Health & Equity Scores

Metric	Result for Project Census Tract
CalEnviroScreen 4.0 Score for Project Location (a)	—
Healthy Places Index Score for Project Location (b)	90.0
Project Located in a Designated Disadvantaged Community (Senate Bill 535)	No
Project Located in a Low-Income Community (Assembly Bill 1550)	No
Project Located in a Community Air Protection Program Community (Assembly Bill 617)	No

a: The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.
b: The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

7.4. Health & Equity Measures

No Health & Equity Measures selected.

7.5. Evaluation Scorecard

Health & Equity Evaluation Scorecard not completed.

7.6. Health & Equity Custom Measures

No Health & Equity Custom Measures created.

8. User Changes to Default Data

Screen	Justification
Construction: Construction Phases	see construction assumptions

Construction: Off-Road Equipment	see construction assumptions
Construction: Trips and VMT	construction mobile emissions calculated outside of CalEEMod.
Construction: Dust From Material Movement	see construction assumptions

Topanga-SB Bridge-Con Detailed Report

Table of Contents

1. Basic Project Information

1.1. Basic Project Information

1.2. Land Use Types

1.3. User-Selected Emission Reduction Measures by Emissions Sector

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

2.2. Construction Emissions by Year, Unmitigated

3. Construction Emissions Details

3.1. SB Road/Bridge - Demo (2029) - Unmitigated

3.3. SB Road/Bridge - Grading (2029) - Unmitigated

3.5. SB Road/Bridge - BC (2029) - Unmitigated

3.7. SB Road/Bridge - Paving (2029) - Unmitigated

4. Operations Emissions Details

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

5. Activity Data

5.1. Construction Schedule

5.2. Off-Road Equipment

5.2.1. Unmitigated

5.3. Construction Vehicles

5.3.1. Unmitigated

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

5.5. Architectural Coatings

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

5.6.2. Construction Earthmoving Control Strategies

5.7. Construction Paving

5.8. Construction Electricity Consumption and Emissions Factors

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

5.18.2. Sequestration

5.18.2.1. Unmitigated

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

6.2. Initial Climate Risk Scores

6.3. Adjusted Climate Risk Scores

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

7.2. Healthy Places Index Scores

7.3. Overall Health & Equity Scores

7.4. Health & Equity Measures

7.5. Evaluation Scorecard

7.6. Health & Equity Custom Measures

8. User Changes to Default Data

1. Basic Project Information

1.1. Basic Project Information

Data Field	Value
Project Name	Topanga-SB Bridge-Con
Construction Start Date	1/1/2029
Lead Agency	—
Land Use Scale	Project/site
Analysis Level for Defaults	County
Windspeed (m/s)	2.70
Precipitation (days)	4.60
Location	18711 Pacific Coast Hwy, Malibu, CA 90265, USA
County	Los Angeles-South Coast
City	Unincorporated
Air District	South Coast AQMD
Air Basin	South Coast
TAZ	3802
EDFZ	7
Electric Utility	Southern California Edison
Gas Utility	Southern California Gas
App Version	2022.1.1.21

1.2. Land Use Types

Land Use Subtype	Size	Unit	Lot Acreage	Building Area (sq ft)	Landscape Area (sq ft)	Special Landscape Area (sq ft)	Population	Description
Other Asphalt Surfaces	78.4	1000sqft	1.80	0.00	0.00	—	—	—

1.3. User-Selected Emission Reduction Measures by Emissions Sector

No measures selected

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Un/Mit.	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	2.10	1.76	13.2	16.3	0.03	0.56	2.77	3.33	0.51	1.34	1.85	—	3,713	3,713	0.15	0.03	0.00	3,726
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	2.10	1.76	13.2	16.3	0.03	0.56	2.77	3.33	0.51	1.34	1.85	—	3,713	3,713	0.15	0.03	0.00	3,726
Average Daily (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	1.04	0.89	7.16	8.61	0.02	0.31	0.49	0.80	0.29	0.23	0.51	—	1,853	1,853	0.08	0.02	0.00	1,859
Annual (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.19	0.16	1.31	1.57	< 0.005	0.06	0.09	0.15	0.05	0.04	0.09	—	307	307	0.01	< 0.005	0.00	308

2.2. Construction Emissions by Year, Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Year	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily - Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

2029	2.10	1.76	13.2	16.3	0.03	0.56	2.77	3.33	0.51	1.34	1.85	—	3,713	3,713	0.15	0.03	0.00	3,726
Daily - Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2029	2.10	1.76	13.2	16.3	0.03	0.56	2.77	3.33	0.51	1.34	1.85	—	3,713	3,713	0.15	0.03	0.00	3,726
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2029	1.04	0.89	7.16	8.61	0.02	0.31	0.49	0.80	0.29	0.23	0.51	—	1,853	1,853	0.08	0.02	0.00	1,859
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2029	0.19	0.16	1.31	1.57	< 0.005	0.06	0.09	0.15	0.05	0.04	0.09	—	307	307	0.01	< 0.005	0.00	308

3. Construction Emissions Details

3.1. SB Road/Bridge - Demo (2029) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.32	0.27	2.53	3.96	0.01	0.06	—	0.06	0.05	—	0.05	—	574	574	0.02	< 0.005	—	576
Demolition	—	—	—	—	—	—	0.16	0.16	—	0.02	0.02	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipment	0.05	0.04	0.41	0.64	< 0.005	0.01	—	0.01	0.01	—	0.01	—	92.8	92.8	< 0.005	< 0.005	—	93.1
Demolition	—	—	—	—	—	—	0.03	0.03	—	< 0.005	< 0.005	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.01	0.01	0.07	0.12	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	15.4	15.4	< 0.005	< 0.005	—	15.4
Demolition	—	—	—	—	—	—	< 0.005	< 0.005	—	< 0.005	< 0.005	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.3. SB Road/Bridge - Grading (2029) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	2.10	1.76	13.2	16.3	0.03	0.56	—	0.56	0.51	—	0.51	—	3,713	3,713	0.15	0.03	—	3,726
Dust From Material Movement	—	—	—	—	—	—	2.77	2.77	—	1.34	1.34	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	2.10	1.76	13.2	16.3	0.03	0.56	—	0.56	0.51	—	0.51	—	3,713	3,713	0.15	0.03	—	3,726
Dust From Material Movement	—	—	—	—	—	—	2.77	2.77	—	1.34	1.34	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.35	0.29	2.21	2.73	0.01	0.09	—	0.09	0.09	—	0.09	—	621	621	0.03	0.01	—	623
Dust From Material Movement	—	—	—	—	—	—	0.46	0.46	—	0.22	0.22	—	—	—	—	—	—	—

Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.06	0.05	0.40	0.50	< 0.005	0.02	—	0.02	0.02	—	0.02	—	103	103	< 0.005	< 0.005	—	103
Dust From Material Movement	—	—	—	—	—	—	0.08	0.08	—	0.04	0.04	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.5. SB Road/Bridge - BC (2029) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.85	0.71	6.06	6.99	0.02	0.28	—	0.28	0.26	—	0.26	—	1,596	1,596	0.06	0.01	—	1,601
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.85	0.71	6.06	6.99	0.02	0.28	—	0.28	0.26	—	0.26	—	1,596	1,596	0.06	0.01	—	1,601
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.50	0.42	3.55	4.10	0.01	0.16	—	0.16	0.15	—	0.15	—	936	936	0.04	0.01	—	939
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.09	0.08	0.65	0.75	< 0.005	0.03	—	0.03	0.03	—	0.03	—	155	155	0.01	< 0.005	—	155
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.7. SB Road/Bridge - Paving (2029) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.66	1.39	11.6	13.5	0.02	0.53	—	0.53	0.49	—	0.49	—	2,404	2,404	0.10	0.02	—	2,412
Paving	—	0.15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.14	0.12	0.99	1.15	< 0.005	0.05	—	0.05	0.04	—	0.04	—	204	204	0.01	< 0.005	—	205
Paving	—	0.01	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.03	0.02	0.18	0.21	< 0.005	0.01	—	0.01	0.01	—	0.01	—	33.8	33.8	< 0.005	< 0.005	—	33.9
Paving	—	< 0.005	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

4. Operations Emissions Details

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Vegetation	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Species	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

5. Activity Data

5.1. Construction Schedule

Phase Name	Phase Type	Start Date	End Date	Days Per Week	Work Days per Phase	Phase Description
SB Road/Bridge - Demo	Demolition	1/1/2029	2/28/2029	7.00	59.0	—
SB Road/Bridge - Grading	Grading	3/1/2029	4/30/2029	7.00	61.0	—
SB Road/Bridge - BC	Building Construction	5/1/2029	11/30/2029	7.00	214	—
SB Road/Bridge - Paving	Paving	12/1/2029	12/31/2029	7.00	31.0	—

5.2. Off-Road Equipment

5.2.1. Unmitigated

Phase Name	Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor
SB Road/Bridge - Demo	Tractors/Loaders/Backhoes	Diesel	Average	1.00	8.00	84.0	0.37
SB Road/Bridge - Demo	Excavators	Diesel	Average	2.00	8.00	36.0	0.38
SB Road/Bridge - Grading	Graders	Diesel	Average	1.00	8.00	148	0.41
SB Road/Bridge - Grading	Tractors/Loaders/Backhoes	Diesel	Average	1.00	8.00	84.0	0.37
SB Road/Bridge - Grading	Rubber Tired Dozers	Diesel	Average	1.00	8.00	367	0.40
SB Road/Bridge - Grading	Excavators	Diesel	Average	1.00	8.00	36.0	0.38
SB Road/Bridge - Grading	Off-Highway Trucks	Diesel	Average	1.00	8.00	376	0.38
SB Road/Bridge - BC	Cranes	Diesel	Average	1.00	8.00	367	0.29
SB Road/Bridge - BC	Forklifts	Diesel	Average	1.00	8.00	82.0	0.20
SB Road/Bridge - BC	Generator Sets	Diesel	Average	1.00	8.00	14.0	0.74
SB Road/Bridge - BC	Crawler Tractors	Diesel	Average	1.00	8.00	87.0	0.43
SB Road/Bridge - Paving	Pavers	Diesel	Average	1.00	8.00	81.0	0.42
SB Road/Bridge - Paving	Rollers	Diesel	Average	1.00	8.00	36.0	0.38
SB Road/Bridge - Paving	Rubber Tired Dozers	Diesel	Average	1.00	8.00	367	0.40
SB Road/Bridge - Paving	Graders	Diesel	Average	1.00	8.00	148	0.41

5.3. Construction Vehicles

5.3.1. Unmitigated

Phase Name	Trip Type	One-Way Trips per Day	Miles per Trip	Vehicle Mix
SB Road/Bridge - Demo	—	—	—	—
SB Road/Bridge - Demo	Worker	0.00	18.5	LDA,LDT1,LDT2
SB Road/Bridge - Demo	Vendor	—	10.2	HHDT,MHDT
SB Road/Bridge - Demo	Hauling	0.00	20.0	HHDT
SB Road/Bridge - Demo	Onsite truck	—	—	HHDT
SB Road/Bridge - Grading	—	—	—	—
SB Road/Bridge - Grading	Worker	0.00	18.5	LDA,LDT1,LDT2
SB Road/Bridge - Grading	Vendor	—	10.2	HHDT,MHDT
SB Road/Bridge - Grading	Hauling	0.00	20.0	HHDT
SB Road/Bridge - Grading	Onsite truck	—	—	HHDT
SB Road/Bridge - BC	—	—	—	—
SB Road/Bridge - BC	Worker	0.00	18.5	LDA,LDT1,LDT2
SB Road/Bridge - BC	Vendor	0.00	10.2	HHDT,MHDT
SB Road/Bridge - BC	Hauling	0.00	20.0	HHDT
SB Road/Bridge - BC	Onsite truck	—	—	HHDT
SB Road/Bridge - Paving	—	—	—	—
SB Road/Bridge - Paving	Worker	0.00	18.5	LDA,LDT1,LDT2
SB Road/Bridge - Paving	Vendor	—	10.2	HHDT,MHDT
SB Road/Bridge - Paving	Hauling	0.00	20.0	HHDT
SB Road/Bridge - Paving	Onsite truck	—	—	HHDT

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

Non-applicable. No control strategies activated by user.

5.5. Architectural Coatings

Phase Name	Residential Interior Area Coated (sq ft)	Residential Exterior Area Coated (sq ft)	Non-Residential Interior Area Coated (sq ft)	Non-Residential Exterior Area Coated (sq ft)	Parking Area Coated (sq ft)

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

Phase Name	Material Imported (Cubic Yards)	Material Exported (Cubic Yards)	Acres Graded (acres)	Material Demolished (Ton of Debris)	Acres Paved (acres)
SB Road/Bridge - Demo	0.00	0.00	0.00	675	—
SB Road/Bridge - Grading	12,000	17,300	43.0	0.00	—
SB Road/Bridge - Paving	0.00	0.00	0.00	0.00	1.80

5.6.2. Construction Earthmoving Control Strategies

Control Strategies Applied	Frequency (per day)	PM10 Reduction	PM2.5 Reduction
Water Exposed Area	2	61%	61%
Water Demolished Area	2	36%	36%

5.7. Construction Paving

Land Use	Area Paved (acres)	% Asphalt
Other Asphalt Surfaces	1.80	100%

5.8. Construction Electricity Consumption and Emissions Factors

kWh per Year and Emission Factor (lb/MWh)

Year	kWh per Year	CO2	CH4	N2O
2029	0.00	532	0.03	< 0.005

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

Vegetation Land Use Type	Vegetation Soil Type	Initial Acres	Final Acres

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

Biomass Cover Type	Initial Acres	Final Acres

5.18.2. Sequestration

5.18.2.1. Unmitigated

Tree Type	Number	Electricity Saved (kWh/year)	Natural Gas Saved (btu/year)

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

Cal-Adapt midcentury 2040–2059 average projections for four hazards are reported below for your project location. These are under Representation Concentration Pathway (RCP) 8.5 which assumes GHG emissions will continue to rise strongly through 2050 and then plateau around 2100.

Climate Hazard	Result for Project Location	Unit
Temperature and Extreme Heat	9.96	annual days of extreme heat
Extreme Precipitation	5.90	annual days with precipitation above 20 mm

Sea Level Rise	—	meters of inundation depth
Wildfire	20.5	annual hectares burned

Temperature and Extreme Heat data are for grid cell in which your project are located. The projection is based on the 98th historical percentile of daily maximum/minimum temperatures from observed historical data (32 climate model ensemble from Cal-Adapt, 2040–2059 average under RCP 8.5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Extreme Precipitation data are for the grid cell in which your project are located. The threshold of 20 mm is equivalent to about ¾ an inch of rain, which would be light to moderate rainfall if received over a full day or heavy rain if received over a period of 2 to 4 hours. Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Sea Level Rise data are for the grid cell in which your project are located. The projections are from Radke et al. (2017), as reported in Cal-Adapt (Radke et al., 2017, CEC-500-2017-008), and consider inundation location and depth for the San Francisco Bay, the Sacramento-San Joaquin River Delta and California coast resulting different increments of sea level rise coupled with extreme storm events. Users may select from four scenarios to view the range in potential inundation depth for the grid cell. The four scenarios are: No rise, 0.5 meter, 1.0 meter, 1.41 meters
Wildfire data are for the grid cell in which your project are located. The projections are from UC Davis, as reported in Cal-Adapt (2040–2059 average under RCP 8.5), and consider historical data of climate, vegetation, population density, and large (> 400 ha) fire history. Users may select from four model simulations to view the range in potential wildfire probabilities for the grid cell. The four simulations make different assumptions about expected rainfall and temperature are: Warmer/drier (HadGEM2-ES), Cooler/wetter (CNRM-CM5), Average conditions (CanESM2), Range of different rainfall and temperature possibilities (MIROC5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.

6.2. Initial Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	1	0	0	N/A
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	1	0	0	N/A
Wildfire	1	0	0	N/A
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	0	0	0	N/A

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores do not include implementation of climate risk reduction measures.

6.3. Adjusted Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score

Temperature and Extreme Heat	1	1	1	2
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	1	1	1	2
Wildfire	1	1	1	2
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	1	1	1	2

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores include implementation of climate risk reduction measures.

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Exposure Indicators	—
AQ-Ozone	—
AQ-PM	—
AQ-DPM	—
Drinking Water	—
Lead Risk Housing	—
Pesticides	—
Toxic Releases	—

Traffic	—
Effect Indicators	—
CleanUp Sites	—
Groundwater	—
Haz Waste Facilities/Generators	—
Impaired Water Bodies	—
Solid Waste	—
Sensitive Population	—
Asthma	—
Cardio-vascular	—
Low Birth Weights	—
Socioeconomic Factor Indicators	—
Education	—
Housing	—
Linguistic	—
Poverty	—
Unemployment	—

7.2. Healthy Places Index Scores

The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Economic	—
Above Poverty	89.34941614
Employed	19.02989863
Median HI	97.69023483
Education	—
Bachelor's or higher	88.59232645

High school enrollment	100
Preschool enrollment	95.7141024
Transportation	—
Auto Access	93.63531374
Active commuting	12.16476325
Social	—
2-parent households	42.29436674
Voting	82.35596048
Neighborhood	—
Alcohol availability	89.4649044
Park access	38.81688695
Retail density	42.06339022
Supermarket access	2.399589375
Tree canopy	71.42307199
Housing	—
Homeownership	65.75131528
Housing habitability	87.501604
Low-inc homeowner severe housing cost burden	64.24996792
Low-inc renter severe housing cost burden	88.91312717
Uncrowded housing	62.10701912
Health Outcomes	—
Insured adults	89.59322469
Arthritis	0.0
Asthma ER Admissions	99.7
High Blood Pressure	0.0
Cancer (excluding skin)	0.0
Asthma	0.0

Coronary Heart Disease	0.0
Chronic Obstructive Pulmonary Disease	0.0
Diagnosed Diabetes	0.0
Life Expectancy at Birth	77.8
Cognitively Disabled	87.2
Physically Disabled	55.6
Heart Attack ER Admissions	99.5
Mental Health Not Good	0.0
Chronic Kidney Disease	0.0
Obesity	0.0
Pedestrian Injuries	93.4
Physical Health Not Good	0.0
Stroke	0.0
Health Risk Behaviors	—
Binge Drinking	0.0
Current Smoker	0.0
No Leisure Time for Physical Activity	0.0
Climate Change Exposures	—
Wildfire Risk	99.5
SLR Inundation Area	38.8
Children	43.1
Elderly	11.5
English Speaking	77.4
Foreign-born	54.6
Outdoor Workers	85.4
Climate Change Adaptive Capacity	—
Impervious Surface Cover	79.5

Traffic Density	81.9
Traffic Access	23.0
Other Indices	—
Hardship	5.4
Other Decision Support	—
2016 Voting	60.6

7.3. Overall Health & Equity Scores

Metric	Result for Project Census Tract
CalEnviroScreen 4.0 Score for Project Location (a)	—
Healthy Places Index Score for Project Location (b)	90.0
Project Located in a Designated Disadvantaged Community (Senate Bill 535)	No
Project Located in a Low-Income Community (Assembly Bill 1550)	No
Project Located in a Community Air Protection Program Community (Assembly Bill 617)	No

a: The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.
b: The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

7.4. Health & Equity Measures

No Health & Equity Measures selected.

7.5. Evaluation Scorecard

Health & Equity Evaluation Scorecard not completed.

7.6. Health & Equity Custom Measures

No Health & Equity Custom Measures created.

8. User Changes to Default Data

Screen	Justification
Construction: Construction Phases	see construction assumptions

Construction: Off-Road Equipment	see construction assumptions
Construction: Trips and VMT	construction mobile emissions calculated outside of CalEEMod.
Construction: Dust From Material Movement	see construction assumptions

Topanga-VS-Con Detailed Report

Table of Contents

1. Basic Project Information

1.1. Basic Project Information

1.2. Land Use Types

1.3. User-Selected Emission Reduction Measures by Emissions Sector

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

2.2. Construction Emissions by Year, Unmitigated

3. Construction Emissions Details

3.1. Site Preparation (2027) - Unmitigated

3.3. Grading (2027) - Unmitigated

3.5. Building Construction (2027) - Unmitigated

3.7. Paving (2027) - Unmitigated

3.9. Architectural Coating (2027) - Unmitigated

4. Operations Emissions Details

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

5. Activity Data

5.1. Construction Schedule

5.2. Off-Road Equipment

5.2.1. Unmitigated

5.3. Construction Vehicles

5.3.1. Unmitigated

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

5.5. Architectural Coatings

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

5.6.2. Construction Earthmoving Control Strategies

5.7. Construction Paving

5.8. Construction Electricity Consumption and Emissions Factors

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

5.18.2. Sequestration

5.18.2.1. Unmitigated

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

6.2. Initial Climate Risk Scores

6.3. Adjusted Climate Risk Scores

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

7.2. Healthy Places Index Scores

7.3. Overall Health & Equity Scores

7.4. Health & Equity Measures

7.5. Evaluation Scorecard

7.6. Health & Equity Custom Measures

8. User Changes to Default Data

1. Basic Project Information

1.1. Basic Project Information

Data Field	Value
Project Name	Topanga-VS-Con
Construction Start Date	1/1/2027
Lead Agency	—
Land Use Scale	Project/site
Analysis Level for Defaults	County
Windspeed (m/s)	2.70
Precipitation (days)	4.60
Location	18711 Pacific Coast Hwy, Malibu, CA 90265, USA
County	Los Angeles-South Coast
City	Unincorporated
Air District	South Coast AQMD
Air Basin	South Coast
TAZ	3802
EDFZ	7
Electric Utility	Southern California Edison
Gas Utility	Southern California Gas
App Version	2022.1.1.21

1.2. Land Use Types

Land Use Subtype	Size	Unit	Lot Acreage	Building Area (sq ft)	Landscape Area (sq ft)	Special Landscape Area (sq ft)	Population	Description
General Office Building	5.50	1000sqft	0.13	5,500	0.00	—	—	—

Parking Lot	75.0	Space	0.67	0.00	0.00	—	—	—

1.3. User-Selected Emission Reduction Measures by Emissions Sector

No measures selected

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Un/Mit.	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	1.70	10.1	12.6	16.7	0.03	0.47	0.00	0.47	0.44	0.00	0.44	—	3,026	3,026	0.12	0.02	0.00	3,037
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	1.55	1.30	11.4	12.4	0.02	0.52	2.76	3.28	0.48	1.34	1.81	—	2,238	2,238	0.09	0.02	0.00	2,245
Average Daily (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.35	0.46	2.75	3.73	0.01	0.11	0.03	0.14	0.10	0.01	0.11	—	768	768	0.03	0.01	0.00	771
Annual (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.06	0.08	0.50	0.68	< 0.005	0.02	0.01	0.02	0.02	< 0.005	0.02	—	127	127	0.01	< 0.005	0.00	128

2.2. Construction Emissions by Year, Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Year	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e

Daily - Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2027	1.70	10.1	12.6	16.7	0.03	0.47	0.00	0.47	0.44	0.00	0.44	—	3,026	3,026	0.12	0.02	0.00	3,037
Daily - Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2027	1.55	1.30	11.4	12.4	0.02	0.52	2.76	3.28	0.48	1.34	1.81	—	2,238	2,238	0.09	0.02	0.00	2,245
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2027	0.35	0.46	2.75	3.73	0.01	0.11	0.03	0.14	0.10	0.01	0.11	—	768	768	0.03	0.01	0.00	771
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2027	0.06	0.08	0.50	0.68	< 0.005	0.02	0.01	0.02	0.02	< 0.005	0.02	—	127	127	0.01	< 0.005	0.00	128

3. Construction Emissions Details

3.1. Site Preparation (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.49	0.41	3.44	5.56	0.01	0.17	—	0.17	0.15	—	0.15	—	859	859	0.03	0.01	—	862
Dust From Material Movement	—	—	—	—	—	—	0.21	0.21	—	0.02	0.02	—	—	—	—	—	—	—

Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	< 0.005	< 0.005	0.01	0.02	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	2.35	2.35	< 0.005	< 0.005	—	2.36
Dust From Material Movement	—	—	—	—	—	—	< 0.005	< 0.005	—	< 0.005	< 0.005	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	0.39	0.39	< 0.005	< 0.005	—	0.39
Dust From Material Movement	—	—	—	—	—	—	< 0.005	< 0.005	—	< 0.005	< 0.005	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.3. Grading (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.55	1.30	11.4	12.4	0.02	0.52	—	0.52	0.48	—	0.48	—	2,238	2,238	0.09	0.02	—	2,245
Dust From Material Movement	—	—	—	—	—	—	2.76	2.76	—	1.34	1.34	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.02	0.01	0.13	0.14	< 0.005	0.01	—	0.01	0.01	—	0.01	—	24.5	24.5	< 0.005	< 0.005	—	24.6

Dust From Material Movement	—	—	—	—	—	—	0.03	0.03	—	0.01	0.01	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	< 0.005	< 0.005	0.02	0.02	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	4.06	4.06	< 0.005	< 0.005	—	4.07
Dust From Material Movement	—	—	—	—	—	—	0.01	0.01	—	< 0.005	< 0.005	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.5. Building Construction (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.82	0.69	6.51	8.94	0.02	0.25	—	0.25	0.23	—	0.23	—	1,876	1,876	0.08	0.02	—	1,882
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.82	0.69	6.51	8.94	0.02	0.25	—	0.25	0.23	—	0.23	—	1,876	1,876	0.08	0.02	—	1,882
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.32	0.27	2.50	3.43	0.01	0.10	—	0.10	0.09	—	0.09	—	719	719	0.03	0.01	—	722
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.06	0.05	0.46	0.63	< 0.005	0.02	—	0.02	0.02	—	0.02	—	119	119	< 0.005	< 0.005	—	120
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.7. Paving (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipment	0.70	0.58	4.98	6.25	0.01	0.20	—	0.20	0.19	—	0.19	—	973	973	0.04	0.01	—	976
Paving	—	0.25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.01	0.01	0.10	0.12	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	18.7	18.7	< 0.005	< 0.005	—	18.7
Paving	—	< 0.005	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	< 0.005	< 0.005	0.02	0.02	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	3.09	3.09	< 0.005	< 0.005	—	3.10
Paving	—	< 0.005	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.9. Architectural Coating (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.18	0.15	1.11	1.50	< 0.005	0.03	—	0.03	0.02	—	0.02	—	178	178	0.01	< 0.005	—	179
Architectural Coatings	—	8.45	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	< 0.005	< 0.005	0.02	0.03	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	3.41	3.41	< 0.005	< 0.005	—	3.43
Architectural Coatings	—	0.16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	< 0.005	< 0.005	< 0.005	0.01	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	0.57	0.57	< 0.005	< 0.005	—	0.57
Architectural Coatings	—	0.03	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

4. Operations Emissions Details

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Vegetation	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Species	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

5. Activity Data

5.1. Construction Schedule

Phase Name	Phase Type	Start Date	End Date	Days Per Week	Work Days per Phase	Phase Description
Site Preparation	Site Preparation	1/1/2027	1/1/2027	7.00	1.00	—
Grading	Grading	1/2/2027	1/5/2027	7.00	4.00	—
Building Construction	Building Construction	1/6/2027	5/25/2027	7.00	140	—
Paving	Paving	5/19/2027	5/25/2027	7.00	7.00	—
Architectural Coating	Architectural Coating	5/19/2027	5/25/2027	7.00	7.00	—

5.2. Off-Road Equipment

5.2.1. Unmitigated

Phase Name	Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor
Site Preparation	Graders	Diesel	Average	1.00	8.00	148	0.41
Site Preparation	Tractors/Loaders/Backhoes	Diesel	Average	1.00	8.00	84.0	0.37

Grading	Graders	Diesel	Average	1.00	8.00	148	0.41
Grading	Rubber Tired Dozers	Diesel	Average	1.00	8.00	367	0.40
Grading	Tractors/Loaders/Backhoes	Diesel	Average	1.00	8.00	84.0	0.37
Building Construction	Cranes	Diesel	Average	1.00	8.00	367	0.29
Building Construction	Forklifts	Diesel	Average	2.00	8.00	82.0	0.20
Building Construction	Tractors/Loaders/Backhoes	Diesel	Average	2.00	8.00	84.0	0.37
Paving	Tractors/Loaders/Backhoes	Diesel	Average	1.00	8.00	84.0	0.37
Paving	Cement and Mortar Mixers	Diesel	Average	4.00	8.00	10.0	0.56
Paving	Pavers	Diesel	Average	1.00	8.00	81.0	0.42
Paving	Rollers	Diesel	Average	1.00	8.00	36.0	0.38
Architectural Coating	Air Compressors	Diesel	Average	1.00	8.00	37.0	0.48

5.3. Construction Vehicles

5.3.1. Unmitigated

Phase Name	Trip Type	One-Way Trips per Day	Miles per Trip	Vehicle Mix
Site Preparation	—	—	—	—
Site Preparation	Worker	0.00	18.5	LDA,LDT1,LDT2
Site Preparation	Vendor	—	10.2	HHDT,MHDT
Site Preparation	Hauling	0.00	20.0	HHDT
Site Preparation	Onsite truck	—	—	HHDT
Grading	—	—	—	—
Grading	Worker	0.00	18.5	LDA,LDT1,LDT2
Grading	Vendor	—	10.2	HHDT,MHDT
Grading	Hauling	0.00	20.0	HHDT

Grading	Onsite truck	—	—	HHDT
Building Construction	—	—	—	—
Building Construction	Worker	0.00	18.5	LDA,LDT1,LDT2
Building Construction	Vendor	0.00	10.2	HHDT,MHDT
Building Construction	Hauling	0.00	20.0	HHDT
Building Construction	Onsite truck	—	—	HHDT
Paving	—	—	—	—
Paving	Worker	0.00	18.5	LDA,LDT1,LDT2
Paving	Vendor	—	10.2	HHDT,MHDT
Paving	Hauling	0.00	20.0	HHDT
Paving	Onsite truck	—	—	HHDT
Architectural Coating	—	—	—	—
Architectural Coating	Worker	0.00	18.5	LDA,LDT1,LDT2
Architectural Coating	Vendor	—	10.2	HHDT,MHDT
Architectural Coating	Hauling	0.00	20.0	HHDT
Architectural Coating	Onsite truck	—	—	HHDT

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

Non-applicable. No control strategies activated by user.

5.5. Architectural Coatings

Phase Name	Residential Interior Area Coated (sq ft)	Residential Exterior Area Coated (sq ft)	Non-Residential Interior Area Coated (sq ft)	Non-Residential Exterior Area Coated (sq ft)	Parking Area Coated (sq ft)
Architectural Coating	0.00	0.00	8,250	2,750	1,764

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

Phase Name	Material Imported (cy)	Material Exported (cy)	Acres Graded (acres)	Material Demolished (sq. ft.)	Acres Paved (acres)
Site Preparation	—	—	0.50	0.00	—
Grading	—	—	4.00	0.00	—
Paving	0.00	0.00	0.00	0.00	0.67

5.6.2. Construction Earthmoving Control Strategies

Control Strategies Applied	Frequency (per day)	PM10 Reduction	PM2.5 Reduction
Water Exposed Area	2	61%	61%

5.7. Construction Paving

Land Use	Area Paved (acres)	% Asphalt
General Office Building	0.00	0%
Parking Lot	0.67	100%

5.8. Construction Electricity Consumption and Emissions Factors

kWh per Year and Emission Factor (lb/MWh)

Year	kWh per Year	CO2	CH4	N2O
2027	0.00	532	0.03	< 0.005

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

Vegetation Land Use Type	Vegetation Soil Type	Initial Acres	Final Acres

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

Biomass Cover Type	Initial Acres	Final Acres

5.18.2. Sequestration

5.18.2.1. Unmitigated

Tree Type	Number	Electricity Saved (kWh/year)	Natural Gas Saved (btu/year)

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

Cal-Adapt midcentury 2040–2059 average projections for four hazards are reported below for your project location. These are under Representation Concentration Pathway (RCP) 8.5 which assumes GHG emissions will continue to rise strongly through 2050 and then plateau around 2100.

Climate Hazard	Result for Project Location	Unit
Temperature and Extreme Heat	9.96	annual days of extreme heat
Extreme Precipitation	5.90	annual days with precipitation above 20 mm
Sea Level Rise	—	meters of inundation depth
Wildfire	20.5	annual hectares burned

Temperature and Extreme Heat data are for grid cell in which your project are located. The projection is based on the 98th historical percentile of daily maximum/minimum temperatures from observed historical data (32 climate model ensemble from Cal-Adapt, 2040–2059 average under RCP 8.5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Extreme Precipitation data are for the grid cell in which your project are located. The threshold of 20 mm is equivalent to about ¾ an inch of rain, which would be light to moderate rainfall if received over a full day or heavy rain if received over a period of 2 to 4 hours. Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Sea Level Rise data are for the grid cell in which your project are located. The projections are from Radke et al. (2017), as reported in Cal-Adapt (Radke et al., 2017, CEC-500-2017-008), and consider inundation location and depth for the San Francisco Bay, the Sacramento-San Joaquin River Delta and California coast resulting different increments of sea level rise coupled with extreme storm events. Users may select from four scenarios to view the range in potential inundation depth for the grid cell. The four scenarios are: No rise, 0.5 meter, 1.0 meter, 1.41 meters
Wildfire data are for the grid cell in which your project are located. The projections are from UC Davis, as reported in Cal-Adapt (2040–2059 average under RCP 8.5), and consider historical data of climate, vegetation, population density, and large (> 400 ha) fire history. Users may select from four model simulations to view the range in potential wildfire probabilities for the grid cell. The four simulations make different assumptions about expected rainfall and temperature are: Warmer/drier (HadGEM2-ES), Cooler/wetter (CNRM-CM5), Average conditions (CanESM2), Range of different rainfall and temperature possibilities (MIROC5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.

6.2. Initial Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	1	0	0	N/A
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	1	0	0	N/A
Wildfire	1	0	0	N/A
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	0	0	0	N/A

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores do not include implementation of climate risk reduction measures.

6.3. Adjusted Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	1	1	1	2
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	1	1	1	2
Wildfire	1	1	1	2
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	1	1	1	2

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.

The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores include implementation of climate risk reduction measures.

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Exposure Indicators	—
AQ-Ozone	—
AQ-PM	—
AQ-DPM	—
Drinking Water	—
Lead Risk Housing	—
Pesticides	—
Toxic Releases	—
Traffic	—
Effect Indicators	—
CleanUp Sites	—
Groundwater	—
Haz Waste Facilities/Generators	—
Impaired Water Bodies	—
Solid Waste	—
Sensitive Population	—
Asthma	—
Cardio-vascular	—

Low Birth Weights	—
Socioeconomic Factor Indicators	—
Education	—
Housing	—
Linguistic	—
Poverty	—
Unemployment	—

7.2. Healthy Places Index Scores

The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Economic	—
Above Poverty	89.34941614
Employed	19.02989863
Median HI	97.69023483
Education	—
Bachelor's or higher	88.59232645
High school enrollment	100
Preschool enrollment	95.7141024
Transportation	—
Auto Access	93.63531374
Active commuting	12.16476325
Social	—
2-parent households	42.29436674
Voting	82.35596048
Neighborhood	—
Alcohol availability	89.4649044

Park access	38.81688695
Retail density	42.06339022
Supermarket access	2.399589375
Tree canopy	71.42307199
Housing	—
Homeownership	65.75131528
Housing habitability	87.501604
Low-inc homeowner severe housing cost burden	64.24996792
Low-inc renter severe housing cost burden	88.91312717
Uncrowded housing	62.10701912
Health Outcomes	—
Insured adults	89.59322469
Arthritis	0.0
Asthma ER Admissions	99.7
High Blood Pressure	0.0
Cancer (excluding skin)	0.0
Asthma	0.0
Coronary Heart Disease	0.0
Chronic Obstructive Pulmonary Disease	0.0
Diagnosed Diabetes	0.0
Life Expectancy at Birth	77.8
Cognitively Disabled	87.2
Physically Disabled	55.6
Heart Attack ER Admissions	99.5
Mental Health Not Good	0.0
Chronic Kidney Disease	0.0
Obesity	0.0

Pedestrian Injuries	93.4
Physical Health Not Good	0.0
Stroke	0.0
Health Risk Behaviors	—
Binge Drinking	0.0
Current Smoker	0.0
No Leisure Time for Physical Activity	0.0
Climate Change Exposures	—
Wildfire Risk	99.5
SLR Inundation Area	38.8
Children	43.1
Elderly	11.5
English Speaking	77.4
Foreign-born	54.6
Outdoor Workers	85.4
Climate Change Adaptive Capacity	—
Impervious Surface Cover	79.5
Traffic Density	81.9
Traffic Access	23.0
Other Indices	—
Hardship	5.4
Other Decision Support	—
2016 Voting	60.6

7.3. Overall Health & Equity Scores

Metric	Result for Project Census Tract
CalEnviroScreen 4.0 Score for Project Location (a)	—

Healthy Places Index Score for Project Location (b)	90.0
Project Located in a Designated Disadvantaged Community (Senate Bill 535)	No
Project Located in a Low-Income Community (Assembly Bill 1550)	No
Project Located in a Community Air Protection Program Community (Assembly Bill 617)	No

a: The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.
b: The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

7.4. Health & Equity Measures

No Health & Equity Measures selected.

7.5. Evaluation Scorecard

Health & Equity Evaluation Scorecard not completed.

7.6. Health & Equity Custom Measures

No Health & Equity Custom Measures created.

8. User Changes to Default Data

Screen	Justification
Land Use	see construction assumptions
Construction: Construction Phases	see construction assumptions
Construction: Off-Road Equipment	see construction assumptions
Construction: Trips and VMT	construction mobile emissions calculated outside of CalEEMod.

P.4-1 Option 2 Construction GHG Mobile Emissions

Topanga Canyon - Op2 and 3
Total Emissions

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Idling per Day (minutes)	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10 Dust	PM10 Exh	Total PM10	PM2.5 Dust	PM2.5 Exh	Total PM2.5	(MT/yr) Total CO2e
Grading/Excavation	2030															
Total Haul Trips	200															
Hauling	6	43	8	36.5	15	0.02	0.86	0.43	0.01	0.20	0.01	0.21	0.05	0.01	0.06	11.02
Vendor	0	214	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0	0.10	0.10	1.47	0.00	0.52	0.00	0.52	0.13	0.00	0.13	43.18
					Total	0.12	0.96	1.90	0.01	0.72	0.01	0.73	0.18	0.01	0.19	54.20
Demolition NB Road/Bridge	2031				Workers+Ver	0.10	0.10	1.47	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	0															
Hauling	0	43	8	36.5	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	59	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	18.5	0	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	11.69
					Total	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	11.69
Construct NB Road/Bridge	2031	Grading/Excavation			Workers+Ver	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	200															
Hauling	6	43	8	36.5	15	0.02	0.83	0.42	0.01	0.20	0.01	0.21	0.05	0.01	0.06	10.73
Vendor	0	61	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	12.08
					Total	0.11	0.92	1.81	0.01	0.72	0.01	0.73	0.18	0.01	0.19	22.82
Construct NB Road/Bridge	2031	Building Construction			Workers+Ver	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	330															
Hauling	4	152	8	36.5	15	0.01	0.56	0.28	0.00	0.14	0.01	0.14	0.04	0.01	0.04	17.71
Vendor	0	214	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	42.39
					Total	0.10	0.64	1.67	0.01	0.65	0.01	0.66	0.16	0.01	0.17	60.10
Construct NB Road/Bridge	2031	Paving			Workers+Ver	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	0															
Hauling	0	23	8	36.5	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	6.14
					Total	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	6.14
					Workers+Ver	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	

Topanga Canyon - Op2 and 3
Running Emissions

		Running Emissions Factor (grams/mile)						Running Emissions Factor (grams/mile)		
		ROG_RUNEX	NOx_RUNEX	CO_RUNEX	SOx_RUNEX	PM10_RUNEX	PM2.5_RUNEX	CO2_RUNEX	CH4_RUNEX	N2O_RUNEX
2027	2027Hauling Hauling	0.013128	1.553518611	0.45473657	0.01336714	0.02273486	0.02174732	1471.80075	0.0608523	0.23462364
2027	2027Vendor Vendor	0.01570588	1.102331968	0.36327753	0.01214871	0.01475662	0.01411185	1311.1435	0.03509759	0.18307889
2027	2027Worker Worker	0.01447264	0.062492418	0.90233334	0.00281062	0.00150729	0.0013867	284.320587	0.00354266	0.00566149
2028	2028Hauling Hauling	0.01261339	1.493718015	0.43877031	0.01305596	0.02247317	0.02149714	1438.29866	0.05768159	0.22931835
2028	2028Vendor Vendor	0.01417298	1.038868065	0.3360531	0.01185313	0.01426835	0.01364491	1280.01295	0.03342244	0.17922194
2028	2028Worker Worker	0.01314756	0.057035459	0.85167037	0.00274948	0.00140448	0.00129194	278.134904	0.00325313	0.00533773
2029	2029Hauling Hauling	0.01213472	1.434866903	0.4224926	0.01273534	0.0221686	0.0212059	1403.60667	0.05465536	0.22381566
2029	2029Vendor Vendor	0.0128196	0.978781777	0.31101237	0.01152628	0.01380314	0.01320005	1245.46404	0.03180989	0.17489835
2029	2029Worker Worker	0.01192021	0.051957034	0.80464317	0.00269297	0.00130724	0.00120239	272.417637	0.00298654	0.00503952
2030	2030Hauling Hauling	0.01169729	1.381905725	0.40596438	0.01241489	0.02183595	0.02088778	1368.72007	0.05170538	0.2182712
2030	2030Vendor Vendor	0.01168751	0.9252091	0.28941545	0.01117412	0.01336285	0.01277903	1208.11234	0.03023265	0.17022289
2030	2030Worker Worker	0.01081241	0.047255061	0.76242747	0.00264062	0.00121547	0.00111789	267.121939	0.00274623	0.00476556
2031	2031Hauling Hauling	0.01126827	1.331771303	0.38663416	0.01209496	0.02148002	0.02054741	1333.31591	0.04842446	0.21262163
2031	2031Vendor Vendor	0.01070694	0.874998281	0.26868024	0.01079467	0.01293916	0.01237394	1167.57711	0.02847022	0.16520071
2031	2031Worker Worker	0.00977403	0.042746598	0.72305591	0.00259298	0.00112929	0.00103861	262.302837	0.0025216	0.00450761
0	GWP	N/A	N/A	N/A	N/A	N/A	N/A	1	25	298

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10	PM2.5	Regional Emissions (MT/year) CO2	CH4	N2O	CO2e
Grading/Excavation	2030													
Total Haul Trips	200													
Hauling	6	43	8	36.5	0.01	0.67	0.20	0.01	0.01	0.01	9.99	0.01	0.47	10.48
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.02	0.08	1.24	0.00	0.00	0.00	42.30	0.01	0.22	42.54
Demolition NB Road/Bridge	2031													
Total Haul Trips	0													
Hauling	0	43	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	59	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	18.5	0.02	0.07	1.18	0.00	0.00	0.00	11.45	0.00	0.06	11.51
Construct NB Road/Bridge	2031													
Total Haul Trips	200													
Hauling	6	43	8	36.5	0.01	0.64	0.19	0.01	0.01	0.01	9.73	0.01	0.46	10.20
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0.02	0.07	1.18	0.00	0.00	0.00	11.84	0.00	0.06	11.90
Construct NB Road/Bridge	2031													
Total Haul Trips	330													
Hauling	4	152	8	36.5	0.00	0.43	0.12	0.00	0.01	0.01	16.06	0.01	0.76	16.84
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.02	0.07	1.18	0.00	0.00	0.00	41.54	0.01	0.21	41.76
Construct NB Road/Bridge	2031													
Total Haul Trips	0													
Hauling	0	23	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0.02	0.07	1.18	0.00	0.00	0.00	6.02	0.00	0.03	6.05

Topanga Canyon - Op2 and 3
Start Emissions

			Start Emissions Factor (grams/trip)						Start Emissions Factor (grams/trip)		
			ROG_STREX	NOX_STREX	CO_STREX	SOx_STREX	PM10_STREX	PM2.5_STREX	CO2_STREX	CH4_STREX	N2O_STREX
2027	2027Hauling	Hauling	0.00060894	2.672142352	0.00302137	3.16557E-07	5.30481E-07	4.87758E-07	0.03202066	7.5498E-08	7.36611E-06
2027	2027Vendor	Vendor	0.080213538	1.961946447	0.60365405	5.50826E-05	6.07836E-05	5.58883E-05	5.57177064	0.005494835	0.004037678
2027	2027Worker	Worker	1.038950633	0.251050817	3.01934346	0.000691936	0.002053348	0.001887978	69.9913431	0.06616369	0.030829475
2028	2028Hauling	Hauling	0.000490696	2.636914961	0.00257595	2.71845E-07	4.29594E-07	3.94995E-07	0.02749789	6.56178E-08	5.97594E-06
2028	2028Vendor	Vendor	0.075419112	1.927915654	0.55968909	5.22383E-05	5.76932E-05	5.30468E-05	5.28405692	0.005169504	0.003780947
2028	2028Worker	Worker	0.997046953	0.239560346	2.85187017	0.000675557	0.001941969	0.001785569	68.3345653	0.062483886	0.030029939
2029	2029Hauling	Hauling	0.000383539	2.591170334	0.00214107	2.33546E-07	3.28727E-07	3.02252E-07	0.02362391	5.62127E-08	4.65545E-06
2029	2029Vendor	Vendor	0.069289941	1.883995908	0.51714657	4.94212E-05	5.46034E-05	5.02058E-05	4.99909929	0.004852786	0.003548842
2029	2029Worker	Worker	0.945798618	0.229251267	2.69630558	0.000660221	0.001832244	0.00168468	66.7833	0.059077063	0.029313823
2030	2030Hauling	Hauling	0.00027279	2.546881303	0.00161285	1.92445E-07	2.06187E-07	1.89581E-07	0.01946637	4.71315E-08	4.0595E-06
2030	2030Vendor	Vendor	0.063656597	1.839529651	0.47865041	4.67001E-05	5.18671E-05	4.76899E-05	4.72385215	0.004565454	0.003322989
2030	2030Worker	Worker	0.901632052	0.219772527	2.55165593	0.00064583	0.001725708	0.001586724	65.3276344	0.055883281	0.028658371
2031	2031Hauling	Hauling	0.000210057	2.503276097	0.00139863	1.66951E-07	1.58801E-07	1.46012E-07	0.01688763	4.13015E-08	2.64568E-06
2031	2031Vendor	Vendor	0.059141215	1.792713918	0.44197461	4.38654E-05	4.91716E-05	4.52115E-05	4.43711805	0.004280254	0.003105544
2031	2031Worker	Worker	0.857879142	0.211029605	2.41545051	0.000632455	0.001621689	0.001491083	63.974738	0.052892816	0.028060877
	GWP			N/A					1	25	298

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10	PM2.5	Regional Emissions (MT/year) CO2	CH4	N2O	CO2e
Grading/Excavation	2030													
Total Haul Trips	200													
Hauling	6	43	8	36.5	0.00	0.03	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.08	0.02	0.23	0.00	0.00	0.00	0.56	0.00	0.00	0.64
Demolition NB Road/Bridg	2031													
Total Haul Trips	0													
Hauling	0	43	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	59	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	18.5	0.08	0.02	0.21	0.00	0.00	0.00	0.15	0.00	0.00	0.17
Construct NB Road/Bridge	2031													
Total Haul Trips	200													
Hauling	6	43	8	36.5	0.00	0.03	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0.08	0.02	0.21	0.00	0.00	0.00	0.16	0.00	0.00	0.18
Construct NB Road/Bridge	2031													
Total Haul Trips	330													
Hauling	4	152	8	36.5	0.00	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.08	0.02	0.21	0.00	0.00	0.00	0.55	0.00	0.00	0.63
Construct NB Road/Bridge	2031													
Total Haul Trips	0													
Hauling	0	23	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0.08	0.02	0.21	0.00	0.00	0.00	0.08	0.00	0.00	0.09

Topanga Canyon - Op2 and 3
Idling Emissions

			Idling Emissions Factor (grams/minute)						Idling Emissions Factor (grams/minute)		
			ROG_IDLEX	NOx_IDLEX	CO_IDLEX	SOx_IDLEX	PM10_IDLEX	PM2.5_IDLEX	CO2_IDLEX	CH4_IDLEX	N2O_IDLEX
2027	2027Hauling	Hauling	0.07592279	0.881696127	1.19921987	0.00159973	0.00047074	0.00044926	181.442358	0.03427011	0.02916541
2027	2027Vendor	Vendor	0.05529965	0.899602458	1.04932075	0.00167506	0.00086494	0.00082645	186.589554	0.03155173	0.02918792
2027	2027Worker	Worker	0	0	0	0	0	0	0	0	0
2028	2028Hauling	Hauling	0.07529788	0.857767875	1.19214339	0.00156045	0.00045204	0.00043133	177.300744	0.03377364	0.02851321
2028	2028Vendor	Vendor	0.05432839	0.863093228	1.0395891	0.00163993	0.00074988	0.00071632	182.978932	0.03134729	0.02865517
2028	2028Worker	Worker	0	0	0	0	0	0	0	0	0
2029	2029Hauling	Hauling	0.07461794	0.835480721	1.18399992	0.00152188	0.00043143	0.00041158	173.194944	0.03323976	0.02786481
2029	2029Vendor	Vendor	0.05333308	0.827999465	1.02749811	0.0016013	0.00065239	0.00062302	178.951612	0.03104801	0.02805443
2029	2029Worker	Worker	0	0	0	0	0	0	0	0	0
2030	2030Hauling	Hauling	0.07391144	0.816007794	1.17493744	0.0014846	0.00041331	0.00039421	169.186161	0.03269373	0.0272299
2030	2030Vendor	Vendor	0.05232472	0.795299763	1.01321823	0.00155966	0.00057171	0.0005458	174.561724	0.03067462	0.02739395
2030	2030Worker	Worker	0	0	0	0	0	0	0	0	0
2031	2031Hauling	Hauling	0.0732853	0.799579641	1.1664382	0.00145061	0.00039768	0.00037924	165.457521	0.03205186	0.02663599
2031	2031Vendor	Vendor	0.05130878	0.763402339	0.99683404	0.00151522	0.00050437	0.00048136	169.805962	0.03011968	0.02667472
2031	2031Worker	Worker	0	0	0	0	0	0	0	0	0
		GWP	N/A	N/A	N/A	N/A	N/A	N/A	1	25	298

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	Idling minutes per Day	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10	PM2.5	Regional Emissions (MT/year) CO2	CH4	N2O	CO2e
Grading/Excavation	2030													
Total Haul Trips	200													
Hauling	6	43	8	15	0.01	0.16	0.23	0.00	0.00	0.00	0.51	0.00	0.02	0.53
Vendor	0	214	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Demolition NB Road/Bridge	2031													
Total Haul Trips	0													
Hauling	0	43	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	59	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct NB Road/Bridge	2031													
Total Haul Trips	200													
Hauling	6	43	8	15	0.01	0.16	0.23	0.00	0.00	0.00	0.50	0.00	0.02	0.52
Vendor	0	61	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct NB Road/Bridge	2031													
Total Haul Trips	330													
Hauling	4	152	8	15	0.01	0.11	0.15	0.00	0.00	0.00	0.82	0.00	0.04	0.86
Vendor	0	214	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct NB Road/Bridge	2031													
Total Haul Trips	0													
Hauling	0	23	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Topanga Canyon - Op2 and 3
Road Dust, Break Wear, and Tire wear Emissions

			Emission Factors (grams/mile)					
			PM10			PM2.5		
			RD	PM10_PMBW	PM10_PMTW	RD	PM2.5_PMBW	PM2.5_PMTW
2027	2027Hauling	Hauling	0.29984991	0.084297987	0.03545106	0.07359952	0.0295043	0.00886277
2027	2027Vendor	Vendor	0.29984991	0.063623189	0.02372553	0.07359952	0.02226812	0.00593138
2027	2027Worker	Worker	0.29984991	0.009305649	0.008	0.07359952	0.00325698	0.002
2028	2028Hauling	Hauling	0.29984991	0.084486989	0.03545475	0.07359952	0.02957045	0.00886369
2028	2028Vendor	Vendor	0.29984991	0.063544145	0.02372738	0.07359952	0.02224045	0.00593184
2028	2028Worker	Worker	0.29984991	0.009284129	0.008	0.07359952	0.00324945	0.002
2029	2029Hauling	Hauling	0.29984991	0.084584422	0.03545835	0.07359952	0.02960455	0.00886459
2029	2029Vendor	Vendor	0.29984991	0.063359545	0.02372918	0.07359952	0.02217584	0.00593229
2029	2029Worker	Worker	0.29984991	0.00926272	0.008	0.07359952	0.00324195	0.002
2030	2030Hauling	Hauling	0.29984991	0.08460378	0.03546191	0.07359952	0.02961132	0.00886548
2030	2030Vendor	Vendor	0.29984991	0.063078834	0.02373095	0.07359952	0.02207759	0.00593274
2030	2030Worker	Worker	0.29984991	0.00924132	0.008	0.07359952	0.00323446	0.002
2031	2031Hauling	Hauling	0.29984991	0.084504548	0.03546578	0.07359952	0.02957659	0.00886644
2031	2031Vendor	Vendor	0.29984991	0.062682863	0.02373289	0.07359952	0.021939	0.00593322
2031	2031Worker	Worker	0.29984991	0.009221285	0.008	0.07359952	0.00322745	0.002

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day)					
					PM10			PM2.5		
					RD	BW	TW	RD	BW	TW
Grading/Excavation	2030									
Total Haul Trips	200									
Hauling	6	43	8	36.5	0.14	0.04	0.02	0.04	0.01	0.00
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Demolition NB Road/Bridge	2031									
Total Haul Trips	0									
Hauling	0	43	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	59	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Construct NB Road/Bridge	2031									
Total Haul Trips	200									
Hauling	6	43	8	36.5	0.14	0.04	0.02	0.04	0.01	0.00
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Construct NB Road/Bridge	2031									
Total Haul Trips	330									
Hauling	4	152	8	36.5	0.10	0.03	0.01	0.02	0.01	0.00
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Construct NB Road/Bridge	2031									
Total Haul Trips	0									
Hauling	0	23	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00

Topanga Canyon - Op2 and 3
Road Dust

Paved Road Dust Emission Factors (Assumes No Precipitation)

Formula: $EF_{Dust,P} = (k\ (sL)^{0.91} \times (W)^{1.02})$

Where:

$EF_{Dust,P}$ =	Paved Road Dust Emission Factor (having the same units as k)
k =	particle size multiplier
sL =	road surface silt loading (g/m^2)
W =	average fleet vehicle weight (tons) (CARB uses 2.4 tons as a fleet average vehicle weight factor)

	Emission Factor (grams per VMT)	
	PM10	PM2.5
k	0.9979	0.2449
sL	0.1	0.1
W	2.4	2.4
$EF_{Dust,P}$	3.00E-01	7.36E-02

Unpaved Road Dust Emission Factors (Assumes No Precipitation)

Formula: $EF_{Dust,U} = (k\ (\ s / 12)^{1} \times (Sp / 30)^{0.5} / (M / 0.5)^{0.2}) - C)$

Where:

$EF_{Dust,U}$ =	Unpaved Road Dust Emission Factor (having the same units as k)
k =	particle size multiplier
s =	surface material silt content (%)
Sp =	mean vehicle speed (mph)
M =	surface material moisture content (%)
C =	Emission Factor for 1980s vehicle fleet exhaust, brake wear, and tire wear

	Emission Factor (grams per VMT)	
	PM10	PM2.5
k	816.47	81.65
s	4.3%	4.3%
Sp	15	15
M	0.5%	0.5%
C	0.00047	0.00036
$EF_{Dust,U}$	5.20E+00	5.19E-01

Sources:

SCAQMD, CalEEMod, Version 2022.1.

CARB, *Entrained Dust from Paved Road Travel: Emission Estimation Methodology Background Document* , (1997).

USEPA, *AP-42* , Fifth Edition, Volume I, Chapter 13.2.1 - Paved Roads, (2011).

ESA, 2023.

P.4-2 Option 2 Construction Modeling

Topanga-Op2-Con Detailed Report

Table of Contents

1. Basic Project Information

1.1. Basic Project Information

1.2. Land Use Types

1.3. User-Selected Emission Reduction Measures by Emissions Sector

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

2.2. Construction Emissions by Year, Unmitigated

3. Construction Emissions Details

3.1. Grading (2030) - Unmitigated

4. Operations Emissions Details

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

5. Activity Data

5.1. Construction Schedule

5.2. Off-Road Equipment

5.2.1. Unmitigated

5.3. Construction Vehicles

5.3.1. Unmitigated

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

5.5. Architectural Coatings

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

5.6.2. Construction Earthmoving Control Strategies

5.7. Construction Paving

5.8. Construction Electricity Consumption and Emissions Factors

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

5.18.2. Sequestration

5.18.2.1. Unmitigated

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

6.2. Initial Climate Risk Scores

6.3. Adjusted Climate Risk Scores

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

7.2. Healthy Places Index Scores

7.3. Overall Health & Equity Scores

7.4. Health & Equity Measures

7.5. Evaluation Scorecard

7.6. Health & Equity Custom Measures

8. User Changes to Default Data

1. Basic Project Information

1.1. Basic Project Information

Data Field	Value
Project Name	Topanga-Op2-Con
Construction Start Date	4/1/2030
Lead Agency	—
Land Use Scale	Project/site
Analysis Level for Defaults	County
Windspeed (m/s)	2.70
Precipitation (days)	4.60
Location	18711 Pacific Coast Hwy, Malibu, CA 90265, USA
County	Los Angeles-South Coast
City	Unincorporated
Air District	South Coast AQMD
Air Basin	South Coast
TAZ	3802
EDFZ	7
Electric Utility	Southern California Edison
Gas Utility	Southern California Gas
App Version	2022.1.1.21

1.2. Land Use Types

Land Use Subtype	Size	Unit	Lot Acreage	Building Area (sq ft)	Landscape Area (sq ft)	Special Landscape Area (sq ft)	Population	Description
Other Non-Asphalt Surfaces	8.00	1000sqft	0.18	0.00	0.00	—	—	—

1.3. User-Selected Emission Reduction Measures by Emissions Sector

No measures selected

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Un/Mit.	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.52	0.43	3.29	5.10	0.01	0.14	0.21	0.35	0.13	0.02	0.16	—	792	792	0.03	0.01	0.00	795
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.52	0.43	3.29	5.10	0.01	0.14	0.21	0.35	0.13	0.02	0.16	—	792	792	0.03	0.01	0.00	795
Average Daily (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.30	0.25	1.93	2.99	< 0.005	0.08	0.12	0.21	0.08	0.01	0.09	—	464	464	0.02	< 0.005	0.00	466
Annual (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.06	0.05	0.35	0.55	< 0.005	0.02	0.02	0.04	0.01	< 0.005	0.02	—	76.9	76.9	< 0.005	< 0.005	0.00	77.1

2.2. Construction Emissions by Year, Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Year	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily - Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

2030	0.52	0.43	3.29	5.10	0.01	0.14	0.21	0.35	0.13	0.02	0.16	—	792	792	0.03	0.01	0.00	795
Daily - Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2030	0.52	0.43	3.29	5.10	0.01	0.14	0.21	0.35	0.13	0.02	0.16	—	792	792	0.03	0.01	0.00	795
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2030	0.30	0.25	1.93	2.99	< 0.005	0.08	0.12	0.21	0.08	0.01	0.09	—	464	464	0.02	< 0.005	0.00	466
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2030	0.06	0.05	0.35	0.55	< 0.005	0.02	0.02	0.04	0.01	< 0.005	0.02	—	76.9	76.9	< 0.005	< 0.005	0.00	77.1

3. Construction Emissions Details

3.1. Grading (2030) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.52	0.43	3.29	5.10	0.01	0.14	—	0.14	0.13	—	0.13	—	792	792	0.03	0.01	—	795
Dust From Material Movement	—	—	—	—	—	—	0.21	0.21	—	0.02	0.02	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipment	0.52	0.43	3.29	5.10	0.01	0.14	—	0.14	0.13	—	0.13	—	792	792	0.03	0.01	—	795
Dust From Material Movement	—	—	—	—	—	—	0.21	0.21	—	0.02	0.02	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.30	0.25	1.93	2.99	< 0.005	0.08	—	0.08	0.08	—	0.08	—	464	464	0.02	< 0.005	—	466
Dust From Material Movement	—	—	—	—	—	—	0.12	0.12	—	0.01	0.01	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.06	0.05	0.35	0.55	< 0.005	0.02	—	0.02	0.01	—	0.01	—	76.9	76.9	< 0.005	< 0.005	—	77.1
Dust From Material Movement	—	—	—	—	—	—	0.02	0.02	—	< 0.005	< 0.005	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

4. Operations Emissions Details

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Vegetation	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Species	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Sequest	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

5. Activity Data

5.1. Construction Schedule

Phase Name	Phase Type	Start Date	End Date	Days Per Week	Work Days per Phase	Phase Description
Grading	Grading	4/1/2030	10/31/2030	7.00	214	—

5.2. Off-Road Equipment

5.2.1. Unmitigated

Phase Name	Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor
Grading	Graders	Diesel	Average	1.00	8.00	148	0.41
Grading	Excavators	Diesel	Average	1.00	8.00	36.0	0.38
Grading	Pumps	Diesel	Average	1.00	8.00	11.0	0.74

5.3. Construction Vehicles

5.3.1. Unmitigated

Phase Name	Trip Type	One-Way Trips per Day	Miles per Trip	Vehicle Mix
Grading	—	—	—	—
Grading	Worker	0.00	18.5	LDA,LDT1,LDT2
Grading	Vendor	—	10.2	HHDT,MHDT
Grading	Hauling	0.00	20.0	HHDT
Grading	Onsite truck	—	—	HHDT

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

Non-applicable. No control strategies activated by user.

5.5. Architectural Coatings

Phase Name	Residential Interior Area Coated (sq ft)	Residential Exterior Area Coated (sq ft)	Non-Residential Interior Area Coated (sq ft)	Non-Residential Exterior Area Coated (sq ft)	Parking Area Coated (sq ft)

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

Phase Name	Material Imported (Cubic Yards)	Material Exported (Cubic Yards)	Acres Graded (acres)	Material Demolished (sq. ft.)	Acres Paved (acres)
Grading	—	1,000	77.0	0.00	—

5.6.2. Construction Earthmoving Control Strategies

Control Strategies Applied	Frequency (per day)	PM10 Reduction	PM2.5 Reduction
Water Exposed Area	2	61%	61%

5.7. Construction Paving

Land Use	Area Paved (acres)	% Asphalt
Other Non-Asphalt Surfaces	0.18	0%

5.8. Construction Electricity Consumption and Emissions Factors

kWh per Year and Emission Factor (lb/MWh)

Year	kWh per Year	CO2	CH4	N2O
2030	0.00	532	0.03	< 0.005

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

Vegetation Land Use Type	Vegetation Soil Type	Initial Acres	Final Acres

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

Biomass Cover Type	Initial Acres	Final Acres

5.18.2. Sequestration

5.18.2.1. Unmitigated

Tree Type	Number	Electricity Saved (kWh/year)	Natural Gas Saved (btu/year)

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

Cal-Adapt midcentury 2040–2059 average projections for four hazards are reported below for your project location. These are under Representation Concentration Pathway (RCP) 8.5 which assumes GHG emissions will continue to rise strongly through 2050 and then plateau around 2100.

Climate Hazard	Result for Project Location	Unit
Temperature and Extreme Heat	9.96	annual days of extreme heat
Extreme Precipitation	5.90	annual days with precipitation above 20 mm
Sea Level Rise	—	meters of inundation depth
Wildfire	20.5	annual hectares burned

Temperature and Extreme Heat data are for grid cell in which your project are located. The projection is based on the 98th historical percentile of daily maximum/minimum temperatures from observed historical data (32 climate model ensemble from Cal-Adapt, 2040–2059 average under RCP 8.5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Extreme Precipitation data are for the grid cell in which your project are located. The threshold of 20 mm is equivalent to about ¾ an inch of rain, which would be light to moderate rainfall if received over a full day or heavy rain if received over a period of 2 to 4 hours. Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Sea Level Rise data are for the grid cell in which your project are located. The projections are from Radke et al. (2017), as reported in Cal-Adapt (Radke et al., 2017, CEC-500-2017-008), and consider inundation location and depth for the San Francisco Bay, the Sacramento-San Joaquin River Delta and California coast resulting different increments of sea level rise coupled with extreme storm events. Users may select from four scenarios to view the range in potential inundation depth for the grid cell. The four scenarios are: No rise, 0.5 meter, 1.0 meter, 1.41 meters
Wildfire data are for the grid cell in which your project are located. The projections are from UC Davis, as reported in Cal-Adapt (2040–2059 average under RCP 8.5), and consider historical data of climate, vegetation, population density, and large (> 400 ha) fire history. Users may select from four model simulations to view the range in potential wildfire probabilities for the grid cell. The four simulations make different assumptions about expected rainfall and temperature are: Warmer/drier (HadGEM2-ES), Cooler/wetter (CNRM-CM5), Average conditions (CanESM2), Range of different rainfall and temperature possibilities (MIROC5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.

6.2. Initial Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	1	0	0	N/A
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	1	0	0	N/A
Wildfire	1	0	0	N/A
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	0	0	0	N/A

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores do not include implementation of climate risk reduction measures.

6.3. Adjusted Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	1	1	1	2
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	1	1	1	2

Wildfire	1	1	1	2
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	1	1	1	2

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores include implementation of climate risk reduction measures.

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Exposure Indicators	—
AQ-Ozone	—
AQ-PM	—
AQ-DPM	—
Drinking Water	—
Lead Risk Housing	—
Pesticides	—
Toxic Releases	—
Traffic	—
Effect Indicators	—
CleanUp Sites	—

Groundwater	—
Haz Waste Facilities/Generators	—
Impaired Water Bodies	—
Solid Waste	—
Sensitive Population	—
Asthma	—
Cardio-vascular	—
Low Birth Weights	—
Socioeconomic Factor Indicators	—
Education	—
Housing	—
Linguistic	—
Poverty	—
Unemployment	—

7.2. Healthy Places Index Scores

The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Economic	—
Above Poverty	89.34941614
Employed	19.02989863
Median HI	97.69023483
Education	—
Bachelor's or higher	88.59232645
High school enrollment	100
Preschool enrollment	95.7141024
Transportation	—

Auto Access	93.63531374
Active commuting	12.16476325
Social	—
2-parent households	42.29436674
Voting	82.35596048
Neighborhood	—
Alcohol availability	89.4649044
Park access	38.81688695
Retail density	42.06339022
Supermarket access	2.399589375
Tree canopy	71.42307199
Housing	—
Homeownership	65.75131528
Housing habitability	87.501604
Low-inc homeowner severe housing cost burden	64.24996792
Low-inc renter severe housing cost burden	88.91312717
Uncrowded housing	62.10701912
Health Outcomes	—
Insured adults	89.59322469
Arthritis	0.0
Asthma ER Admissions	99.7
High Blood Pressure	0.0
Cancer (excluding skin)	0.0
Asthma	0.0
Coronary Heart Disease	0.0
Chronic Obstructive Pulmonary Disease	0.0
Diagnosed Diabetes	0.0

Life Expectancy at Birth	77.8
Cognitively Disabled	87.2
Physically Disabled	55.6
Heart Attack ER Admissions	99.5
Mental Health Not Good	0.0
Chronic Kidney Disease	0.0
Obesity	0.0
Pedestrian Injuries	93.4
Physical Health Not Good	0.0
Stroke	0.0
Health Risk Behaviors	—
Binge Drinking	0.0
Current Smoker	0.0
No Leisure Time for Physical Activity	0.0
Climate Change Exposures	—
Wildfire Risk	99.5
SLR Inundation Area	38.8
Children	43.1
Elderly	11.5
English Speaking	77.4
Foreign-born	54.6
Outdoor Workers	85.4
Climate Change Adaptive Capacity	—
Impervious Surface Cover	79.5
Traffic Density	81.9
Traffic Access	23.0
Other Indices	—

Hardship	5.4
Other Decision Support	—
2016 Voting	60.6

7.3. Overall Health & Equity Scores

Metric	Result for Project Census Tract
CalEnviroScreen 4.0 Score for Project Location (a)	—
Healthy Places Index Score for Project Location (b)	90.0
Project Located in a Designated Disadvantaged Community (Senate Bill 535)	No
Project Located in a Low-Income Community (Assembly Bill 1550)	No
Project Located in a Community Air Protection Program Community (Assembly Bill 617)	No

a: The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.
b: The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

7.4. Health & Equity Measures

No Health & Equity Measures selected.

7.5. Evaluation Scorecard

Health & Equity Evaluation Scorecard not completed.

7.6. Health & Equity Custom Measures

No Health & Equity Custom Measures created.

8. User Changes to Default Data

Screen	Justification
Construction: Construction Phases	see construction assumptions
Construction: Off-Road Equipment	see construction assumptions
Construction: Trips and VMT	construction mobile emissions calculated outside of CalEEMod.
Construction: Dust From Material Movement	see construction assumptions

P.5-1 Option 3 Construction GHG Mobile Emissions

Topanga Canyon - Op2 and 3
Total Emissions

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Idling per Day (minutes)	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10 Dust	PM10 Exh	Total PM10	PM2.5 Dust	PM2.5 Exh	Total PM2.5	(MT/yr) Total CO2e
Grading/Excavation	2030															
Total Haul Trips	200															
Hauling	6	43	8	36.5	15	0.02	0.86	0.43	0.01	0.20	0.01	0.21	0.05	0.01	0.06	11.02
Vendor	0	214	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0	0.10	0.10	1.47	0.00	0.52	0.00	0.52	0.13	0.00	0.13	43.18
					Total	0.12	0.96	1.90	0.01	0.72	0.01	0.73	0.18	0.01	0.19	54.20
Demolition NB Road/Bridge	2031				Workers+Ver	0.10	0.10	1.47	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	0															
Hauling	0	43	8	36.5	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	59	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	18.5	0	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	11.69
					Total	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	11.69
Construct NB Road/Bridge	2031	Grading/Excavation			Workers+Ver	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	200															
Hauling	6	43	8	36.5	15	0.02	0.83	0.42	0.01	0.20	0.01	0.21	0.05	0.01	0.06	10.73
Vendor	0	61	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	12.08
					Total	0.11	0.92	1.81	0.01	0.72	0.01	0.73	0.18	0.01	0.19	22.82
Construct NB Road/Bridge	2031	Building Construction			Workers+Ver	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	330															
Hauling	4	152	8	36.5	15	0.01	0.56	0.28	0.00	0.14	0.01	0.14	0.04	0.01	0.04	17.71
Vendor	0	214	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	42.39
					Total	0.10	0.64	1.67	0.01	0.65	0.01	0.66	0.16	0.01	0.17	60.10
Construct NB Road/Bridge	2031	Paving			Workers+Ver	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	
Total Haul Trips	0															
Hauling	0	23	8	36.5	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	6.14
					Total	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	6.14
					Workers+Ver	0.09	0.09	1.39	0.00	0.52	0.00	0.52	0.13	0.00	0.13	

Topanga Canyon - Op2 and 3
Running Emissions

		Running Emissions Factor (grams/mile)						Running Emissions Factor (grams/mile)		
		ROG_RUNEX	NOx_RUNEX	CO_RUNEX	SOx_RUNEX	PM10_RUNEX	PM2.5_RUNEX	CO2_RUNEX	CH4_RUNEX	N2O_RUNEX
2027	2027Hauling Hauling	0.013128	1.553518611	0.45473657	0.01336714	0.02273486	0.02174732	1471.80075	0.0608523	0.23462364
2027	2027Vendor Vendor	0.01570588	1.102331968	0.36327753	0.01214871	0.01475662	0.01411185	1311.1435	0.03509759	0.18307889
2027	2027Worker Worker	0.01447264	0.062492418	0.90233334	0.00281062	0.00150729	0.0013867	284.320587	0.00354266	0.00566149
2028	2028Hauling Hauling	0.01261339	1.493718015	0.43877031	0.01305596	0.02247317	0.02149714	1438.29866	0.05768159	0.22931835
2028	2028Vendor Vendor	0.01417298	1.038868065	0.3360531	0.01185313	0.01426835	0.01364491	1280.01295	0.03342244	0.17922194
2028	2028Worker Worker	0.01314756	0.057035459	0.85167037	0.00274948	0.00140448	0.00129194	278.134904	0.00325313	0.00533773
2029	2029Hauling Hauling	0.01213472	1.434866903	0.4224926	0.01273534	0.0221686	0.0212059	1403.60667	0.05465536	0.22381566
2029	2029Vendor Vendor	0.0128196	0.978781777	0.31101237	0.01152628	0.01380314	0.01320005	1245.46404	0.03180989	0.17489835
2029	2029Worker Worker	0.01192021	0.051957034	0.80464317	0.00269297	0.00130724	0.00120239	272.417637	0.00298654	0.00503952
2030	2030Hauling Hauling	0.01169729	1.381905725	0.40596438	0.01241489	0.02183595	0.02088778	1368.72007	0.05170538	0.2182712
2030	2030Vendor Vendor	0.01168751	0.9252091	0.28941545	0.01117412	0.01336285	0.01277903	1208.11234	0.03023265	0.17022289
2030	2030Worker Worker	0.01081241	0.047255061	0.76242747	0.00264062	0.00121547	0.00111789	267.121939	0.00274623	0.00476556
2031	2031Hauling Hauling	0.01126827	1.331771303	0.38663416	0.01209496	0.02148002	0.02054741	1333.31591	0.04842446	0.21262163
2031	2031Vendor Vendor	0.01070694	0.874998281	0.26868024	0.01079467	0.01293916	0.01237394	1167.57711	0.02847022	0.16520071
2031	2031Worker Worker	0.00977403	0.042746598	0.72305591	0.00259298	0.00112929	0.00103861	262.302837	0.0025216	0.00450761
0	GWP	N/A	N/A	N/A	N/A	N/A	N/A	1	25	298

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10	PM2.5	Regional Emissions (MT/year) CO2	CH4	N2O	CO2e
Grading/Excavation	2030													
Total Haul Trips	200													
Hauling	6	43	8	36.5	0.01	0.67	0.20	0.01	0.01	0.01	9.99	0.01	0.47	10.48
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.02	0.08	1.24	0.00	0.00	0.00	42.30	0.01	0.22	42.54
Demolition NB Road/Bridge	2031													
Total Haul Trips	0													
Hauling	0	43	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	59	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	18.5	0.02	0.07	1.18	0.00	0.00	0.00	11.45	0.00	0.06	11.51
Construct NB Road/Bridge	2031													
Total Haul Trips	200													
Hauling	6	43	8	36.5	0.01	0.64	0.19	0.01	0.01	0.01	9.73	0.01	0.46	10.20
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0.02	0.07	1.18	0.00	0.00	0.00	11.84	0.00	0.06	11.90
Construct NB Road/Bridge	2031													
Total Haul Trips	330													
Hauling	4	152	8	36.5	0.00	0.43	0.12	0.00	0.01	0.01	16.06	0.01	0.76	16.84
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.02	0.07	1.18	0.00	0.00	0.00	41.54	0.01	0.21	41.76
Construct NB Road/Bridge	2031													
Total Haul Trips	0													
Hauling	0	23	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0.02	0.07	1.18	0.00	0.00	0.00	6.02	0.00	0.03	6.05

Topanga Canyon - Op2 and 3
Start Emissions

			Start Emissions Factor (grams/trip)						Start Emissions Factor (grams/trip)		
			ROG_STREX	NOX_STREX	CO_STREX	SOx_STREX	PM10_STREX	PM2.5_STREX	CO2_STREX	CH4_STREX	N2O_STREX
2027	2027Hauling	Hauling	0.00060894	2.672142352	0.00302137	3.16557E-07	5.30481E-07	4.87758E-07	0.03202066	7.5498E-08	7.36611E-06
2027	2027Vendor	Vendor	0.080213538	1.961946447	0.60365405	5.50826E-05	6.07836E-05	5.58883E-05	5.57177064	0.005494835	0.004037678
2027	2027Worker	Worker	1.038950633	0.251050817	3.01934346	0.000691936	0.002053348	0.001887978	69.9913431	0.06616369	0.030829475
2028	2028Hauling	Hauling	0.000490696	2.636914961	0.00257595	2.71845E-07	4.29594E-07	3.94995E-07	0.02749789	6.56178E-08	5.97594E-06
2028	2028Vendor	Vendor	0.075419112	1.927915654	0.55968909	5.22383E-05	5.76932E-05	5.30468E-05	5.28405692	0.005169504	0.003780947
2028	2028Worker	Worker	0.997046953	0.239560346	2.85187017	0.000675557	0.001941969	0.001785569	68.3345653	0.062483886	0.030029939
2029	2029Hauling	Hauling	0.000383539	2.591170334	0.00214107	2.33546E-07	3.28727E-07	3.02252E-07	0.02362391	5.62127E-08	4.65545E-06
2029	2029Vendor	Vendor	0.069289941	1.883995908	0.51714657	4.94212E-05	5.46034E-05	5.02058E-05	4.99909929	0.004852786	0.003548842
2029	2029Worker	Worker	0.945798618	0.229251267	2.69630558	0.000660221	0.001832244	0.00168468	66.7833	0.059077063	0.029313823
2030	2030Hauling	Hauling	0.00027279	2.546881303	0.00161285	1.92445E-07	2.06187E-07	1.89581E-07	0.01946637	4.71315E-08	4.0595E-06
2030	2030Vendor	Vendor	0.063656597	1.839529651	0.47865041	4.67001E-05	5.18671E-05	4.76899E-05	4.72385215	0.004565454	0.003322989
2030	2030Worker	Worker	0.901632052	0.219772527	2.55165593	0.00064583	0.001725708	0.001586724	65.3276344	0.055883281	0.028658371
2031	2031Hauling	Hauling	0.000210057	2.503276097	0.00139863	1.66951E-07	1.58801E-07	1.46012E-07	0.01688763	4.13015E-08	2.64568E-06
2031	2031Vendor	Vendor	0.059141215	1.792713918	0.44197461	4.38654E-05	4.91716E-05	4.52115E-05	4.43711805	0.004280254	0.003105544
2031	2031Worker	Worker	0.857879142	0.211029605	2.41545051	0.000632455	0.001621689	0.001491083	63.974738	0.052892816	0.028060877
	GWP			N/A					1	25	298

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10	PM2.5	Regional Emissions (MT/year) CO2	CH4	N2O	CO2e
Grading/Excavation	2030													
Total Haul Trips	200													
Hauling	6	43	8	36.5	0.00	0.03	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.08	0.02	0.23	0.00	0.00	0.00	0.56	0.00	0.00	0.64
Demolition NB Road/Bridg	2031													
Total Haul Trips	0													
Hauling	0	43	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	59	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	18.5	0.08	0.02	0.21	0.00	0.00	0.00	0.15	0.00	0.00	0.17
Construct NB Road/Bridge	2031													
Total Haul Trips	200													
Hauling	6	43	8	36.5	0.00	0.03	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0.08	0.02	0.21	0.00	0.00	0.00	0.16	0.00	0.00	0.18
Construct NB Road/Bridge	2031													
Total Haul Trips	330													
Hauling	4	152	8	36.5	0.00	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.08	0.02	0.21	0.00	0.00	0.00	0.55	0.00	0.00	0.63
Construct NB Road/Bridge	2031													
Total Haul Trips	0													
Hauling	0	23	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0.08	0.02	0.21	0.00	0.00	0.00	0.08	0.00	0.00	0.09

Topanga Canyon - Op2 and 3
Idling Emissions

			Idling Emissions Factor (grams/minute)						Idling Emissions Factor (grams/minute)		
			ROG_IDLEX	NOx_IDLEX	CO_IDLEX	SOx_IDLEX	PM10_IDLEX	PM2.5_IDLEX	CO2_IDLEX	CH4_IDLEX	N2O_IDLEX
2027	2027Hauling	Hauling	0.07592279	0.881696127	1.19921987	0.00159973	0.00047074	0.00044926	181.442358	0.03427011	0.02916541
2027	2027Vendor	Vendor	0.05529965	0.899602458	1.04932075	0.00167506	0.00086494	0.00082645	186.589554	0.03155173	0.02918792
2027	2027Worker	Worker	0	0	0	0	0	0	0	0	0
2028	2028Hauling	Hauling	0.07529788	0.857767875	1.19214339	0.00156045	0.00045204	0.00043133	177.300744	0.03377364	0.02851321
2028	2028Vendor	Vendor	0.05432839	0.863093228	1.0395891	0.00163993	0.00074988	0.00071632	182.978932	0.03134729	0.02865517
2028	2028Worker	Worker	0	0	0	0	0	0	0	0	0
2029	2029Hauling	Hauling	0.07461794	0.835480721	1.18399992	0.00152188	0.00043143	0.00041158	173.194944	0.03323976	0.02786481
2029	2029Vendor	Vendor	0.05333308	0.827999465	1.02749811	0.0016013	0.00065239	0.00062302	178.951612	0.03104801	0.02805443
2029	2029Worker	Worker	0	0	0	0	0	0	0	0	0
2030	2030Hauling	Hauling	0.07391144	0.816007794	1.17493744	0.0014846	0.00041331	0.00039421	169.186161	0.03269373	0.0272299
2030	2030Vendor	Vendor	0.05232472	0.795299763	1.01321823	0.00155966	0.00057171	0.0005458	174.561724	0.03067462	0.02739395
2030	2030Worker	Worker	0	0	0	0	0	0	0	0	0
2031	2031Hauling	Hauling	0.0732853	0.799579641	1.1664382	0.00145061	0.00039768	0.00037924	165.457521	0.03205186	0.02663599
2031	2031Vendor	Vendor	0.05130878	0.763402339	0.99683404	0.00151522	0.00050437	0.00048136	169.805962	0.03011968	0.02667472
2031	2031Worker	Worker	0	0	0	0	0	0	0	0	0
		GWP	N/A	N/A	N/A	N/A	N/A	N/A	1	25	298

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	Idling minutes per Day	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10	PM2.5	Regional Emissions (MT/year) CO2	CH4	N2O	CO2e
Grading/Excavation	2030													
Total Haul Trips	200													
Hauling	6	43	8	15	0.01	0.16	0.23	0.00	0.00	0.00	0.51	0.00	0.02	0.53
Vendor	0	214	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Demolition NB Road/Bridge	2031													
Total Haul Trips	0													
Hauling	0	43	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	59	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct NB Road/Bridge	2031													
Total Haul Trips	200													
Hauling	6	43	8	15	0.01	0.16	0.23	0.00	0.00	0.00	0.50	0.00	0.02	0.52
Vendor	0	61	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct NB Road/Bridge	2031													
Total Haul Trips	330													
Hauling	4	152	8	15	0.01	0.11	0.15	0.00	0.00	0.00	0.82	0.00	0.04	0.86
Vendor	0	214	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construct NB Road/Bridge	2031													
Total Haul Trips	0													
Hauling	0	23	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Topanga Canyon - Op2 and 3
Road Dust, Break Wear, and Tire wear Emissions

			Emission Factors (grams/mile)					
			PM10			PM2.5		
			RD	PM10_PMBW	PM10_PMTW	RD	PM2.5_PMBW	PM2.5_PMTW
2027	2027Hauling	Hauling	0.29984991	0.084297987	0.03545106	0.07359952	0.0295043	0.00886277
2027	2027Vendor	Vendor	0.29984991	0.063623189	0.02372553	0.07359952	0.02226812	0.00593138
2027	2027Worker	Worker	0.29984991	0.009305649	0.008	0.07359952	0.00325698	0.002
2028	2028Hauling	Hauling	0.29984991	0.084486989	0.03545475	0.07359952	0.02957045	0.00886369
2028	2028Vendor	Vendor	0.29984991	0.063544145	0.02372738	0.07359952	0.02224045	0.00593184
2028	2028Worker	Worker	0.29984991	0.009284129	0.008	0.07359952	0.00324945	0.002
2029	2029Hauling	Hauling	0.29984991	0.084584422	0.03545835	0.07359952	0.02960455	0.00886459
2029	2029Vendor	Vendor	0.29984991	0.063359545	0.02372918	0.07359952	0.02217584	0.00593229
2029	2029Worker	Worker	0.29984991	0.00926272	0.008	0.07359952	0.00324195	0.002
2030	2030Hauling	Hauling	0.29984991	0.08460378	0.03546191	0.07359952	0.02961132	0.00886548
2030	2030Vendor	Vendor	0.29984991	0.063078834	0.02373095	0.07359952	0.02207759	0.00593274
2030	2030Worker	Worker	0.29984991	0.00924132	0.008	0.07359952	0.00323446	0.002
2031	2031Hauling	Hauling	0.29984991	0.084504548	0.03546578	0.07359952	0.02957659	0.00886644
2031	2031Vendor	Vendor	0.29984991	0.062682863	0.02373289	0.07359952	0.021939	0.00593322
2031	2031Worker	Worker	0.29984991	0.009221285	0.008	0.07359952	0.00322745	0.002

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day)					
					PM10			PM2.5		
					RD	BW	TW	RD	BW	TW
Grading/Excavation	2030									
Total Haul Trips	200									
Hauling	6	43	8	36.5	0.14	0.04	0.02	0.04	0.01	0.00
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Demolition NB Road/Bridge	2031									
Total Haul Trips	0									
Hauling	0	43	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	59	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	59	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Construct NB Road/Bridge	2031									
Total Haul Trips	200									
Hauling	6	43	8	36.5	0.14	0.04	0.02	0.04	0.01	0.00
Vendor	0	61	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	61	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Construct NB Road/Bridge	2031									
Total Haul Trips	330									
Hauling	4	152	8	36.5	0.10	0.03	0.01	0.02	0.01	0.00
Vendor	0	214	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	214	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00
Construct NB Road/Bridge	2031									
Total Haul Trips	0									
Hauling	0	23	8	36.5	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	31	8	10.2	0.00	0.00	0.00	0.00	0.00	0.00
Worker	40	31	8	18.5	0.49	0.02	0.01	0.12	0.01	0.00

Topanga Canyon - Op2 and 3
Road Dust

Paved Road Dust Emission Factors (Assumes No Precipitation)

Formula: $EF_{Dust,P} = (k\ (sL)^{0.91} \times (W)^{1.02})$

Where:

$EF_{Dust,P}$ =	Paved Road Dust Emission Factor (having the same units as k)
k =	particle size multiplier
sL =	road surface silt loading (g/m^2)
W =	average fleet vehicle weight (tons) (CARB uses 2.4 tons as a fleet average vehicle weight factor)

	Emission Factor (grams per VMT)	
	PM10	PM2.5
k	0.9979	0.2449
sL	0.1	0.1
W	2.4	2.4
$EF_{Dust,P}$	3.00E-01	7.36E-02

Unpaved Road Dust Emission Factors (Assumes No Precipitation)

Formula: $EF_{Dust,U} = (k\ (\ s / 12)^{1} \times (Sp / 30)^{0.5} / (M / 0.5)^{0.2}) - C)$

Where:

$EF_{Dust,U}$ =	Unpaved Road Dust Emission Factor (having the same units as k)
k =	particle size multiplier
s =	surface material silt content (%)
Sp =	mean vehicle speed (mph)
M =	surface material moisture content (%)
C =	Emission Factor for 1980s vehicle fleet exhaust, brake wear, and tire wear

	Emission Factor (grams per VMT)	
	PM10	PM2.5
k	816.47	81.65
s	4.3%	4.3%
Sp	15	15
M	0.5%	0.5%
C	0.00047	0.00036
$EF_{Dust,U}$	5.20E+00	5.19E-01

Sources:

SCAQMD, CalEEMod, Version 2022.1.

CARB, *Entrained Dust from Paved Road Travel: Emission Estimation Methodology Background Document* , (1997).

USEPA, *AP-42* , Fifth Edition, Volume I, Chapter 13.2.1 - Paved Roads, (2011).

ESA, 2023.

P.5-2 Option 3 Construction Modeling

Topanga-Op3-Con Detailed Report

Table of Contents

1. Basic Project Information

1.1. Basic Project Information

1.2. Land Use Types

1.3. User-Selected Emission Reduction Measures by Emissions Sector

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

2.2. Construction Emissions by Year, Unmitigated

3. Construction Emissions Details

3.1. Demolition (2031) - Unmitigated

3.3. Grading (2031) - Unmitigated

3.5. Building Construction (2031) - Unmitigated

3.7. Paving (2031) - Unmitigated

4. Operations Emissions Details

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

5. Activity Data

5.1. Construction Schedule

5.2. Off-Road Equipment

5.2.1. Unmitigated

5.3. Construction Vehicles

5.3.1. Unmitigated

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

5.5. Architectural Coatings

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

5.6.2. Construction Earthmoving Control Strategies

5.7. Construction Paving

5.8. Construction Electricity Consumption and Emissions Factors

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

5.18.2. Sequestration

5.18.2.1. Unmitigated

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

6.2. Initial Climate Risk Scores

6.3. Adjusted Climate Risk Scores

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

7.2. Healthy Places Index Scores

7.3. Overall Health & Equity Scores

7.4. Health & Equity Measures

7.5. Evaluation Scorecard

7.6. Health & Equity Custom Measures

8. User Changes to Default Data

1. Basic Project Information

1.1. Basic Project Information

Data Field	Value
Project Name	Topanga-Op3-Con
Construction Start Date	1/1/2031
Lead Agency	—
Land Use Scale	Project/site
Analysis Level for Defaults	County
Windspeed (m/s)	2.70
Precipitation (days)	4.60
Location	18711 Pacific Coast Hwy, Malibu, CA 90265, USA
County	Los Angeles-South Coast
City	Unincorporated
Air District	South Coast AQMD
Air Basin	South Coast
TAZ	3802
EDFZ	7
Electric Utility	Southern California Edison
Gas Utility	Southern California Gas
App Version	2022.1.1.21

1.2. Land Use Types

Land Use Subtype	Size	Unit	Lot Acreage	Building Area (sq ft)	Landscape Area (sq ft)	Special Landscape Area (sq ft)	Population	Description
Other Asphalt Surfaces	40.0	1000sqft	0.92	0.00	0.00	—	—	—

1.3. User-Selected Emission Reduction Measures by Emissions Sector

No measures selected

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Un/Mit.	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	2.01	1.69	12.2	16.2	0.03	0.53	2.76	3.29	0.49	1.34	1.82	—	3,713	3,713	0.15	0.03	0.00	3,726
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	2.01	1.69	12.2	16.2	0.03	0.53	2.76	3.29	0.49	1.34	1.82	—	3,713	3,713	0.15	0.03	0.00	3,726
Average Daily (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.99	0.84	6.66	8.55	0.02	0.29	0.46	0.75	0.26	0.22	0.49	—	1,853	1,853	0.08	0.02	0.00	1,859
Annual (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.18	0.15	1.22	1.56	< 0.005	0.05	0.08	0.14	0.05	0.04	0.09	—	307	307	0.01	< 0.005	0.00	308

2.2. Construction Emissions by Year, Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Year	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily - Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

2031	2.01	1.69	12.2	16.2	0.03	0.53	2.76	3.29	0.49	1.34	1.82	—	3,713	3,713	0.15	0.03	0.00	3,726
Daily - Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2031	2.01	1.69	12.2	16.2	0.03	0.53	2.76	3.29	0.49	1.34	1.82	—	3,713	3,713	0.15	0.03	0.00	3,726
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2031	0.99	0.84	6.66	8.55	0.02	0.29	0.46	0.75	0.26	0.22	0.49	—	1,853	1,853	0.08	0.02	0.00	1,859
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2031	0.18	0.15	1.22	1.56	< 0.005	0.05	0.08	0.14	0.05	0.04	0.09	—	307	307	0.01	< 0.005	0.00	308

3. Construction Emissions Details

3.1. Demolition (2031) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.28	0.24	2.48	3.93	0.01	0.05	—	0.05	0.04	—	0.04	—	574	574	0.02	< 0.005	—	576
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipment	0.05	0.04	0.40	0.63	< 0.005	0.01	—	0.01	0.01	—	0.01	—	92.8	92.8	< 0.005	< 0.005	—	93.1
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.01	0.01	0.07	0.12	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	15.4	15.4	< 0.005	< 0.005	—	15.4
Demolition	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.3. Grading (2031) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	2.01	1.69	12.2	16.2	0.03	0.53	—	0.53	0.49	—	0.49	—	3,713	3,713	0.15	0.03	—	3,726
Dust From Material Movement	—	—	—	—	—	—	2.76	2.76	—	1.34	1.34	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	2.01	1.69	12.2	16.2	0.03	0.53	—	0.53	0.49	—	0.49	—	3,713	3,713	0.15	0.03	—	3,726
Dust From Material Movement	—	—	—	—	—	—	2.76	2.76	—	1.34	1.34	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.34	0.28	2.04	2.71	0.01	0.09	—	0.09	0.08	—	0.08	—	621	621	0.03	0.01	—	623
Dust From Material Movement	—	—	—	—	—	—	0.46	0.46	—	0.22	0.22	—	—	—	—	—	—	—

Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.06	0.05	0.37	0.49	< 0.005	0.02	—	0.02	0.01	—	0.01	—	103	103	< 0.005	< 0.005	—	103
Dust From Material Movement	—	—	—	—	—	—	0.08	0.08	—	0.04	0.04	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.5. Building Construction (2031) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.81	0.68	5.63	6.94	0.02	0.25	—	0.25	0.23	—	0.23	—	1,596	1,596	0.06	0.01	—	1,601
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.81	0.68	5.63	6.94	0.02	0.25	—	0.25	0.23	—	0.23	—	1,596	1,596	0.06	0.01	—	1,601
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.47	0.40	3.30	4.07	0.01	0.15	—	0.15	0.14	—	0.14	—	936	936	0.04	0.01	—	939
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.09	0.07	0.60	0.74	< 0.005	0.03	—	0.03	0.03	—	0.03	—	155	155	0.01	< 0.005	—	155
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.7. Paving (2031) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.58	1.33	10.8	13.4	0.02	0.50	—	0.50	0.46	—	0.46	—	2,404	2,404	0.10	0.02	—	2,412
Paving	—	0.08	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.13	0.11	0.92	1.14	< 0.005	0.04	—	0.04	0.04	—	0.04	—	204	204	0.01	< 0.005	—	205
Paving	—	0.01	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.02	0.02	0.17	0.21	< 0.005	0.01	—	0.01	0.01	—	0.01	—	33.8	33.8	< 0.005	< 0.005	—	33.9
Paving	—	< 0.005	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

4. Operations Emissions Details

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Vegetation	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Species	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

5. Activity Data

5.1. Construction Schedule

Phase Name	Phase Type	Start Date	End Date	Days Per Week	Work Days per Phase	Phase Description
Demolition	Demolition	1/1/2031	2/28/2031	7.00	59.0	—
Grading	Grading	3/1/2031	4/30/2031	7.00	61.0	—
Building Construction	Building Construction	5/1/2031	11/30/2031	7.00	214	—
Paving	Paving	12/1/2031	12/31/2031	7.00	31.0	—

5.2. Off-Road Equipment

5.2.1. Unmitigated

Phase Name	Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor
Demolition	Tractors/Loaders/Backhoes	Diesel	Average	1.00	8.00	84.0	0.37
Demolition	Excavators	Diesel	Average	2.00	8.00	36.0	0.38
Grading	Graders	Diesel	Average	1.00	8.00	148	0.41
Grading	Rubber Tired Dozers	Diesel	Average	1.00	8.00	367	0.40
Grading	Tractors/Loaders/Backhoes	Diesel	Average	1.00	8.00	84.0	0.37
Grading	Excavators	Diesel	Average	1.00	8.00	36.0	0.38
Grading	Off-Highway Trucks	Diesel	Average	1.00	8.00	376	0.38
Building Construction	Cranes	Diesel	Average	1.00	8.00	367	0.29
Building Construction	Forklifts	Diesel	Average	1.00	8.00	82.0	0.20
Building Construction	Crawler Tractors	Diesel	Average	1.00	8.00	87.0	0.43
Building Construction	Generator Sets	Diesel	Average	1.00	8.00	14.0	0.74
Paving	Pavers	Diesel	Average	1.00	8.00	81.0	0.42
Paving	Rollers	Diesel	Average	1.00	8.00	36.0	0.38
Paving	Rubber Tired Dozers	Diesel	Average	1.00	8.00	367	0.40
Paving	Graders	Diesel	Average	1.00	8.00	148	0.41

5.3. Construction Vehicles

5.3.1. Unmitigated

Phase Name	Trip Type	One-Way Trips per Day	Miles per Trip	Vehicle Mix
Demolition	—	—	—	—
Demolition	Worker	0.00	18.5	LDA,LDT1,LDT2

Demolition	Vendor	—	10.2	HHDT,MHDT
Demolition	Hauling	0.00	20.0	HHDT
Demolition	Onsite truck	—	—	HHDT
Grading	—	—	—	—
Grading	Worker	0.00	18.5	LDA,LDT1,LDT2
Grading	Vendor	—	10.2	HHDT,MHDT
Grading	Hauling	0.00	20.0	HHDT
Grading	Onsite truck	—	—	HHDT
Building Construction	—	—	—	—
Building Construction	Worker	0.00	18.5	LDA,LDT1,LDT2
Building Construction	Vendor	0.00	10.2	HHDT,MHDT
Building Construction	Hauling	0.00	20.0	HHDT
Building Construction	Onsite truck	—	—	HHDT
Paving	—	—	—	—
Paving	Worker	0.00	18.5	LDA,LDT1,LDT2
Paving	Vendor	—	10.2	HHDT,MHDT
Paving	Hauling	0.00	20.0	HHDT
Paving	Onsite truck	—	—	HHDT

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

Non-applicable. No control strategies activated by user.

5.5. Architectural Coatings

Phase Name	Residential Interior Area Coated (sq ft)	Residential Exterior Area Coated (sq ft)	Non-Residential Interior Area Coated (sq ft)	Non-Residential Exterior Area Coated (sq ft)	Parking Area Coated (sq ft)

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

Phase Name	Material Imported (Cubic Yards)	Material Exported (Cubic Yards)	Acres Graded (acres)	Material Demolished (sq. ft.)	Acres Paved (acres)
Demolition	0.00	0.00	0.00	—	—
Grading	0.00	1,000	43.0	0.00	—
Paving	0.00	0.00	0.00	0.00	0.92

5.6.2. Construction Earthmoving Control Strategies

Control Strategies Applied	Frequency (per day)	PM10 Reduction	PM2.5 Reduction
Water Exposed Area	2	61%	61%
Water Demolished Area	2	36%	36%

5.7. Construction Paving

Land Use	Area Paved (acres)	% Asphalt
Other Asphalt Surfaces	0.92	100%

5.8. Construction Electricity Consumption and Emissions Factors

kWh per Year and Emission Factor (lb/MWh)

Year	kWh per Year	CO2	CH4	N2O
2031	0.00	532	0.03	< 0.005

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

Vegetation Land Use Type	Vegetation Soil Type	Initial Acres	Final Acres

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

Biomass Cover Type	Initial Acres	Final Acres

5.18.2. Sequestration

5.18.2.1. Unmitigated

Tree Type	Number	Electricity Saved (kWh/year)	Natural Gas Saved (btu/year)

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

Cal-Adapt midcentury 2040–2059 average projections for four hazards are reported below for your project location. These are under Representation Concentration Pathway (RCP) 8.5 which assumes GHG emissions will continue to rise strongly through 2050 and then plateau around 2100.

Climate Hazard	Result for Project Location	Unit
Temperature and Extreme Heat	9.96	annual days of extreme heat
Extreme Precipitation	5.90	annual days with precipitation above 20 mm
Sea Level Rise	—	meters of inundation depth
Wildfire	20.5	annual hectares burned

Temperature and Extreme Heat data are for grid cell in which your project are located. The projection is based on the 98th historical percentile of daily maximum/minimum temperatures from observed historical data (32 climate model ensemble from Cal-Adapt, 2040–2059 average under RCP 8.5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Extreme Precipitation data are for the grid cell in which your project are located. The threshold of 20 mm is equivalent to about ¾ an inch of rain, which would be light to moderate rainfall if received over a full day or heavy rain if received over a period of 2 to 4 hours. Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.

Sea Level Rise data are for the grid cell in which your project are located. The projections are from Radke et al. (2017), as reported in Cal-Adapt (Radke et al., 2017, CEC-500-2017-008), and consider inundation location and depth for the San Francisco Bay, the Sacramento-San Joaquin River Delta and California coast resulting different increments of sea level rise coupled with extreme storm events. Users may select from four scenarios to view the range in potential inundation depth for the grid cell. The four scenarios are: No rise, 0.5 meter, 1.0 meter, 1.41 meters
Wildfire data are for the grid cell in which your project are located. The projections are from UC Davis, as reported in Cal-Adapt (2040–2059 average under RCP 8.5), and consider historical data of climate, vegetation, population density, and large (> 400 ha) fire history. Users may select from four model simulations to view the range in potential wildfire probabilities for the grid cell. The four simulations make different assumptions about expected rainfall and temperature are: Warmer/drier (HadGEM2-ES), Cooler/wetter (CNRM-CM5), Average conditions (CanESM2), Range of different rainfall and temperature possibilities (MIROC5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.

6.2. Initial Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	1	0	0	N/A
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	1	0	0	N/A
Wildfire	1	0	0	N/A
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	0	0	0	N/A

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores do not include implementation of climate risk reduction measures.

6.3. Adjusted Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	1	1	1	2
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	1	1	1	2
Wildfire	1	1	1	2
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A

Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	1	1	1	2

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores include implementation of climate risk reduction measures.

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Exposure Indicators	—
AQ-Ozone	—
AQ-PM	—
AQ-DPM	—
Drinking Water	—
Lead Risk Housing	—
Pesticides	—
Toxic Releases	—
Traffic	—
Effect Indicators	—
CleanUp Sites	—
Groundwater	—
Haz Waste Facilities/Generators	—
Impaired Water Bodies	—

Solid Waste	—
Sensitive Population	—
Asthma	—
Cardio-vascular	—
Low Birth Weights	—
Socioeconomic Factor Indicators	—
Education	—
Housing	—
Linguistic	—
Poverty	—
Unemployment	—

7.2. Healthy Places Index Scores

The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Economic	—
Above Poverty	89.34941614
Employed	19.02989863
Median HI	97.69023483
Education	—
Bachelor's or higher	88.59232645
High school enrollment	100
Preschool enrollment	95.7141024
Transportation	—
Auto Access	93.63531374
Active commuting	12.16476325
Social	—

2-parent households	42.29436674
Voting	82.35596048
Neighborhood	—
Alcohol availability	89.4649044
Park access	38.81688695
Retail density	42.06339022
Supermarket access	2.399589375
Tree canopy	71.42307199
Housing	—
Homeownership	65.75131528
Housing habitability	87.501604
Low-inc homeowner severe housing cost burden	64.24996792
Low-inc renter severe housing cost burden	88.91312717
Uncrowded housing	62.10701912
Health Outcomes	—
Insured adults	89.59322469
Arthritis	0.0
Asthma ER Admissions	99.7
High Blood Pressure	0.0
Cancer (excluding skin)	0.0
Asthma	0.0
Coronary Heart Disease	0.0
Chronic Obstructive Pulmonary Disease	0.0
Diagnosed Diabetes	0.0
Life Expectancy at Birth	77.8
Cognitively Disabled	87.2
Physically Disabled	55.6

Heart Attack ER Admissions	99.5
Mental Health Not Good	0.0
Chronic Kidney Disease	0.0
Obesity	0.0
Pedestrian Injuries	93.4
Physical Health Not Good	0.0
Stroke	0.0
Health Risk Behaviors	—
Binge Drinking	0.0
Current Smoker	0.0
No Leisure Time for Physical Activity	0.0
Climate Change Exposures	—
Wildfire Risk	99.5
SLR Inundation Area	38.8
Children	43.1
Elderly	11.5
English Speaking	77.4
Foreign-born	54.6
Outdoor Workers	85.4
Climate Change Adaptive Capacity	—
Impervious Surface Cover	79.5
Traffic Density	81.9
Traffic Access	23.0
Other Indices	—
Hardship	5.4
Other Decision Support	—
2016 Voting	60.6

7.3. Overall Health & Equity Scores

Metric	Result for Project Census Tract
CalEnviroScreen 4.0 Score for Project Location (a)	—
Healthy Places Index Score for Project Location (b)	90.0
Project Located in a Designated Disadvantaged Community (Senate Bill 535)	No
Project Located in a Low-Income Community (Assembly Bill 1550)	No
Project Located in a Community Air Protection Program Community (Assembly Bill 617)	No

a: The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.
b: The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

7.4. Health & Equity Measures

No Health & Equity Measures selected.

7.5. Evaluation Scorecard

Health & Equity Evaluation Scorecard not completed.

7.6. Health & Equity Custom Measures

No Health & Equity Custom Measures created.

8. User Changes to Default Data

Screen	Justification
Construction: Construction Phases	see construction assumptions
Construction: Off-Road Equipment	see construction assumptions
Construction: Trips and VMT	construction mobile calculated outside of CalEEMod.
Construction: Dust From Material Movement	see construction assumptions

Topanga Lagoon Restoration Project

Appendix V

Noise Technical Appendix

1. Construction Noise Modeling

Topanga Lagoon Restoration Project

1. Construction Noise Modeling

Project: Topanga Lagoon Restoration - Project + Option 2

Construction Noise Impact on Sensitive Receptors

				R1					R2					R3				
Construction Phase **Equipment Type**	**No. of Equip.**	**Reference Noise Level at 50ft, Lmax**	**Acoustical Usage Factor**	**Distance (ft)**	**Lmax**	**Leq**	**L10**	**Estimated Noise Shielding, dBA**	**Distance (ft)**	**Lmax**	**Leq**	**L10**	**Estimated Noise Shielding, dBA**	**Distance (ft)**	**Lmax**	**Leq**	**L10**	**Estimated Noise Shielding, dBA**
Demolition/Renovation & Temp Parking Provisions					***78***	***74***		**0**		***73***	***68***				***84***	***80***		
Excavator	2	81	40%	100	78	74	77	0	200	72	68	71	0	50	84	80	83	0
Mounted Impact Hammer (hoe ram)	1	90	20%	620	68	61	64	0	1165	63	56	59	0	650	68	61	64	0
Front End Loader	1	79	40%	1840	48	44	47	0	2685	44	40	43	0	1350	50	46	49	0
Dozer	1	82	40%	620	60	56	59	0	1165	55	51	54	0	650	60	56	59	0
Grader	1	85	40%	1840	54	50	53	0	2685	50	46	49	0	1350	56	52	55	0
Paver	1	77	50%	620	54	51	54	1	1165	50	47	50	0	650	55	52	55	0
Roller	2	80	20%	1840	50	43	46	2	2685	48	41	44	0	1350	54	47	50	0
Unsuitable Material Replacement					***75***	***72***		**0**		***69***	***66***		**0**		***81***	***77***		**0**
Excavator	1	81	40%	100	75	71	74	0	200	69	65	68	0	50	81	77	80	0
Other Equipment	1	85	50%	620	63	60	63	0	1165	58	55	58	0	650	63	60	63	0
Front End Loader	1	79	40%	1840	48	44	47	0	2685	44	40	43	0	1350	50	46	49	0
Dozer	1	82	40%	620	60	56	59	0	1165	55	51	54	0	650	60	56	59	0
Grader	1	85	40%	1840	54	50	53	0	2685	50	46	49	0	1350	56	52	55	0
Relocate Utilities					***75***	***71***		**0**		***69***	***65***		**0**		***81***	***77***		**0**
Excavator	1	81	40%	100	75	71	74	0	200	69	65	68	0	50	81	77	80	0
Dump Truck	1	76	40%	620	54	50	53	0	1165	49	45	48	0	650	54	50	53	0
Front End Loader	1	79	40%	1840	48	44	47	0	2685	44	40	43	0	1350	50	46	49	0
Construct Temporary Road/Bridge					***79***	***75***		**0**		***73***	***69***		**0**		***85***	***81***		**0**
Excavator	1	81	40%	100	75	71	74	0	200	69	65	68	0	50	81	77	80	0
Other Equipment	1	85	50%	620	63	60	63	0	1165	58	55	58	0	650	63	60	63	0
Front End Loader	1	79	40%	1840	48	44	47	0	2685	44	40	43	0	1350	50	46	49	0
Dozer	1	82	40%	100	76	72	75	0	200	70	66	69	0	50	82	78	81	0
Grader	1																	
Construct Temporary Road/Bridge					***83***	***76***		**0**		***77***	***70***		**0**		***89***	***82***		**0**
Jackhammer	1	89	20%	100	83	76	79	0	200	77	70	73	0	50	89	82	85	0
Forklift	1	75	10%	620	53	43	46	0	1165	48	38	41	0	650	53	43	46	0
Crane	1	81	16%	1840	50	42	45	0	2685	46	38	41	0	1350	52	44	47	0
Tractor	1	84	40%	620	62	58	61	0	1165	57	53	56	0	650	62	58	61	0
Generator	1	81	50%	1840	50	47	50	0	2685	46	43	46	0	1350	52	49	52	0
Construct Temporary Road/Bridge					***74***	***68***				***68***	***62***				***80***	***73***		
Dozer	1	82	40%	1840	51	47	50	0	2685	47	43	46	0	1350	53	49	52	0
Grader	1	85	40%	620	63	59	62	0	1165	58	54	57	0	650	63	59	62	0
Paver	1	77	50%	620	55	52	55	0	1165	50	47	50	0	650	55	52	55	0
Roller	1	80	20%	100	74	67	70	0	200	68	61	64	0	50	80	73	76	0
Demolition NB Road/Bridge					***78***	***74***				***72***	***68***				***84***	***80***		
Excavator	2	81	40%	100	78	74	77	0	200	72	68	71	0	50	84	80	83	0
Mounted Impact Hammer (hoe ram)	1	90	20%	620	68	61	64	0	1165	63	56	59	0	650	68	61	64	0
Front End Loader	1	79	40%	1840	48	44	47	0	2685	44	40	43	0	1350	50	46	49	0
Construct NB Road/Bridge					***75***	***71***				***69***	***65***				***81***	***77***		
Excavator	1	81	40%	100	75	71	74	0	200	69	65	68	0	50	81	77	80	0
Other Equipment	1	85	50%	620	63	60	63	0	1165	58	55	58	0	650	63	60	63	0
Front End Loader	1	79	40%	1840	48	44	47	0	2685	44	40	43	0	1350	50	46	49	0
Dozer	1	82	40%	620	60	56	59	0	1165	55	51	54	0	650	60	56	59	0
Grader	1	85	40%	1840	54	50	53	0	2685	50	46	49	0	1350	56	52	55	0
Construct NB Road/Bridge					***83***	***76***				***77***	***70***				***89***	***82***		
Jackhammer	1	89	20%	100	83	76	79	0	200	77	70	73	0	50	89	82	85	0
Forklift	1	75	10%	620	53	43	46	0	1165	48	38	41	0	650	53	43	46	0
Crane	1	81	16%	1840	50	42	45	0	2685	46	38	41	0	1350	52	44	47	0
Tractor	1	84	40%	620	62	58	61	0	1165	57	53	56	0	650	62	58	61	0

				R1					R2					R3				
Construction Phase **Equipment Type**	**No. of Equip.**	**Reference Noise Level at 50ft, Lmax**	**Acoustical Usage Factor**	**Distance (ft)**	**Lmax**	**Leq**	**L10**	**Estimated Noise Shielding, dBA**	**Distance (ft)**	**Lmax**	**Leq**	**L10**	**Estimated Noise Shielding, dBA**	**Distance (ft)**	**Lmax**	**Leq**	**L10**	**Estimated Noise Shielding, dBA**
Construct NB Road/Bridge					***76***	***72***				***70***	***66***				***82***	***78***		
Dozer	1	82	40%	100	76	72	75	0	200	70	66	69	0	50	82	78	81	0
Grader	1	85	40%	620	63	59	62	0	1165	58	54	57	0	650	63	59	62	0
Paver	1	77	50%	1840	46	43	46	0	2685	42	39	42	0	1350	48	45	48	0
Roller	1	80	20%	620	58	51	54	0	1165	53	46	49	0	650	58	51	54	0
Demolition SB Road/Bridge					***78***	***74***				***72***	***68***				***84***	***80***		
Excavator	2	81	40%	100	78	74	77	0	200	72	68	71	0	50	84	80	83	0
Mounted Impact Hammer (hoe ram)	1	90	20%	620	68	61	64	0	1165	63	56	59	0	650	68	61	64	0
Front End Loader	1	79	40%	1840	48	44	47	0	2685	44	40	43	0	1350	50	46	49	0
Construct SB Road/Bridge					***75***	***71***				***69***	***65***				***81***	***77***		
Excavator	1	81	40%	100	75	71	74	0	200	69	65	68	0	50	81	77	80	0
Other Equipment	1	85	50%	620	63	60	63	0	1165	58	55	58	0	650	63	60	63	0
Front End Loader	1	79	40%	1840	48	44	47	0	2685	44	40	43	0	1350	50	46	49	0
Dozer	1	82	40%	620	60	56	59	0	1165	55	51	54	0	650	60	56	59	0
Grader	1	85	40%	1840	54	50	53	0	2685	50	46	49	0	1350	56	52	55	0
Construct SB Road/Bridge					***83***	***76***				***77***	***70***				***89***	***82***		
Jackhammer	1	89	20%	100	83	76	79	0	200	77	70	73	0	50	89	82	85	0
Forklift	1	75	10%	620	53	43	46	0	1165	48	38	41	0	650	53	43	46	0
Crane	1	81	16%	1840	50	42	45	0	2685	46	38	41	0	1350	52	44	47	0
Tractor	1	84	40%	620	62	58	61	0	1165	57	53	56	0	650	62	58	61	0
Construct SB Road/Bridge					***70***	***66***				***64***	***60***				***76***	***72***		
Dump Truck	1	76	40%	100	70	66	69	0	200	64	60	63	0	50	76	72	75	0
Dozer	1	82	40%	620	60	56	59	0	1165	55	51	54	0	650	60	56	59	0
Grader	1	85	40%	1840	54	50	53	0	2685	50	46	49	0	1350	56	52	55	0
Paver	1	77	50%	620	55	52	55	0	1165	50	47	50	0	650	55	52	55	0
Roller	1	80	20%	1840	49	42	45	0	2685	45	38	41	0	1350	51	44	47	0
Demolition Temporary Bridge					***78***	***74***				***72***	***68***				***84***	***80***		
Excavator	2	81	40%	100	78	74	77	0	200	72	68	71	0	50	84	80	83	0
Mounted Impact Hammer (hoe ram)	1	90	20%	620	68	61	64	0	1165	63	56	59	0	650	68	61	64	0
Front End Loader	1	79	40%	1840	48	44	47	0	2685	44	40	43	0	1350	50	46	49	0
Construct DBH Facilities(Lifeguard HQ/Helipad)					***83***	***76***				***77***	***70***				***89***	***82***		
Jackhammer	1	89	20%	100	83	76	79	0	200	77	70	73	0	50	89	82	85	0
Forklift	1	75	10%	620	53	43	46	0	1165	48	38	41	0	650	53	43	46	0
Crane	1	81	16%	1840	50	42	45	0	2685	46	38	41	0	1350	52	44	47	0
Tractor	1	84	40%	620	62	58	61	0	1165	57	53	56	0	650	62	58	61	0
Seepage Pit (Option 2)					***75***	***71***				***69***	***65***				***81***	***77***		
Excavator	1	81	40%	100	75	71	74	0	200	69	65	68	0	50	81	77	80	0
Grader	1	85	40%	620	63	59	62	0	1165	58	54	57	0	650	63	59	62	0
Pumps	1	81	50%	1840	50	47	50	0	2685	46	43	46	0	1350	52	49	52	0
Lagoon Grading					***75***	***71***				***69***	***65***				***81***	***77***		
Excavator	1	81	40%	100	75	71	74	0	200	69	65	68	0	50	81	77	80	0
Grader	1	85	40%	620	63	59	62	0	1165	58	54	57	0	650	63	59	62	0
Other Equipment	1	85	50%	1840	54	51	54	0	2685	50	47	50	0	1350	56	53	56	0
Restore Beach Area					***72***	***68***				***66***	***62***				***78***	***74***		
Tractor/Loader/Backhoe	1	78	40%	100	72	68	71	0	200	66	62	65	0	50	78	74	77	0
Grader	1	85	40%	620	63	59	62	0	1165	58	54	57	0	650	63	59	62	0
Visitor Center Site Preparation					***72***	***68***				***66***	***62***				***78***	***74***		
Tractor/Loader/Backhoe	1	78	40%	100	72	68	71	0	200	66	62	65	0	50	78	74	77	0
Grader	1	85	40%	620	63	59	62	0	1165	58	54	57	0	650	63	59	62	0
Visitor Center Grading					***79***	***75***				***73***	***69***				***85***	***81***		
Grader	1	85	40%	100	79	75	78	0	200	73	69	72	0	50	85	81	84	0
Dozer	1	82	40%	620	60	56	59	0	1165	55	51	54	0	650	60	56	59	0
Tractor/Loader/Backhoe	1	78	40%	1840	47	43	46	0	2685	43	39	42	0	1350	49	45	48	0
Visitor Center Building Construction					***75***	***67***				***69***	***61***				***81***	***73***		
Crane	1	81	16%	100	75	67	70	0	200	69	61	64	0	50	81	73	76	0
Forklift	2	75	10%	620	56	46	49	0	1165	51	41	44	0	650	56	46	49	0
Tractor/Loader/Backhoe	2	78	40%	1840	50	46	49	0	2685	46	42	45	0	1350	52	48	51	0
Visitor Center Paving					***79***	***75***				***73***	***69***				***85***	***81***		
Concrete Mixer Truck	4	79	40%	100	79	75	78	0	200	73	69	72	0	50	85	81	84	0
Paver	1	77	50%	620	55	52	55	0	1165	50	47	50	0	650	55	52	55	0
Roller	1	80	20%	1840	49	42	45	0	2685	45	38	41	0	1350	51	44	47	0
Tractor/Loader/Backhoe	1	78	40%	620	56	52	55	0	1165	51	47	50	0	650	56	52	55	0
Visitor Center Architectural Coating					***72***	***68***				***66***	***62***				***78***	***74***		
Compressor (air)	1	78	40%	100	72	68	71	0	200	66	62	65	0	50	78	74	77	0
Overlapping Phases																		
Demolition & Temp Parking Provisions/Unsuitable Material Replacement						**76.1**					**70.2**					**81.9**		
Demolition & Temp Parking Provisions/Unsuitable Material Replacement/Relocate Utilities						**77.3**					**71.3**					**83.1**		
Relocate Utilities/Construct Temporary Road and Bridge						**76.3**					**70.3**					**82.2**		
Relocate Utilities/Construct Temporary Road and Bridge						**78.2**					**72.2**					**84.2**		
Vistor Center Building construction/Pacing.Architectural Coating						**76.3**					**70.3**					**82.4**		
Maximum Combined Noise Levels						**78.2**					**72.2**					**84.2**		

Source for Ref. Noise Levels: LA CEQA Guides, 2006 & FHWA RCNM, 2005

Project: Topanga Lagoon Restoration - Option 3

Construction Noise Impact on Sensitive Receptors

				R1					R2					R3				
Construction Phase **Equipment Type**	**No. of Equip.**	**Reference Noise Level at 50ft, Lmax**	**Acoustical Usage Factor**	**Distance (ft)**	**Lmax**	**Leq**	**L10**	**Estimated Noise Shielding, dBA**	**Distance (ft)**	**Lmax**	**Leq**	**L10**	**Estimated Noise Shielding, dBA**	**Distance (ft)**	**Lmax**	**Leq**	**L10**	**Estimated Noise Shielding, dBA**
Demolition/Renovation & Temp Parking Provisions					***63***	***58***				***80***	***76***				***77***	***73***		
Excavator	2	81	40%	650	62	58	61	0	81	80	76	79	0	115	77	73	76	0
Mounted Impact Hammer (hoe ram)	1	90	20%	2388	56	49	52	0	2100	58	51	54	0	2000	58	51	54	0
Front End Loader	1	79	40%	4300	40	36	39	0	3000	43	39	42	0	3400	42	38	41	0
Sewer - Grading					***60***	***56***				***80***	***76***				***74***	***70***		
Excavator	1	81	40%	650	59	55	58	0	81	77	73	76	0	115	74	70	73	0
Other Equipment	1	85	50%	2388	51	48	51	0	2100	53	50	53	0	2000	53	50	53	0
Front End Loader	1	79	40%	4300	40	36	39	0	3000	43	39	42	0	3400	42	38	41	0
Dozer	1	82	40%	2388	48	44	47	0	81	78	74	77	0	2000	50	46	49	0
Grader	1	85	40%	4300	46	42	45	0	2100	53	49	52	0	3400	48	44	47	0
Sewer - Building Construction					***67***	***60***				***85***	***78***				***82***	***75***		
Jackhammer	1	89	20%	650	67	60	63	0	81	85	78	81	0	115	82	75	78	0
Forklift	1	75	10%	2388	41	31	34	0	2100	43	33	36	0	2000	43	33	36	0
Crane	1	81	16%	4300	42	34	37	0	3000	45	37	40	0	3400	44	36	39	0
Tractor	1	84	40%	2100	52	48	51	0	2388	50	46	49	0	2000	52	48	51	0
Sewer - Paving					***61***	***56***				***78***	***74***				***75***	***71***		
Dozer	1	82	40%	650	60	56	59	0	81	78	74	77	0	115	75	71	74	0
Grader	1	85	40%	2388	51	47	50	0	2100	53	49	52	0	2000	53	49	52	0
Paver	1	77	50%	4300	38	35	38	0	3000	41	38	41	0	3400	40	37	40	0
Roller	1	80	20%	2100	48	41	44	0	2388	46	39	42	0	2000	48	41	44	0
Maximum Combined Noise Levels						**60.0**					**77.8**					**74.8**		

Source for Ref. Noise Levels: LA CEQA Guides, 2006 & FHWA RCNM, 2005

Table 1. CA/T equipment noise emissions and acoustical usage factors database.

CA/T Noise Emission Reference Levels and Usage Factors						
filename: EQUIPLST.xls						
revised: 7/26/05		Acoustical	Spec 721.560	Actual Measured	No. of Actual	Actual Combined
	Impact	Use Factor	Lmax @ 50ft	Lmax @ 50ft	Data Samples	Lmax @ 50ft
Equipment Description	Device ?	(%)	(dBA, slow)	(dBA, slow)	(Count)	(dBA, slow)
				(samples averaged)		
Other Equipment	No	50%	85	-- N/A --	0	85
Auger Drill Rig	No	20%	85	84	36	84
Tractor/Loader/Backhoe	No	40%	80	78	372	78
Bar Bender	No	20%	80	-- N/A --	0	80
Blasting	Yes	#VALUE!	94	-- N/A --	0	94
Boring Jack Power Unit	No	50%	80	83	1	83
Chain Saw	No	20%	85	84	46	84
Clam Shovel (dropping)	Yes	20%	93	87	4	87
Compactor (ground)	No	20%	80	83	57	83
Compressor (air)	No	40%	80	78	18	78
Concrete Batch Plant	No	15%	83	-- N/A --	0	83
Concrete Mixer Truck	No	40%	85	79	40	79
Concrete Pump Truck	No	20%	82	81	30	81
Concrete Saw	No	20%	90	90	55	90
Crane	No	16%	85	81	405	81
Dozer	No	40%	85	82	55	82
Drill Rig Truck	No	20%	84	79	22	79
Drum Mixer	No	50%	80	80	1	80
Dump Truck	No	40%	84	76	31	76
Excavator	No	40%	85	81	170	81
Flat Bed Truck	No	40%	84	74	4	74
Forklift	No	10%	75			75
Front End Loader	No	40%	80	79	96	79
Generator	No	50%	82	81	19	81
Generator (<25KVA, VMS signs)	No	50%	70	73	74	73
Gradall	No	40%	85	83	70	83
Grader	No	40%	85	-- N/A --	0	85
Grapple (on backhoe)	No	40%	85	87	1	87
Horizontal Boring Hydr. Jack	No	25%	80	82	6	82
Hydra Break Ram	Yes	10%	90	-- N/A --	0	90
Impact Pile Driver	Yes	20%	95	101	11	101
Jackhammer	Yes	20%	85	89	133	89
Man Lift	No	20%	85	75	23	75
Mounted Impact Hammer (hoe ram)	Yes	20%	90	90	212	90
Pavement Scarafier	No	20%	85	90	2	90
Paver	No	50%	85	77	9	77
Pickup Truck	No	40%	55	75	1	75
Pneumatic Tools	No	50%	85	85	90	85
Pumps	No	50%	77	81	17	81
Refrigerator Unit	No	100%	82	73	3	73
Rivit Buster/chipping gun	Yes	20%	85	79	19	79
Rock Drill	No	20%	85	81	3	81
Roller	No	20%	85	80	16	80
Sand Blasting (Single Nozzle)	No	20%	85	96	9	96
Scraper	No	40%	85	84	12	84
Shears (on backhoe)	No	40%	85	96	5	96
Slurry Plant	No	100%	78	78	1	78
Slurry Trenching Machine	No	50%	82	80	75	80
Soil Mix Drill Rig	No	50%	80	-- N/A --	0	80
Tractor	No	40%	84	-- N/A --	0	84
Vacuum Excavator (Vac-truck)	No	40%	85	85	149	85
Vacuum Street Sweeper	No	10%	80	82	19	82
Ventilation Fan	No	100%	85	79	13	79
Vibrating Hopper	No	50%	85	87	1	87
Vibratory Concrete Mixer	No	20%	80	80	1	80
Vibratory Pile Driver	No	20%	95	101	44	101
Warning Horn	No	5%	85	83	12	83
Welder	No	40%	73	74	5	74

Appendix O

Structures Preliminary Geotechnical Report Pacific Coast Highway Bridge over Topanga Lagoon Bridge No. 53-0035 Topanga Lagoon Restoration Project Malibu, California (GeoPentech 2022)

The Appendices herein contain supporting information. These Appendices contain highly detailed figures and other graphic information, which are difficult to translate for screen reading software; therefore, the Appendices have not been translated into an auditory format. If you have a disability and/or have difficulty accessing any material in this document, please contact us by mail, email, or telephone, and we will work with you to make all reasonable accommodations. Please indicate 1) the nature of the accessibility need; 2) your preferred format; 3) the material you are trying to access and its location within this document; and 4) how to reach you if questions arise while fulfilling your request. You can direct your requests to:

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Structures Preliminary Geotechnical Report
Pacific Coast Highway Bridge over Topanga Lagoon
Bridge No. 53-0035
Topanga Lagoon Restoration Project
Malibu, California

January 18, 2022

Prepared for

Resource Conservation District of the Santa Monica Mountains
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Structures Preliminary Geotechnical Report
Pacific Coast Highway Bridge over Topanga Lagoon
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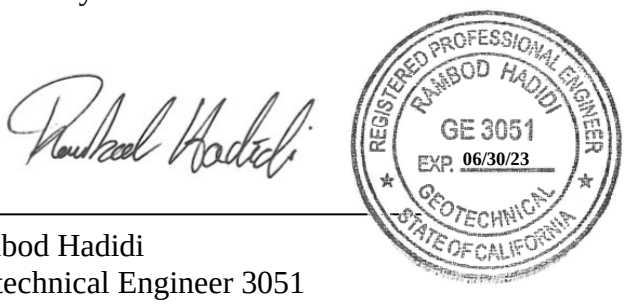

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TABLE OF CONTENTS

1 INTRODUCTION 3
1.1 GENERAL 3
1.2 PURPOSE 3
1.3 SCOPE OF WORK 3
2 PROJECT DESCRIPTION 4
3 EXCEPTIONS TO POLICIES AND PROCEDURES 4
4 GEOTECHNICAL INVESTIGATION 5
5 GEOTECHNICAL CONDITIONS 6
5.1 GEOLOGY 6
5.2 SURFACE CONDITIONS 6
5.3 SUBSURFACE CONDITIONS 7
6 GROUNDWATER 8
7 AS-BUILT DATA 9
8 SCOUR DATA 9
9 CORROSION EVALUATION 10
10 SEISMIC INFORMATION 10
10.1 GROUND MOTION HAZARD 10
10.2 OTHER SEISMIC HAZARDS 11
11 GEOTECHNICAL RECOMMENDATIONS 13
12 ADDITIONAL FIELD WORK AND LABORATORY TESTING 13
13 LIMITATIONS 14
14 REFERENCES 15

TABLES

1 Summary of Available Geologic Data
2 Summary of Available Groundwater Data

FIGURES

1 Site Location Map
2 Alternative 2 – PCH Bridge Configuration
3 Alternative 3 – PCH Bridge Configuration
4 Alternative 4 – PCH Bridge Configuration
5 2002 Field Investigation Location Map
6 Site Geologic Map (Dibblee, 1992)
7 FEMA Flood Insurance Rate Map
8 Schematic Geologic Profiles for Alternates 2 through 4
9 Site Fault Map (CGS, 2020)
10 Ground Motion Data Sheet
11 Earthquake Zones of Required Investigation (CGS, 1997 and 2018)

APPENDICES

A 2002 Field Investigation (GeoPentech, 2003)
B As-Built Data - Current PCH Bridge (Bridge No. 53-0035)

1 INTRODUCTION

1.1 General

This Structures Preliminary Geotechnical Report (SPGR) was prepared by GeoPentech to support the planned construction of a new Pacific Coast Highway (PCH) Bridge over Topanga Lagoon (PCH Bridge, Bridge No. 53-0035) in Malibu, California. The site location is shown on the map on Figure 1. The information presented in this SPGR follows guidelines outlined in the Caltrans Geotechnical Manual – Foundation Reports for Bridges (Caltrans, 2021). This work was completed in accordance with the Agreement for Professional Services between the Resource Conservation District of the Santa Monica Mountains (RCDSMM) and GeoPentech dated October 7, 2021 and GeoPentech's proposal dated October 6, 2021.

1.2 Purpose

The purpose of this SPGR is to provide preliminary foundation recommendations for the planned construction of a new PCH Bridge based on existing available information. This report includes preliminary geotechnical and geological information to assist in the preparation of an Advanced Planning Study. Additional geotechnical studies will be required for the design level recommendations after the preferred project alternative is selected.

1.3 Scope of Work

GeoPentech's scope of work included the following:

- Performed an initial site reconnaissance field visit,
- Reviewed relevant available published geologic and geotechnical information, including geologic and seismic hazard maps,
- Reviewed and compiled relevant previous reports, including boring logs and cone penetration test (CPT) soundings completed in the project area.
- Reviewed available as-built plans for the existing bridge,
- Performed preliminary engineering analysis to evaluate foundation types for the proposed bridge structure.

The pertinent previous information reviewed are listed in the references presented in Section 14 of this report.

2 PROJECT DESCRIPTION

PCH Bridge is on State Route 1 at PM 40.99, spans across Topanga Lagoon, and was built in 1933 by partially filling in the lagoon at the time. The Topanga Lagoon Restoration Project is a coordinated multiagency plan that seeks to expand the existing lagoon footprint. As part of this project, the existing 78.62-foot long PCH Bridge over Topanga Lagoon will be removed and replaced with a longer bridge span over a widened lagoon.

Alternative 1 is the "No Project/Managed Decline" alternative. Alternatives 2, 3, and 4 include changes to the PCH Bridge configurations, as discussed below.

- Alternative 2: Construct an approximately 460-foot-long bridge supported on concrete columns along the current alignment of PCH. The new bridge would consist of a 200-foot primary span with secondary/side spans of 130 feet each plus an additional span to accommodate an emergency services underpass on the east side if that is included in the next phase of design development. The proposed Alternative 2 bridge configuration and grading plan are presented on Figure 2.

- Alternative 3: Construct an approximately 460-foot-long bridge supported on concrete columns along the current alignment of PCH. Like Alternative 2, the new bridge would consist of a 200-foot primary span with secondary/side spans of 130 feet each. The proposed lagoon grading plan for Alternative 3 is different than Alternative 2, which requires bridge supports at slightly different locations. The proposed Alternative 3 bridge configuration and grading plan are presented on Figure 3.

- Alternative 4: Realign PCH as much as approximately 80 feet to the north and construct an approximately 460-foot-long bridge supported on concrete columns. Similar to Alternatives 2 and 3, the new bridge would consist of a 200-foot primary span with secondary/side spans of 130 feet each. The proposed Alternative 4 bridge configuration and grading plan are presented on Figure 4.

The 1933 as-built plans did not include a vertical datum reference. It is assumed that the elevations are based on the National Geodetic Vertical Datum of 1929 (NGVD 29); however, it is recommended that structure design verify this assumption. Elevations referenced in previous investigations by GeoPentech (2003a,b) are based on NGVD 29. Within this report, GeoPentech (2003a,b) elevations were converted to North American Vertical Datum of 1988 (NAVD 88) by adding 2½ feet. The remaining elevations referenced within this report are based on the NAVD 88, unless otherwise noted.

3 EXCEPTIONS TO POLICIES AND PROCEDURES

There are no geotechnical design exceptions for the proposed PCH Bridge that would cause deviation from Caltrans policies or procedures.

4 GEOTECHNICAL INVESTIGATION

No as-built borehole information, test pile records, or production pile records were available through a Caltrans record search.

Preliminary geotechnical recommendations provided herein are based on a 2002 field investigation and associated laboratory testing completed by GeoPentech in the vicinity of PCH Bridge as part of a soil evaluation for the proposed restoration of Topanga Lagoon (GeoPentech, 2003a,b). The 2002 field investigation included a total of seven hollow stem auger borings (B-1 through B-7, B-7A, and B-8 through B-10) and four CPTs (CPT-2, CPT-3, CPT-7, and CPT-7A). The locations of the 2002 borings and CPTs are shown on Figure 5. Additional details of the 2002 field investigation and laboratory testing are summarized below.

2002 Borings: The borings were drilled to total depths ranging between about 19½ and 35½ feet below ground surface (bgs) (about Elevation +17 feet above mean sea level (MSL) to about -6 feet below MSL). The borings were advanced using a truck-mounted CME 85 drill rig using an 8-inch outside diameter hollow-stem auger. During drilling, drive-samples were collected at 2-foot intervals using an 18-inch-long modified California sampler. The modified California sampler cutting shoe and barrel have nominal inside diameters of 2.38 and 2.50 inches, respectively, and a nominal outside diameter of 3 inches. The modified California sampler was driven 18 inches or to refusal into the bottom of the borehole by repeatedly dropping a 140-pound hammer 30 inches. Appendix A presents the Logs of Test Borings (LOTBs) used in our evaluation.

2002 CPTs: The cone penetrometer testing consisted of pushing an instrumented cone-tipped probe into the ground while simultaneously recording the resistance to penetration at the cone tip and along the friction sleeve. The CPTs were advanced to total depths between about 34 feet and 58 feet bgs (about Elevation -6 to -28 feet MSL). Appendix A presents the CPT sounding data used in our evaluation. The CPT plots show the measured tip resistance, local friction, and friction ratio. The CPT plots also show the estimated soil behavior type and interpreted SPT blow counts, N values.

2002 Laboratory Testing: Selected soil samples collected during the 2002 field investigation were tested to evaluate their physical properties. The laboratory tests performed included grain-size distribution (ASTM D422) and specific gravity (ASTM D854). The laboratory test results are included on the LOTBs in Appendix A.

5 GEOTECHNICAL CONDITIONS

5.1 Geology

PCH Bridge is located in California's Transverse Ranges geomorphic province, which is characterized by east-west trending mountains, oblique to the northwesterly-trending coastline and mountains of the adjacent Coast Ranges and Peninsular Ranges geomorphic provinces. PCH Bridge is located at the southern base of the Santa Monica Mountains along the shoreline adjacent to the Pacific Ocean. The bridge spans Topanga Lagoon at the mouth of Topanga Creek. Up to about 35 vertical feet of fill material was placed across the historic 30-acre Topanga Lagoon in the early 1930s to construct PCH.

Figure 6 shows the PCH Bridge on a geologic map of the area by Dibblee (1992). As indicated on Figure 6, the site area is underlain by Holocene-age surficial sediments, including active stream channel deposits (Qg), beach sand (Qs), and alluvium (Qa). As described by Dibblee (1992), the surficial sediments generally consist of sand, gravel, silt, and clay. As noted above, fill is also currently present at the site; however, this fill was not mapped separately on Figure 6. The project alternatives include removing on-site fill material and constructing a new PCH Bridge over a widened Topanga Lagoon. The surficial sediments at the site are underlain by upper Cretaceous-age sedimentary rocks of the Tuna Canyon formation (Kss, Ksh, and Kcg). The Tuna Canyon Formation consists of marine and nonmarine sandstone with shale and conglomerate beds. Miocene-age intrusive rocks (db) generally consisting of diabase and basalt have also been mapped in the site area.

5.2 Surface Conditions

PCH is relatively flat at an elevation of about +32 feet MSL across the site. PCH Bridge spans Topanga Lagoon, which has a minimum elevation of about +5 feet MSL. The south side of the site slopes down to Topanga Beach and the Pacific Ocean. The northern portion of the site slopes up into the Santa Monica Mountains. The site currently contains man-placed artificial fill from the original 1930s construction of PCH across Topanga Lagoon. The project includes removing artificial fill at the site and constructing a new bridge over an enlarged lagoon.

Topanga Lagoon is filled with water year-round. A natural sand berm is present most of the year across the downstream portion of Topanga Lagoon which creates a generally stagnant pool of water in the lagoon. The sand berm generally breaches during storm events establishing a surface connection between the lagoon and the ocean until the breach is closed again. According to Federal Emergency Management Agency (FEMA, 2021), the lagoon is located within a “Special Flood Hazard Area – Zone AE” with a base flood elevation of about +20 feet MSL (see Figure 7).

Landslides are mapped on the bedrock slopes outside the project area; however, no landslides are mapped in the sedimentary bedrock immediately north of the site by Dibblee (1992) (see Figure 6). The slopes around Topanga Lagoon adjacent to the site are composed of artificial fill and alluvial sediments that may have the potential to slump or ravel over time.

5.3 Subsurface Conditions

The 2002 field investigation (GeoPentech, 2003a) completed in the vicinity of PCH Bridge encountered artificial fill and Beach Deposits (see Figure 5 for 2002 boring and CPT locations). It is noted that bedrock was not encountered in the 2002 field investigation to the full depth explored (about a depth of 58 feet bgs or Elevation -28 feet MSL). Figure 8 shows schematic geologic profiles along the proposed Alternative 2 through 4 PCH Bridge alignments based on the results of the 2002 field investigation. These profiles also show approximate locations of bridge foundation elements for each project alternative. Descriptions of the artificial fill and Beach Deposits are summarized in Table 1 and discussed below.

Artificial Fill: Man-placed artificial fill was encountered in the 2002 borings and CPTs from the ground surface to between about 19 and 30 feet bgs (about Elevation +8 to -1½ feet MSL). A portion of this fill is planned to be removed in the project area as part of the Topanga Lagoon restoration. The fill is undocumented, and we are unaware of any construction records indicating how the fill was placed. The fill generally consisted of medium dense to very dense, moist, silty sand with gravel (SM) to silty/clayey sand with gravel (SM/SC) The observed gravel predominantly consisted of fine to coarse fragments of sandstone and shale. Occasional sandy gravel (GM) and hard, silty clay (CL, CH) zones a few feet thick were observed. Equivalent SPT-N values generally ranged between about 10 to over 50 blows per foot based on converted modified California blow counts. The CPT tip resistance generally ranged between about 50 and 150 tons/feet^2 (tsf) with some zones a few feet thick having tip resistances up to about 350 tsf. In general, the CPT sleeve resistance ranged between about 1 and 6 tsf with occasional zones having sleeve resistances up to about 10 tsf.

Beach Deposits: The 2002 borings and CPTs encountered Beach Deposits below the fill to the full depth investigated (about a depth of 58 feet bgs or Elevation -28 feet MSL). The Beach Deposits predominantly consisted of medium dense to dense, silty sand (SM) to clayey sand (SC) with occasional gravel layers (GM, GC), except for an approximately 2-foot-thick layer of loose, silty sand (SM) at the top of the Beach Deposits within B-5. Equivalent SPT-N ranged from about 7 to over 50 blows per foot based on converted modified California blow counts. The CPT tip resistance generally ranged between about 10 and 350 tsf with some layers a few feet thick having tip resistances up to about 500 tsf. The CPT sleeve resistance generally ranged between about 1 and 6 tsf with occasional layers having sleeve resistances up to about 10 tsf. The CPT estimated soil behavior type indicates the Beach Deposits consist mostly of medium dense to dense sands and silty sands, except for an approximately 10-foot-thick layer of very stiff fine-grained material in CPT-2 between a depth of about 45 and 55 feet bgs (about Elevation -15 to -25 feet MSL).

Table 1: Summary of Available Geologic Data

Boring ID	Ground Surface Elevation (feet) NAVD88	Geologic Unit	Depth Range (feet)	Elevation Range (feet) NAVD88	Predominant Lithology
B-1	19½	Fill	0 to 19	+19½ to +½	GM, SC, SM w/ gravel
		Beach Dep.	19 to 25½	+½ to -6	GM, GC, SM
B-2	30½	Fill	0 to 30	+30½ to +½	SM, SC w/ gravel
		Beach Dep.	30 to 31½	+½ to -1	SM
B-3	28½	Fill	0 to 30	+28½ to -1½	SM w/ gravel
		Beach Dep.	30 to 31½	-1½ to -3	SC
B-4	32½	Fill	0 to 29½	+32½ to +3	GM, SC, SM, CH w/gr.
B-5	32½	Fill	0 to 28½	+32½ to +4	SM w/ gravel
		Beach Dep.	28½ to 33½	+4 to -1	SM
B-6	36½	Fill	0 to 19½	+36½ to +17	SM, SC w/ gravel
B-7	32½	Fill	0 to 24½	+32½ to +8	SM, SC, CL w/ gravel
		Beach Dep.	24½ to 31	+8 to +1½	SC, SM
B-7A	32½	Fill	0 to 24½	+32½ to +8	SM, SC, CL w/ gravel
		Beach Dep.	24½ to 27½	+8 to +5	SP-SM, SC
B-8	33½	Fill	0 to 26	+33½ to +7½	SM, SC w/ gravel
		Beach Dep.	26 to 35½	+7½ to -2	SM, SC
B-9	33½	Fill	0 to 21½	+33½ to +12	SM, SC w/ gravel
B-10	37½	Fill	0 to 30	+37½ to +7½	SM, SC w/ gravel
		Beach Dep.	30 to 33½	+7½ to +4	SM

Based on currently available subsurface data, geologic conditions including expansive soils and collapsible soils are not considered hazards at the site. A comprehensive geotechnical investigation will be conducted during the design phase of the project to assess the presence of expansive and collapsible soils.

6 GROUNDWATER

During the 2002 field investigation, the groundwater surface was encountered at the time of drilling within all boreholes except B-4, B-6, and B-9 that were terminated above elevation 0 MSL. Generally, the groundwater surface was encountered in the Beach Deposits between about Elevation +7½ to -2 feet MSL. Available groundwater data for the site is summarized in Table 2.

Table 2: Summary of Available Groundwater Data

Boring ID	Ground Surface Elevation (feet) NAVD88	Depth to Groundwater (feet)	Groundwater Elevation (feet MSL) NAVD88	Date Measured
B-1	19½	19	+½	11/12/2002
B-2	30½	30	+½	11/11/2002
B-3	28½	30½	-2	11/11/2002
B-4	32½	Dry (>29½)	Dry (> +3)	11/13/2002
B-5	32½	27	+5½	11/13/2002
B-6	36½	Dry (>19½)	Dry (> +17)	11/13/2002
B-7	32½	25	+7½	11/11/2002
B-7A	32½	26	+6½	11/11/2002
B-8	33½	26	+7½	11/12/2002
B-9	33½	Dry (>21½)	Dry (> +12)	11/12/2002
B-10	37½	31½	+6	11/12/2002

7 AS-BUILT DATA

As-built plans for the current PCH bridge (Bridge No. 53-0035) produced by the State of California Department of Public Works, Division of Highways and dated September 8, 1932 were reviewed. As noted on these plans, the existing bridge foundation consists of nominally 27-foot-long untreated Douglas fir piles. These piles were driven into the ground to an elevation of about -30 feet NGVD 29 MSL and to a capacity of at least 22 tons. Nominally 35-foot-long test piles were driven into the ground to an elevation of about -38 feet NGVD 29 MSL. No borehole information, test pile records, or production pile records were included in the State of California plans.

Appendix B presents available as-built data for the current PCH bridge (Bridge No. 53-0035) from Caltrans.

8 SCOUR DATA

The PCH Bridge spans a watercourse (Topanga Lagoon). At the bridge location, the Topanga Lagoon bottom is unlined; therefore, scour potential should be considered in project design. The Structures Hydraulics Branch has not yet issued a Preliminary Hydraulics Report. The scour potential will be evaluated during the design phase of the project.

9 CORROSION EVALUATION

Previous corrosion test data is not available; therefore, the corrosion potential of on-site soils is unknown. As discussed above, the site is predominantly underlain by sands and gravels near the beach and associated salty water. Therefore, for preliminary design purposes, the site should be considered corrosive based on the proximity to the beach and associated salty water. Soil samples for corrosivity testing will be obtained during the design phase to evaluate the corrosion potential of the site.

10 SEISMIC INFORMATION

10.1 Ground Motion Hazard

The PCH Bridge site is in a seismically active region of southern California, as evidenced by the 1987 M6 Whittier earthquake and the 1994 M6.7 Northridge earthquake. Figure 9 shows the site relative to mapped active faults in the region identified by the California Geological Survey (CGS, 2020). As shown on Figure 9, significant faults near the site include the Holocene active Santa Monica fault (located about ¾ km to the south), the late Quaternary active Anacapa-Dune fault (located about 3 km to the south), the late Quaternary active Malibu Coast fault (located about 6½ km to the east), the Holocene active Newport Inglewood fault (located about 15 km to the east), and the Holocene active Hollywood fault (located about 16 km to the east). Based on the seismic setting, the site is susceptible to strong seismic shaking during the design life of the bridge.

Because fill placement at the site is undocumented, the fill is an unsuitable foundation material for the proposed PCH Bridge; therefore, the planned bridge foundations are expected to be founded almost entirely on the underlying Beach Deposits (see schematic profiles on Figure 8). Based on subsurface data collected within Beach Deposits in the 2002 borings and CPTs, equivalent SPT-N values at the site generally ranged from about 25 to greater than 50 blows per foot. The time-average shear-wave velocity for the upper 100 feet (V_{s30}) was estimated using the available equivalent SPT-N standard penetration resistance data based on the procedures outlined in the National Earthquake Hazards Reduction Program (NEHRP). Based on this procedure, the V_{s30} at the site was estimated to be 1,000 ft/s (305 m/s), which falls within NEHRP Site Class D, stiff soil ($600 < Vs30 \leq 1{,}200$ ft/s).

The Design Spectrum was constructed following Caltrans Seismic Design Criteria (SDC 2.0, adopted September 1, 2019). The Design Spectrum is based on the USGS 975-year uniform hazard spectrum using the 2014 National Hazard Map (effective December 1, 2019) with near fault adjustment factors and basin amplification factors. The Design Spectrum is reported in the form of the design Acceleration Response Spectrum (ARS) which represents the horizontal ground motion at the site with a 5% probability of exceedance in 50 years (return period of 975 years).

The Caltrans web-based tool ARS Online V3.0.2 was used to develop the design ground motion parameters, including the ARS for the site. The input to ARS Online V3.0.2 included

the site location (latitude: 34.039132; longitude: -118.583166) and V_{s30} (1,000 ft/s). Figure 10 shows the ground motion data sheet with the design ARS data, ARS plot, and other relevant information. As shown on Figure 10, the design PGA = 0.65 g, the deaggregated mean earthquake moment magnitude for PGA is M = 6.75, and the mean site-to-source distance for 1.0 second period spectral acceleration is 13 km.

The preliminary classification of the soil at the site is "Class S2" per Section 6.1 and 6.2.4 of the SDC 2.0.

10.2 Other Seismic Hazards

Surface Fault Rupture Potential

The PCH Bridge site is not located within a currently established Alquist-Priolo Earthquake Fault Zone based on a review of the Earthquake Zones of Required Investigation for the Topanga Quadrangle (CGS, 2018). Additionally, the site is not located within 300 m (1,000 ft) of a mapped Holocene-active fault based on a review of mapping by CGS (2020). Therefore, the site is not considered susceptible to surface fault rupture hazards per Memo to Designers (MTD) 20-10.

Liquefaction Potential

Liquefaction occurs when relatively loose, saturated, non-cohesive soils undergo a temporary loss of stiffness and strength in response to strong ground shaking. Liquefaction potential is greatest where the groundwater level is shallow, and submerged, loose, fine sands occur within a depth of about 50 feet bgs or less. Liquefaction potential decreases as clay and gravel content increase. Also, higher ground accelerations and shaking durations during earthquakes increase the liquefaction potential.

According to the Earthquake Zones of Required Investigation for the Topanga Quadrangle (CGS, 1997), the PCH Bridge site is located within an area identified as having a potential for liquefaction (see Figure 11). As noted previously, the portions of the artificial fill currently present at the site will be removed down to the underlying Beach Deposits as part of the proposed Topanga Lagoon restoration. Based on subsurface data collected during the 2002 field investigation, the groundwater surface was encountered within the Beach Deposits and will be shallower than 50 feet bgs (i.e., between about Elevation +7½ to -2 feet MSL). Additionally, the Beach Deposits are Holocene-age and were found to be predominately composed of sands and silty sands with local layers of finer grained silts and clays. The sandy soils below the groundwater surface appear to be predominantly medium dense to dense based on equivalent SPT-N estimates calculated from modified California sample blow counts; however, a 2-foot-thick layer of loose, wet, silty sand (SM) was encountered at the top of the Beach Deposits within B-5. The range of equivalent SPT-N in saturated sandy Beach Deposits was in general agreement with the CPT results (tip resistances generally above 200 to 300 tsf). Lower CPT tip resistances (10 to 200 tsf) measured within the Beach Deposits are apparently associated with finer grained clays and silts which would not be expected to be susceptible to

liquefaction; however, this would need to be confirmed with samples collected within future borings.

Based on the limited available information discussed above, liquefaction potential exists at the PCH Bridge site. A comprehensive geotechnical investigation will be conducted during the design phase of the project to further assess liquefaction potential. This future investigation will include mud rotary borings using the SPT sampler and additional CPT soundings.

Seismically Induced Ground Settlement

Seismically induced ground settlement is often caused when unsaturated loose to medium-dense granular soils are densified during ground shaking. Therefore, soils susceptible to liquefaction are also often susceptible to seismically induced settlement.

As discussed above, the sandy soils encountered in the 2002 borings above the water table are generally medium dense to very dense based on equivalent SPT-N estimates. Based on the limited available information, the potential for seismically induced settlement at the PCH Bridge site cannot be conclusively determined. To further evaluate seismically induced ground settlement potential, a comprehensive geotechnical investigation (including mud rotary borings using the SPT sampler and additional CPT soundings) will be conducted during the project design phase.

Lateral Spreading Potential

Lateral spreading occurs when soils liquefy and slide or flow downhill, or breach an open slope face, resulting in permanent ground deformation. Thus, open slope faces composed of materials susceptible to liquefaction are also potentially susceptible to lateral spreading.

As discussed above, a liquefaction potential exists at the PCH Bridge site, and the site contains open slope faces. Therefore, lateral spreading potential exists at the site. As noted above, a comprehensive geotechnical investigation will be conducted during the design phase of the project, and the collected data will be used to further assess lateral spreading potential.

Seismic Slope Stability

Slope stability hazards are generally highest in areas of moderate to steep terrain that are underlain by unfavorably oriented geologic discontinuities.

The site is not located in a designated Earthquake-Induced Landslide Zone (CGS, 1997), as shown on Figure 11, and the proposed grading around the site is relatively low angle with slopes generally shallower than 3:1 (Horizontal to Vertical). However, based on limited subsurface information, the potential for seismically induced landslide hazards cannot be excluded. As noted above, a comprehensive geotechnical investigation will be conducted during the design phase of the project, and the collected data will be used to further assess seismic slope stability.

Tsunami Risk

A tsunami is a sea wave generated by a large submarine landslide or an earthquake-related ground deformation beneath the ocean. The PCH Bridge components will be below an elevation of +40 feet MSL, and the site is located within ½ mile of the Pacific Ocean coastline. Therefore, the risk for tsunami does exist at the site per MTD 20-13.

11 GEOTECHNICAL RECOMMENDATIONS

The following is a discussion of the foundation system alternatives. This discussion is based upon an understanding of the regional geology and the observations of the subsurface conditions from the 2002 field investigation.

- Driven Displacement Piles: Driven displacement piles such as closed end pipe piles or precast prestressed concrete piles are recommended for support of the new structure.

- Driven Non-Displacement Piles: Driven non-displacement open-ended pipe piles or H-piles are feasible for foundation support, however installed pile lengths are expected to be variable and difficult to predict in these subsurface conditions. Driven displacement piles are preferable to driven non-displacement piles.

- Cast-in-Steel-Shell (CISS) Concrete Piles: CISS piles are feasible for foundation support.

- Large Diameter Drilled Shafts (CIDH Concrete Piles): Large diameter drilled shafts, those with diameters greater than 24 inches, are not recommended for support. Saturated granular foundation soils exist at this location. Caving and flowing soils are expected, and "wet" construction methods would be required.

- Small Diameter Drilled Shafts (CIDH Concrete Piles): Small diameter drilled shafts, those with diameters of 24 inches and less, are not recommended for support. Saturated granular foundation soils exist at this location. Caving and flowing soils are expected, and "wet" construction methods would be required.

- Spread Footings: The foundation conditions are not suitable for spread footings because of the presence of loose material in undocumented fill and potentially liquefiable soils.

12 ADDITIONAL FIELD WORK AND LABORATORY TESTING

The existing available site information is not adequate to provide geotechnical design recommendations for the proposed PCH Bridge; therefore, supplemental field investigation and laboratory testing will be performed for project design. The following subsurface investigation and laboratory testing is recommended.

- Geologic Mapping: Perform geologic mapping of present and accessible exposures of bedrock in the general areas of the proposed bridge abutments. The purpose of the

mapping will be to collect data regarding the orientation and character of rock mass discontinuities to assist with the assessment of slope stability.

- Seismic CPT Soundings: Perform CPT soundings with seismic velocity measurements and pore pressure dissipation tests at the proposed bridge foundation locations. The CPTs will collect continuous subsurface information to CPT refusal or a maximum depth of approximately 100 feet bgs. The purpose of the CPTs will be to characterize subsurface material type and foundation conditions, collect CPT data for use in liquefaction and settlement analyses, and evaluate groundwater levels.

- Mud-Rotary Borings: Drill, sample, and log mud-rotary borings to adequately characterize geotechnical conditions at the proposed bridge foundation locations. The borings will be drilled to a total depth of about 100 feet bgs. During drilling, SPT and modified California drive samples will be obtained to the total depth of the boring. The purpose of the drilling will be to characterize subsurface materials, collect SPT blow count data below the water surface for use in liquefaction and settlement analyses, and collect samples for laboratory testing.

- Laboratory Testing: Samples collected during the field investigation will be tested to evaluate pertinent physical and engineering properties. The laboratory testing may include water content, density, Atterberg limits, grain-size distribution, direct shear strength, unconsolidated undrained (UU) triaxial strength, and corrosion.

The proposed field investigation work will be completed outside of Caltrans right of way and will not require lane closures. RCDSMM will perform coordination with California Department of Parks and Recreation (CDPR) for site access on the north side of PCH and Los Angeles County Department of Beaches and Harbors for site access on the south side of PCH.

13 LIMITATIONS

The conclusions and recommendations presented in this SPGR are based upon our review of the available existing documents and our relevant previous experience. No field exploration, laboratory testing, or analyses were performed as part of this review. As such, the findings summarized in this plan are preliminary and subject to change when additional information or further investigations become available.

Professional judgments presented in this SPGR are based on an evaluation of the technical information gathered and GeoPentech's general experience in the fields of geotechnical engineering and geology. GeoPentech does not guarantee the performance of the project in any respect, only that the engineering work and judgment rendered meet the standard of care of the geotechnical profession at this time.

14 REFERENCES

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GeoPentech, 2003b, "Technical Memorandum: Topanga Lagoon Restoration Project, Preliminary Geotechnical Evaluation, Pacific Coast Highway Bridge Span over Topanga Lagoon, Los Angeles County, California", dated December 1.

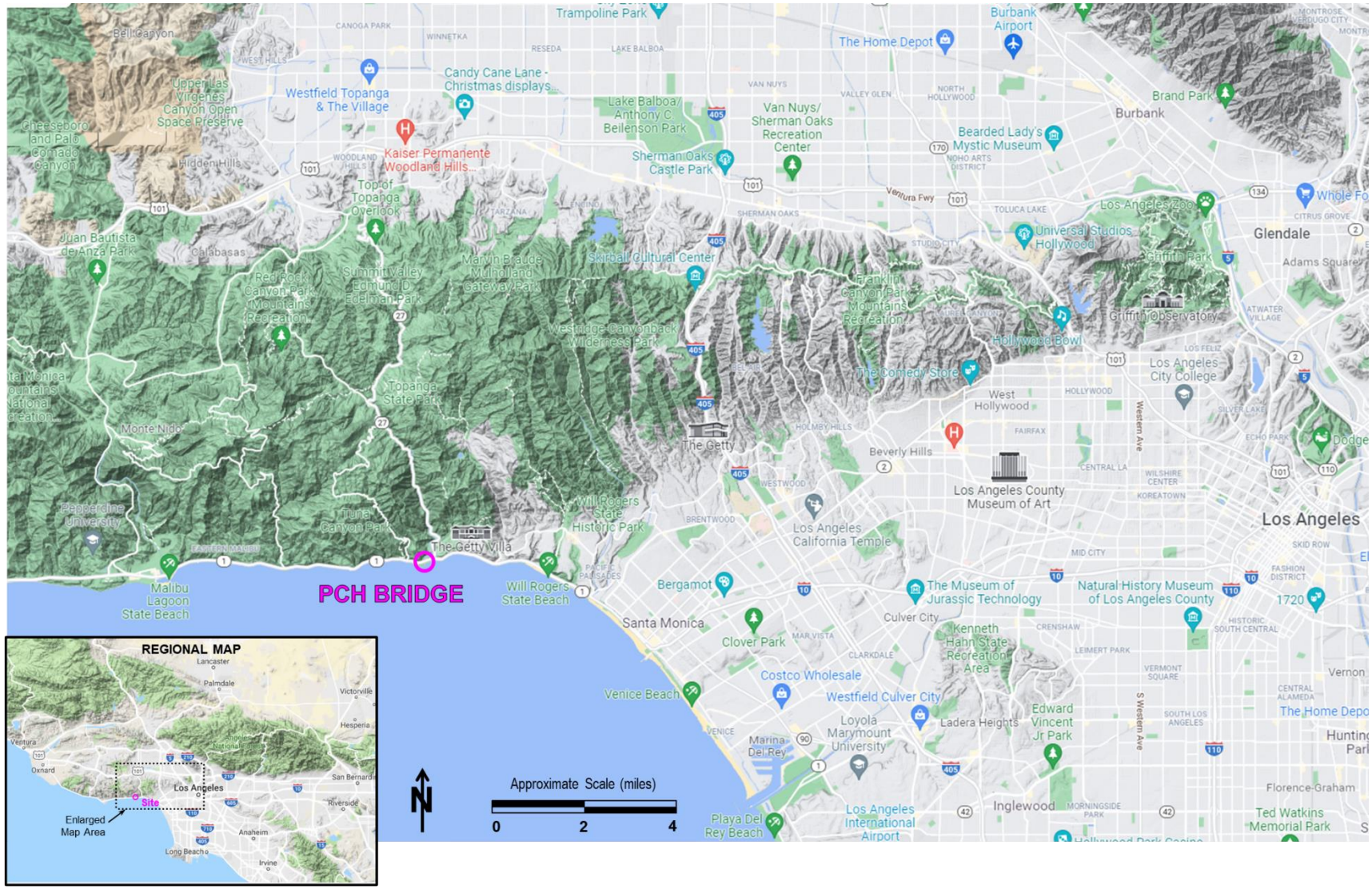


Figure 1: Site Location Map

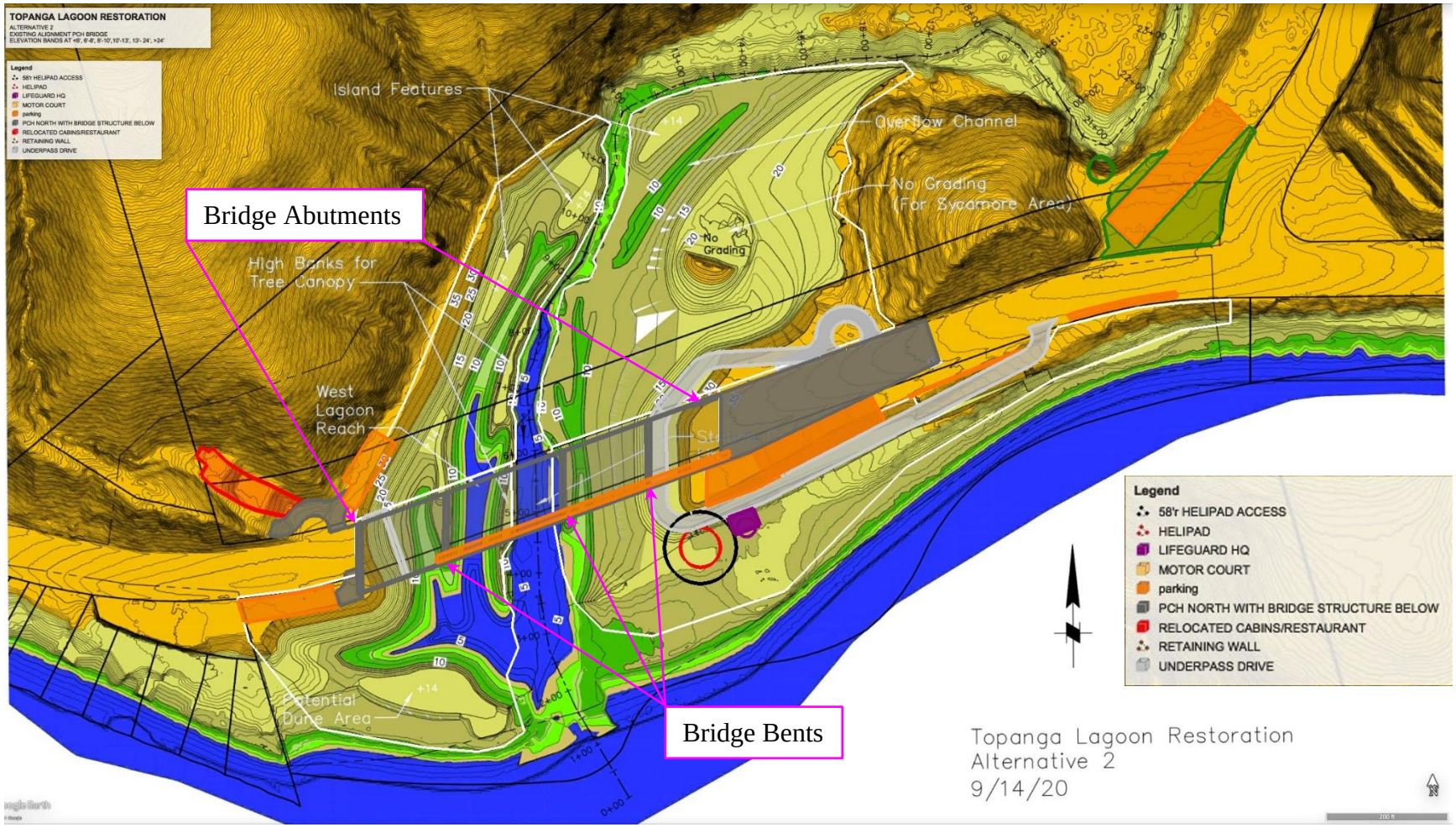


Figure 2: Alternative 2 – PCH Bridge Configuration

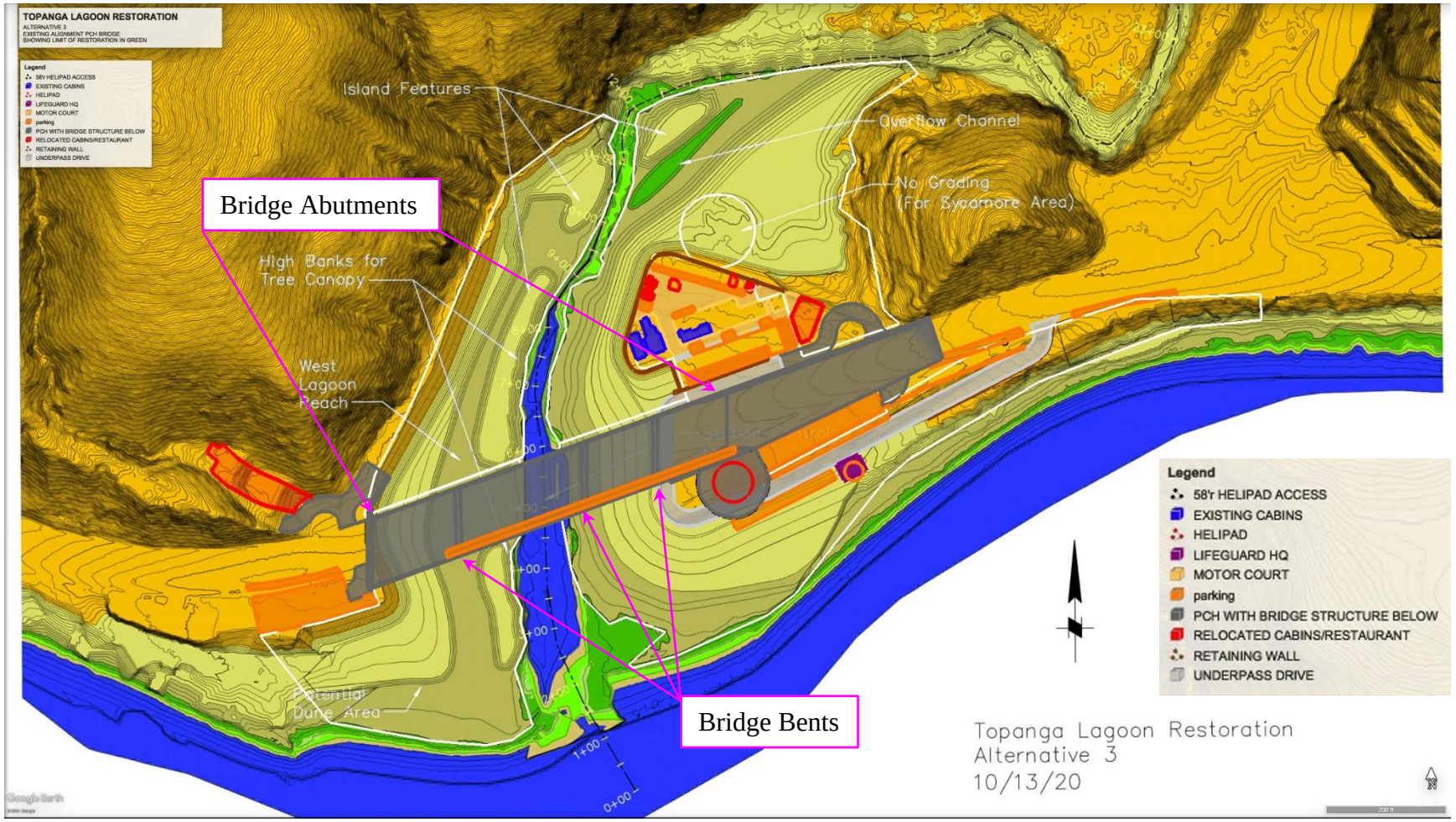


Figure 3: Alternative 3 – PCH Bridge Configuration

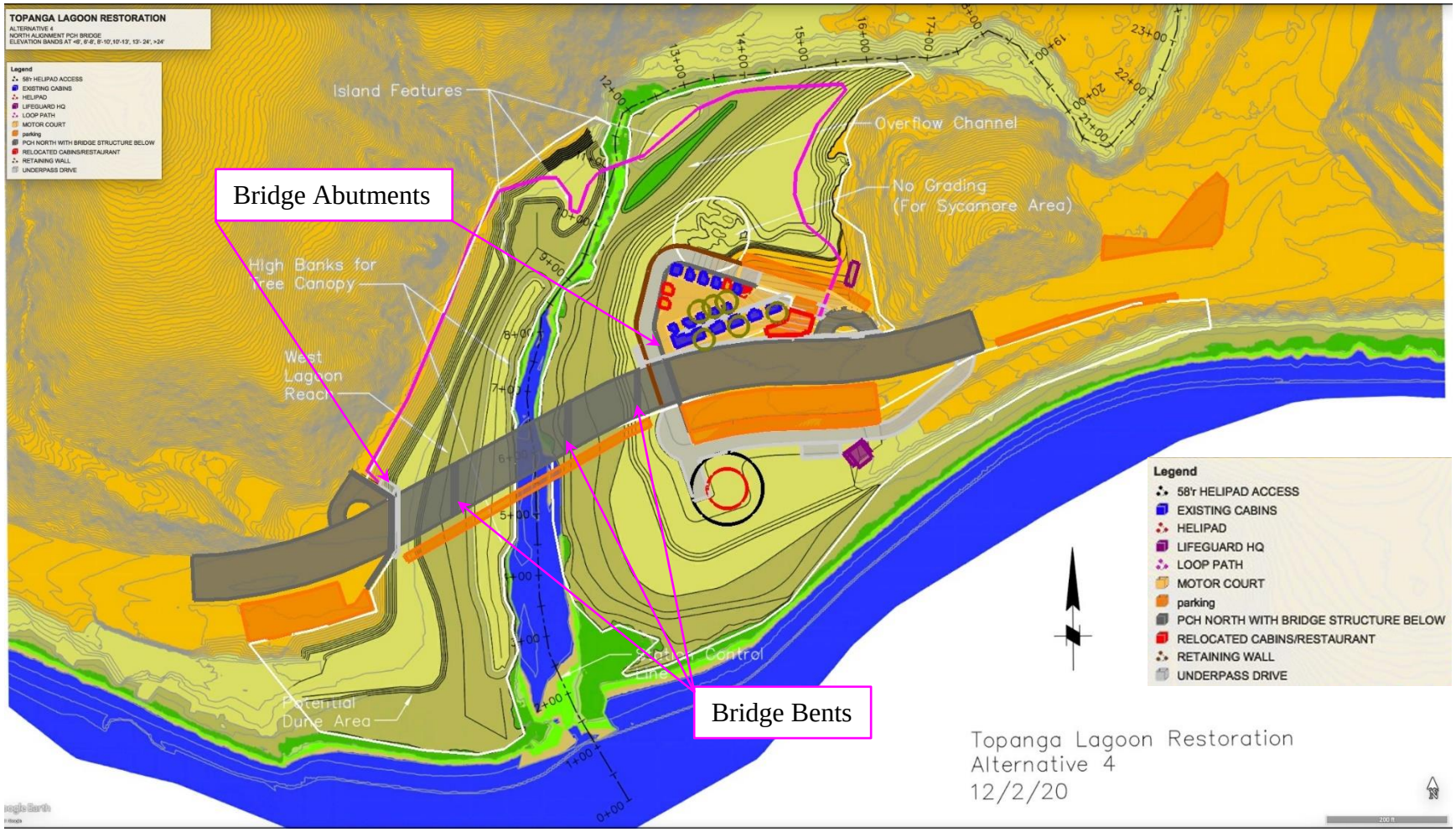


Figure 4: Alternative 4 – PCH Bridge Configuration

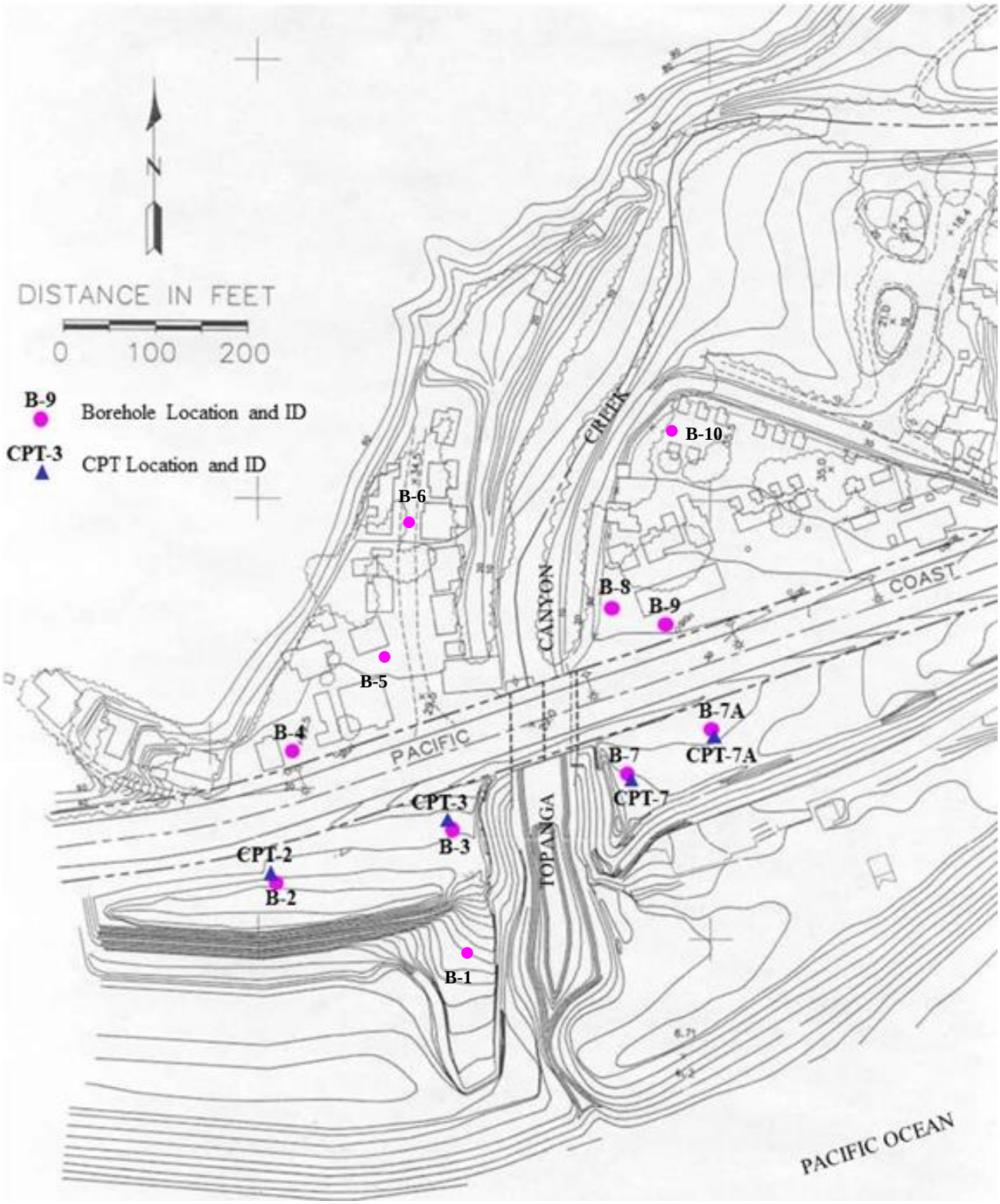


Figure 5: 2002 Field Investigation Location Map

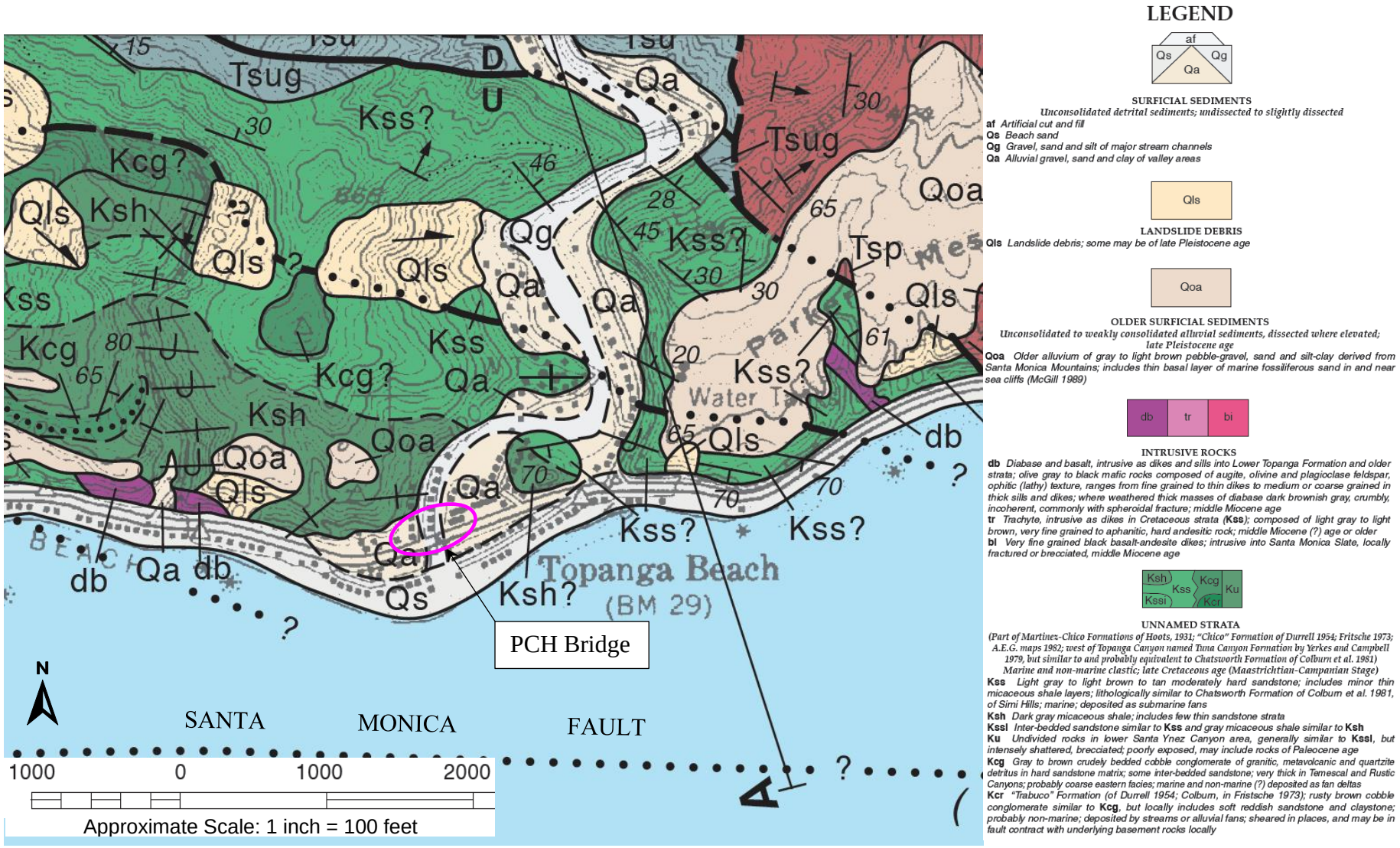


Figure 6: Site Geologic Map (Dibblee, 1992)

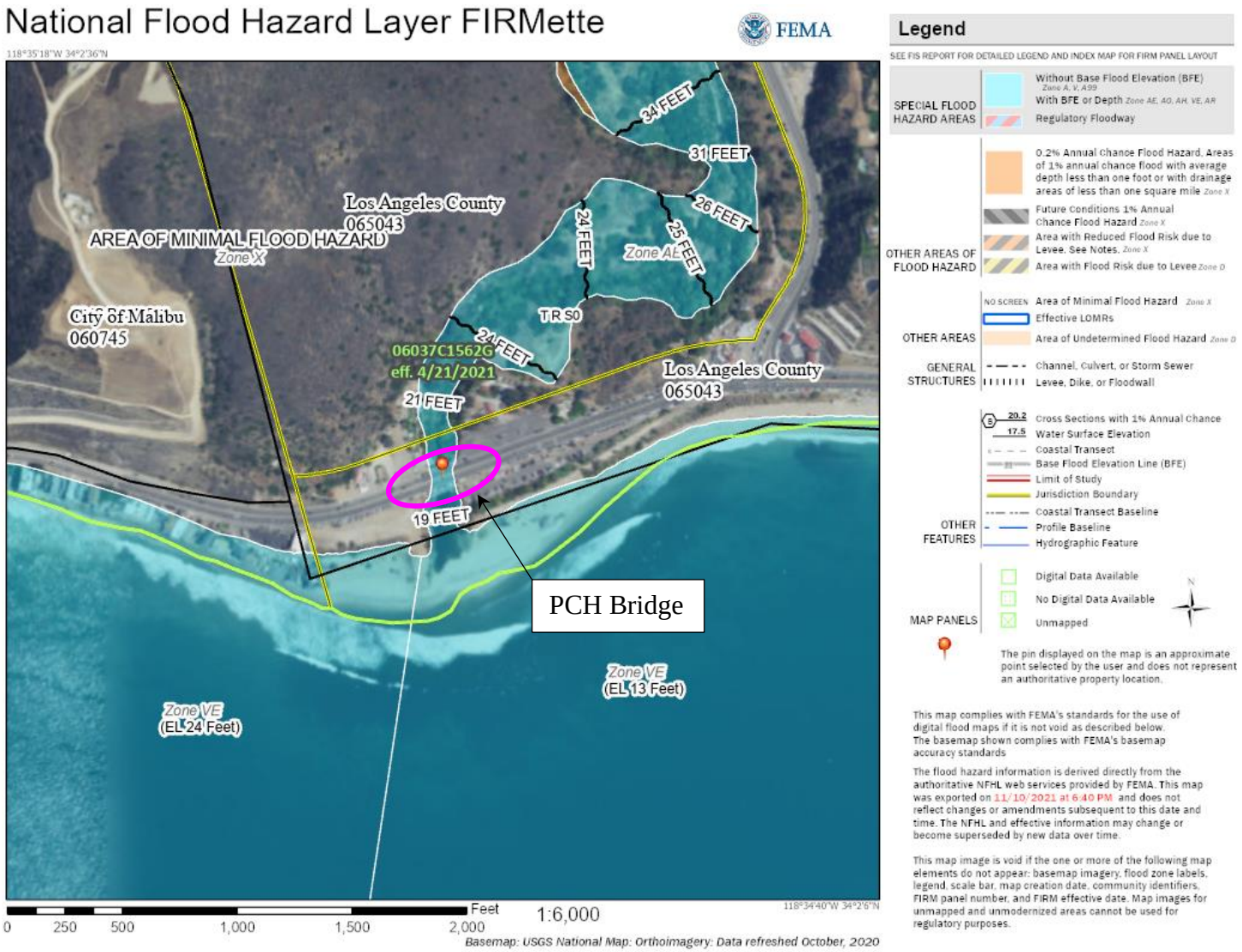


Figure 7: FEMA Flood Insurance Rate Map

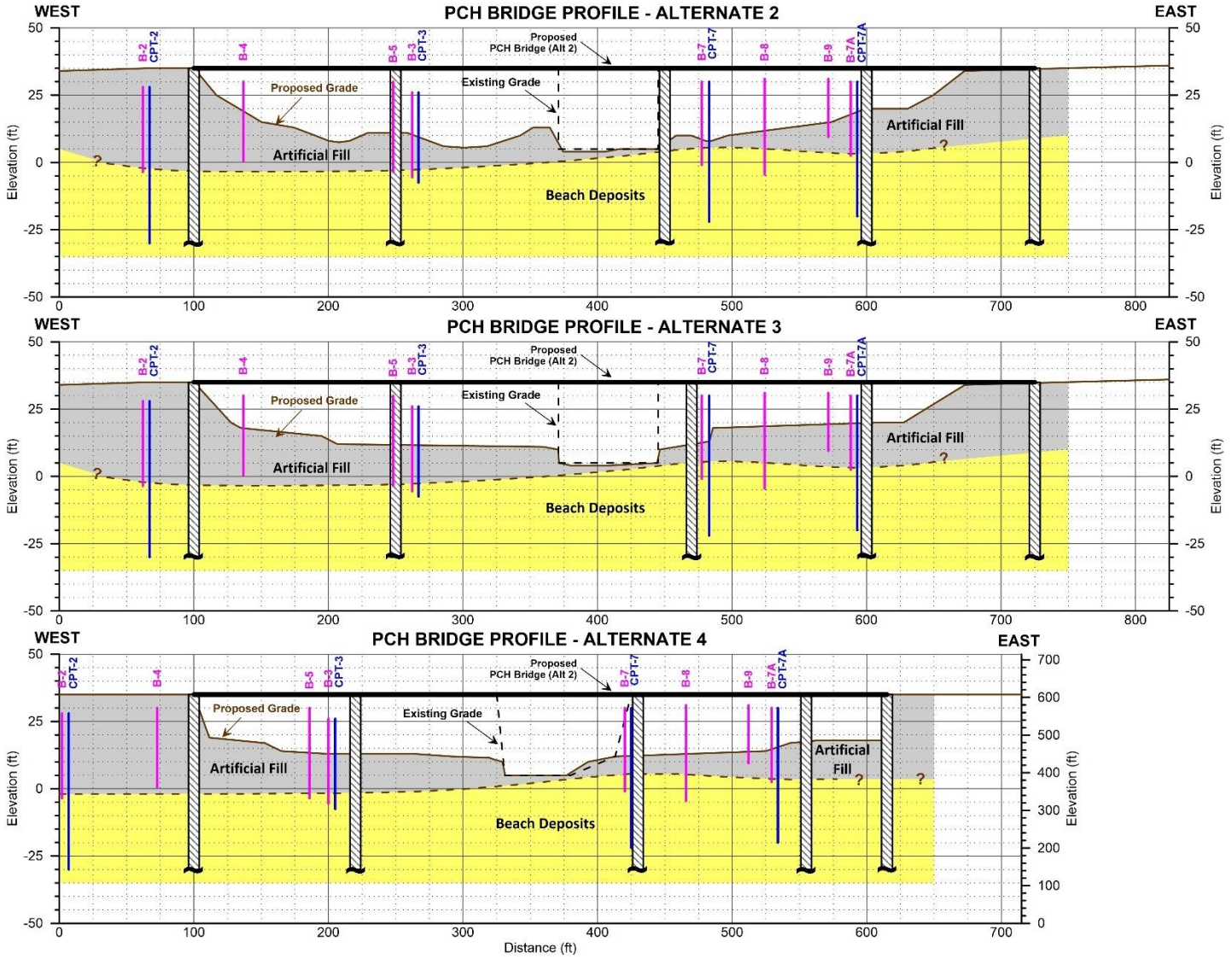


Figure 8: Schematic Geologic Profiles for Alternates 2 through 4

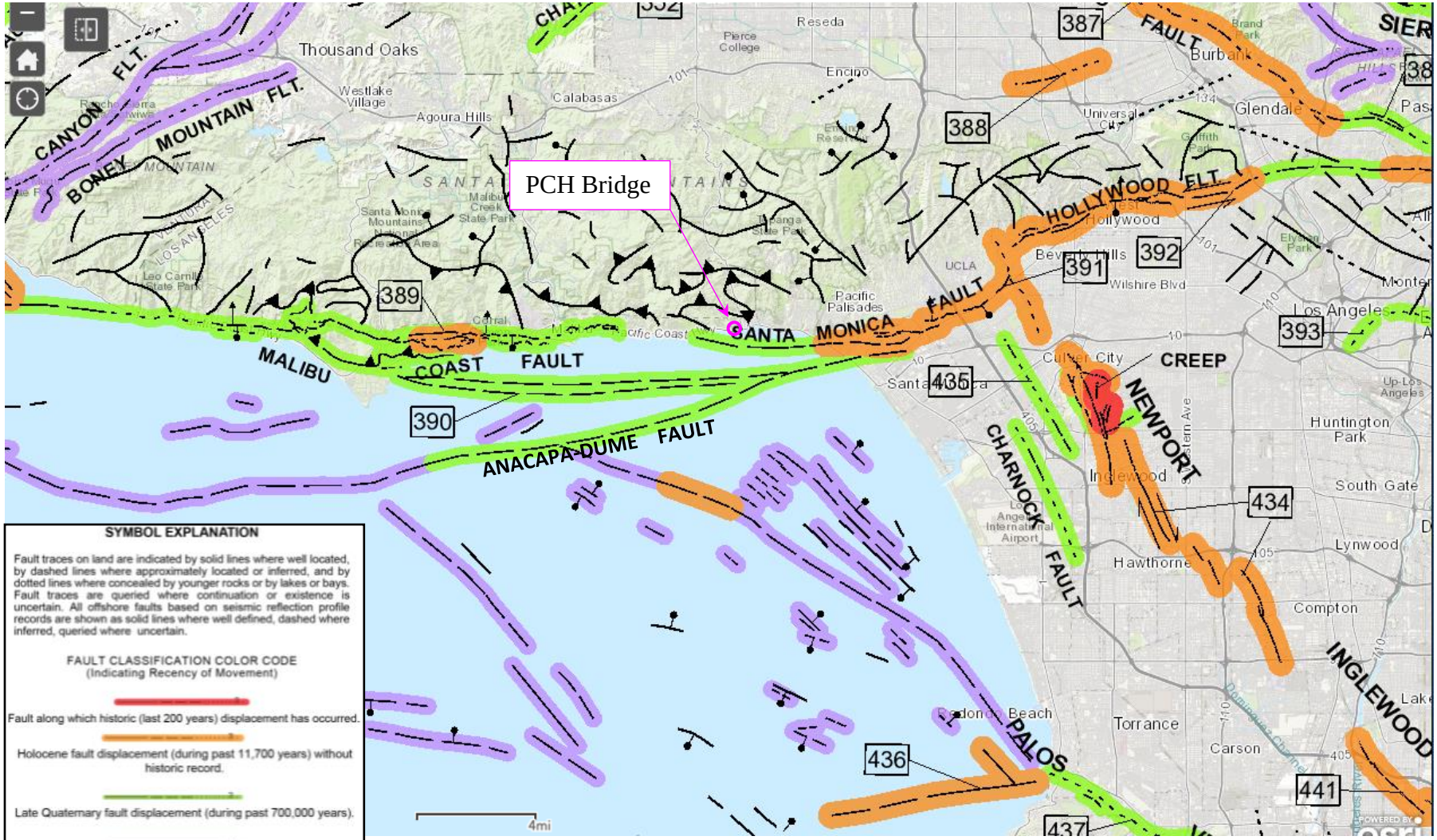
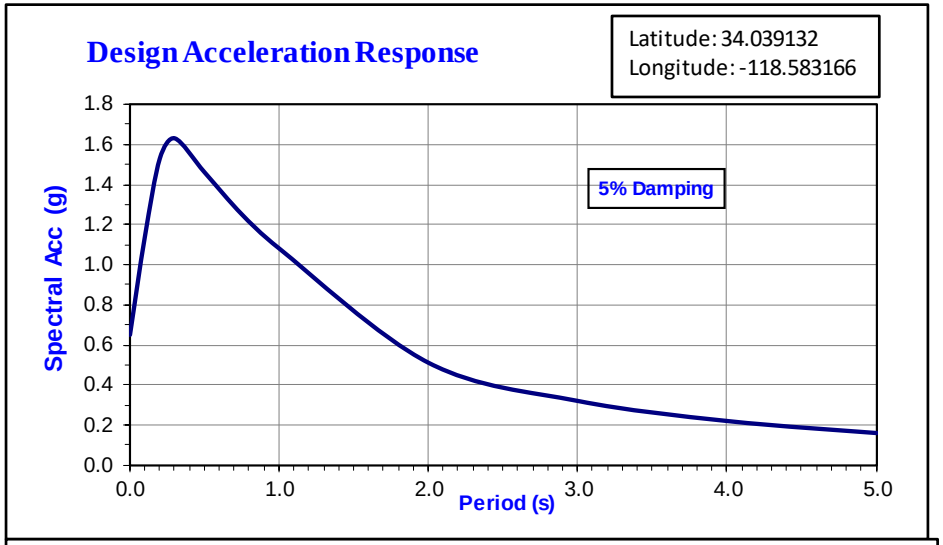


Figure 9: Site Fault Map (CGS, 2020)

Design ARS Data for PCH Bridge *(Bridge No. 53-0035)* Date: 11/12/2021

Period, T (sec)	Spectral Acceleration, Sa(g)
0.00	0.65
0.10	1.14
0.20	1.53
0.30	1.63
0.50	1.46
0.75	1.25
1.00	1.08
2.00	0.51
3.00	0.32
4.00	0.22
5.00	0.16



The Design ARS was developed using the ARS Online Version 3.0.2 webtool based on the 2014 USGS Probabilistic Data (Conterminous - Dynamic Model) with a 975 return period. Modifications for Basin and Near Fault factors are applied where applicable.

Seismic Loading Table (per MTD 1-47)

Soil Profile (V_{S30}): 1,000 ft/s

PGA : 0.65g

Mean Magnitude (for PGA): **M** = 6.75

Mean Site-Source Distance (for Sa at 1s) = 13 km

Figure 10 : Ground Motion Data Sheet

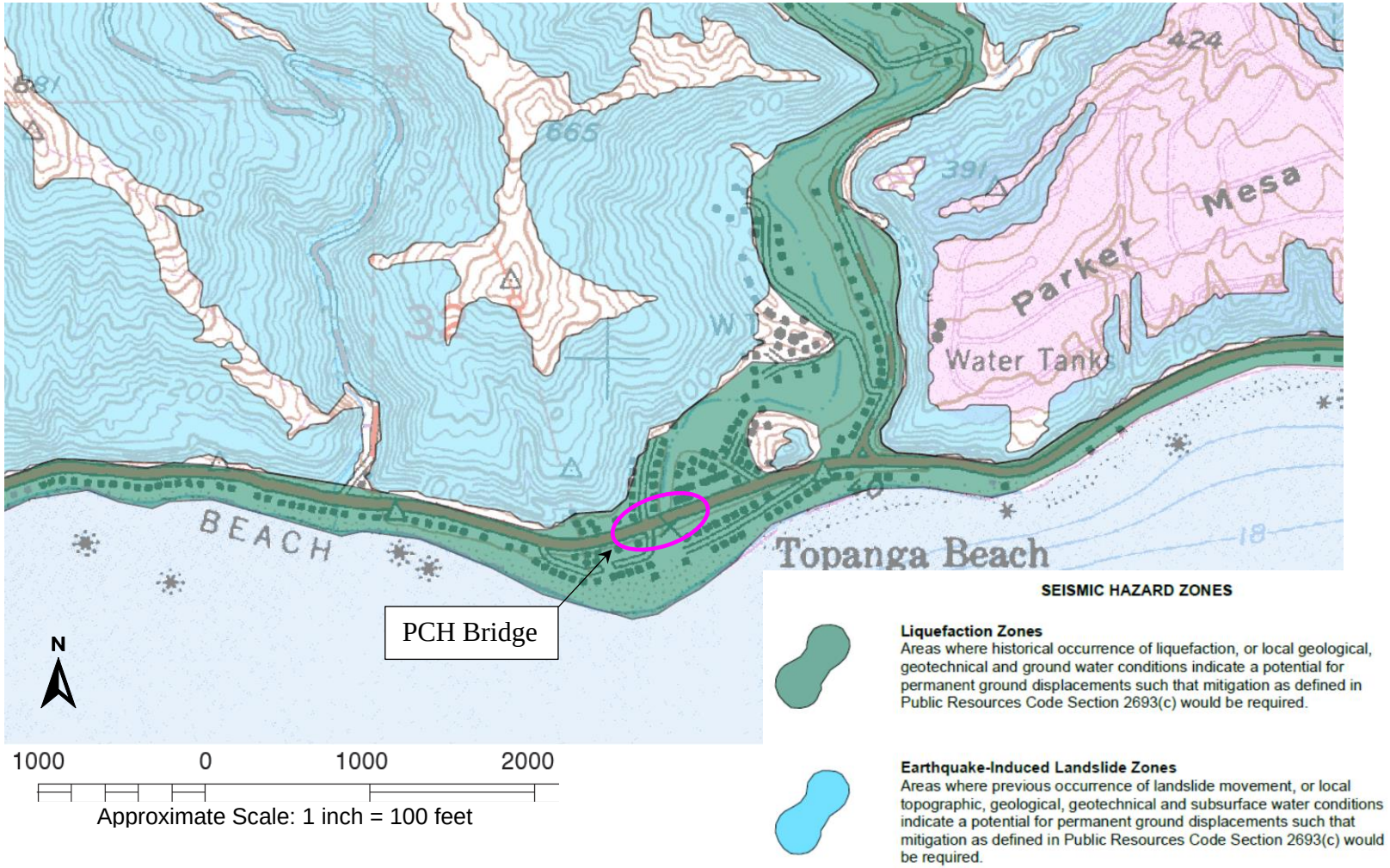


Figure 11: Earthquake Zones of Required Investigation (CGS, 1997 and 2018)

APPENDIX A

2002 Field Investigation (GeoPentech, 2003)

Logs of Test Borings

Cone Penetration Test Data

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Key to Log of Boring

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Number	SAMPLES: Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
1	2	3	4	5	6	7	8	9	10

COLUMN DESCRIPTIONS

1 **Elevation:** Elevation in feet referenced to mean sea level (MSL) or site datum.

2 **Depth:** Depth in feet below the ground surface.

3 **Sample Type:** Type of soil sample collected at depth interval shown; sampler symbols are explained below.

4 **Sample Number:** Sample identification number.

5 **Sampling Resistance:** Number of blows required to advance driven sampler 12 inches beyond first 6-inch interval, or distance noted, using a 140-lb hammer with a 30-inch drop. Hydraulic down-pressure may be recorded for pushed samplers.

6 **Graphic Log:** Graphic depiction of subsurface material encountered; typical symbols are explained below.

7 **Material Description:** Description of material encountered; may include density/consistency, moisture, color, and grain size.

8 **Water Content:** Water content of sample, as percentage of dry weight of soil, measured in lab according to ASTM D2216.

9 **Dry Unit Weight:** Dry weight per unit volume of soil sample, in pounds per cubic foot, measured in lab according to ASTM D2937.

10 **Remarks and Other Tests:** Comments and observations regarding drilling or sampling made by driller or field personnel. Other lab tests are indicated using abbreviations explained below.

TYPICAL MATERIAL GRAPHIC SYMBOLS

- POORLY GRADED SAND (SP)
- POORLY GRADED SAND with SILT (SP-SM)
- SILTY SAND (SM)
- SILT (ML)
- ELASTIC SILT (MH)
- SILTY to CLAYEY SAND (SM/SC)
- LEAN CLAY (CL)
- FAT CLAY (CH)
- CLAYEY SAND (SC)
- SILTY CLAY (CL or CL-ML)
- CLAYEY SILT (ML)
- GRAVEL (GP/GW)

TYPICAL SAMPLER GRAPHIC SYMBOLS

- Modified California tube-lined split barrel (2.5-inch-OD)
- Standard Penetration Test (SPT) split spoon
- Shelby tube (thin-wall, fixed-head undisturbed)
- California ring-lined split barrel (3-inch-OD)
- Bulk sample
- Grab sample

OTHER LABORATORY TEST ABBREVIATIONS

AL	Atterberg Limits test (ASTM D4318)
LL	Liquid Limit from Atterberg Limits test
PI	Plasticity Index from Atterberg Limits test
Gs	Specific Gravity (ASTM D854)
GR	Gravel content from sieve analysis (ASTM D422), %>4 sieve
SA	Sand content from sieve analysis, %<#4 and >#200 sieve
FI	Fines content from sieve analysis, %<#200 sieve
UC	Unconfined compressive strength test (ASTM D2166), q_u in ksf

OTHER GRAPHIC SYMBOLS

- First water encountered at time of drilling and sampling
- Static water level measured at specified time after drilling
- Change in material properties within a lithologic stratum
- Inferred contact between soil strata or gradational lithologic change

Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive; field descriptions may have been modified to reflect lab test results. Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced; they are not warranted to be representative of subsurface conditions at other locations or times.

Figure A-1

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 1

Sheet 1 of 1

Date(s) Drilled	**11/12/02**	Logged By	**S. Duke**	Checked By	**S.T. Freeman**
Drilling Method	**Hollow-Stem Auger**	Drill Bit Size/Type	**4-1/4-inch-ID, 8-inch-OD auger**	Total Depth of Borehole	**25.5 feet**
Drill Rig Type	**CME 85**	Drilling Contractor	**A & R Drilling**	Approximate Surface Elevation	**17 feet MSL**
Groundwater Level(s)	**19 feet bgs ATD**	Sampling Method	**Modified California lined with 2-inch-dia. brass tubes**	Hammer Data	**Downhole hammer; 140 lbs / 30-inch drop**
Borehole Backfill	**Drill cuttings (tamped)**	Location	**Refer to site plan**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
	0					**FILL** Medium dense, moist, brown, SILTY GRAVEL with SAND (GM), gravel consists mostly of yellowish brown sandstone fragments, fine- to medium-grained sand, trace clay			
15			1	28					Composite of 1 and 2: GR = 35% SA = 34% FI = 31%
						Increasing shale fragments			
	5		2	22					
						Medium dense, moist, brown, SILTY to CLAYEY SAND with GRAVEL (SM/SC), fine- to medium-grained sand, fine gravel consists mostly of sandstone and shale fragments			
10			3	22					
						Becomes reddish brown			
			4	35					
	10					Increasing shale and sandstone fragments			
			5	28					Composite of 5 and 6: GR = 20% SA = 46% FI = 34% Gs = 2.80
5						Becomes medium dense to dense, dark gray with dark gray shale fragments			
			6	39					
	15		7	32					
						Dense, moist, dark brown, CLAYEY SAND with GRAVEL (SC), gravel consists of sandstone and shale fragments			
0			8	39					Composite of 8 and 9: GR = 29% SA = 43% FI = 28%
			9	25		▽			
	20					**BEACH DEPOSITS** Medium dense to dense, wet, brown, SILTY to CLAYEY GRAVEL with SAND (GM/GC), fine to coarse gravel			
			10	40					Composite of 10 and 11: GR = 57% SA = 29% FI = 14% Gs = 2.73
-5			11	41					
						Dense, wet, bluish gray, SILTY SAND (SM)			
	25		12	45					
-10						**Bottom of boring at 25.5 feet**			
	30								
-15									
	35								

Report: GP SOIL LOG; File: TLAGOON.GPJ; 12/20/2002

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Figure A-2

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 2

Sheet 1 of 1

Date(s) Drilled	**11/11/02**	Logged By	**S. Duke**	Checked By	**S.T. Freeman**
Drilling Method	**Hollow-Stem Auger**	Drill Bit Size/Type	**4-1/4-inch-ID, 8-inch-OD auger**	Total Depth of Borehole	**31.5 feet**
Drill Rig Type	**CME 85**	Drilling Contractor	**A & R Drilling**	Approximate Surface Elevation	**28 feet MSL**
Groundwater Level(s)	**30 feet bgs ATD**	Sampling Method	**Modified California lined with 2-inch-dia. brass tubes**	Hammer Data	**Downhole hammer; 140 lbs / 30-inch drop**
Borehole Backfill	**Drill cuttings (tamped)**	Location	**Refer to site plan**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
	0					Asphalt			
						FILL			
			1	58		Dense, moist, brown, SILTY to CLAYEY SAND with GRAVEL (SM/SC), fine- to medium-grained sand, fine to coarse gravel consists of sandstone and shale fragments			Composite of 1 and 2: GR = 21% SA = 49% FI = 30% Gs = 2.72
25			2	52					
	5		3	53		Becomes reddish brown			
20			4	59					
						Becomes light brown (in sampler tip)			
	10		5	58		Becomes dark reddish brown			Composite of 5 and 6: GR = 23% SA = 49% FI = 28%
			6	50/2"		Concreted sandstone cobble in sampler shoe			
15									
			7	50/3"		Becomes very dense, dark gray			
	15								
			8	65		Becomes dark reddish brown; increase in clay content			Composite of 8 and 9: GR = 33% SA = 39% FI = 28%
10			9	68					
	20		10	47		Medium dense to dense, moist, dark brown, SILTY SAND (SM), fine-grained sand, few fine to coarse gravel-size fragments of sandstone and shale			
5			11	34					Composite of 11 and 12: GR = 11% SA = 53% FI = 36% Gs = 2.72
	25		12	33					
			13	40					
0			14	28		Medium dense, moist, gray, CLAYEY SAND (SC), fine- to medium-grained sand			
	30					▽			
			15	48		**BEACH DEPOSITS** Dense, wet, brown, SILTY SAND (SM), fine- to medium-grained sand			
						Bottom of boring at 31.5 feet			
-5									
	35								

Report: GP SOIL LOG; File: TLAGOON.GPJ; 12/20/2002

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Figure A-3

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 3

Sheet 1 of 1

Date(s) Drilled	**11/11/02**	Logged By	**S. Duke**	Checked By	**S.T. Freeman**
Drilling Method	**Hollow-Stem Auger**	Drill Bit Size/Type	**4-1/4-inch-ID, 8-inch-OD auger**	Total Depth of Borehole	**31.5 feet**
Drill Rig Type	**CME 85**	Drilling Contractor	**A & R Drilling**	Approximate Surface Elevation	**26 feet MSL**
Groundwater Level(s)	**30.5 feet bgs ATD**	Sampling Method	**Modified California lined with 2-inch-dia. brass tubes**	Hammer Data	**Downhole hammer; 140 lbs / 30-inch drop**
Borehole Backfill	**Drill cuttings (tamped)**	Location	**Refer to site plan**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
25	0					**FILL** Dense, moist, brown, SILTY SAND (SM), fine- to medium-grained sand, some clay			
			1	50					Composite of 1 and 2: GR = 14% SA = 59% FI = 27%
20	5		2	39		Becomes dark reddish brown, with fine to coarse gravel-size fragments of sandstone and shale			
			3	34		Coarse gravel-size sandstone fragment in sampler shoe Becomes medium dense			
15	10		4	64		Becomes very dense			Composite of 4 and 5: GR = 12% SA = 62% FI = 26%
			5	44		Becomes dense			
10	15		6	37		Concreted sandstone cobble in sampler shoe			
			7	30		Medium dense to dense, moist, yellowish brown, SILTY SAND with GRAVEL (SM), fine gravel consists of sandstone and shale fragments			
5	20		8	40		Becomes brown, with some clay			Composite of 8 and 9: GR = 22% SA = 60% FI = 18% Gs = 2.73
			9	33		Cobble in sampler shoe			
0	25		10	60		Becomes dense, dark brown; increase in clay content			
			11	48					
-5	30		12	43		Becomes light brown (in sampler tip)			
			13	33		Becomes medium dense, dark brown			Composite of 13 and 14: GR = 18% SA = 44% FI = 38%
			14	35					
	35		15	36		**BEACH DEPOSITS** Medium dense, wet, dark gray, CLAYEY SAND (SC), fine-grained sand			
						Bottom of boring at 31.5 feet			

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Figure A-4

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 4

Sheet 1 of 1

Date(s) Drilled	**11/13/02**	Logged By	**S. Duke**	Checked By	**S.T. Freeman**
Drilling Method	**Hollow-Stem Auger**	Drill Bit Size/Type	**4-1/4-inch-ID, 8-inch-OD auger**	Total Depth of Borehole	**29.5 feet**
Drill Rig Type	**CME 85**	Drilling Contractor	**A & R Drilling**	Approximate Surface Elevation	**30 feet MSL**
Groundwater Level(s)	**Not encountered**	Sampling Method	**Modified California lined with 2-inch-dia. brass tubes**	Hammer Data	**Downhole hammer; 140 lbs / 30-inch drop**
Borehole Backfill	**Drill cuttings (tamped)**	Location	**Refer to site plan**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
30	0					Asphalt over gravel base course			
			1	50/5"		**FILL** Very dense, wet, dark bluish gray, SILTY GRAVEL with SAND (GM), fine to coarse gravel consists of sandstone fragments, fine- to medium-grained sand, sewage odor [Leach Field?]			Rig grinding.
25	5		2	67					Discrete Sample 2: GR = 42% SA = 40% FI = 18%
			3	50/4"		Very dense, wet, dark bluish gray, CLAYEY SAND with GRAVEL (SC), fine- to medium-grained sand, fine to coarse gravel consists of sandstone fragments; sewage odor [Leach Field?]			
			4	83		Increase in moisture content, decrease in fines content; becomes brownish red			
20	10		5	36		Becomes medium dense, dark bluish gray; increase in moisture content			
			6	50/1"		Bluish gray sandstone cobble in sampler shoe			
			7	36		Decrease in moisture content; decrease in sewage odor (possibly bottom edge of leach field)			Drill rig kicked to the side; may have encountered a boulder.
15	15		8	69		Becomes very dense, moist, dark yellowish brown; gravel consists of shale and sandstone fragments			
			9	28		Medium dense, moist, dark yellowish brown, SILTY SAND with GRAVEL (SM), fine to coarse gravel consists of sandstone and shale fragments			Discrete Sample 9: GR = 29% SA = 39% FI = 32% Gs = 2.68
10	20		10	50		Becomes dense; increase in gravel content			
			11	43		Becomes dark reddish brown to dark brown; decrease in fines and gravel content			Discrete Sample 11: GR = 28% SA = 45% FI = 27%
5	25		12	27		Medium dense, moist, dark yellowish brown, SILTY SAND (SM), fine-grained sand, few gravel-size sandstone fragments			
			13	32		Very stiff, moist, dark gray, FAT CLAY (CH)			
			14	30					
0	30					**Bottom of boring at 29.5 feet**			
-5	35								

Report: GP SOIL LOG; File: TLAGOON.GPJ; 12/20/2002

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Figure A-5

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 5

Sheet 1 of 1

Date(s) Drilled	**11/13/02**	Logged By	**S. Duke**	Checked By	**S.T. Freeman**
Drilling Method	**Hollow-Stem Auger**	Drill Bit Size/Type	**4-1/4-inch-ID, 8-inch-OD auger**	Total Depth of Borehole	**33.5 feet**
Drill Rig Type	**CME 85**	Drilling Contractor	**A & R Drilling**	Approximate Surface Elevation	**30 feet MSL**
Groundwater Level(s)	**27 feet bgs ATD**	Sampling Method	**Modified California lined with 2-inch-dia. brass tubes**	Hammer Data	**Downhole hammer; 140 lbs / 30-inch drop**
Borehole Backfill	**Drill cuttings (tamped)**	Location	**Refer to site plan**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
30	0					Asphalt over gravel base course			
						FILL Dense, moist, dark brown, SILTY SAND with GRAVEL (SM), fine- to medium-grained sand, fine to coarse gravel consists of sandstone and shale fragments			
			1	53					Discrete Sample 1: GR = 26% SA = 48% FI = 26%
						Becomes dense to very dense			
25	5		2	90					
			3	60					Composite of 3 and 4: GR = 18% SA = 51% FI = 31%
			4	80					
20	10					Increase in gravel content			
			5	50					
			6	69					Composite of 6 and 7: GR = 31% SA = 42% FI = 27% Gs = 2.73
15	15		7	42					
			8	50/3"		Strong, yellowish brown sandstone cobble in sampler shoe			
			9	51					
10	20					Becomes medium dense to dense; increase in gravel content			
			10	30					
			11	59					Composite of 11 and 12: GR = 34% SA = 42% FI = 24%
5	25		12	29					
			13	15		Becomes wet ▽			
			14	10		**BEACH DEPOSITS** Loose, wet, dark bluish gray, SILTY SAND (SM), fine- to medium-grained sand			
0	30					Becomes medium dense			
			15	22					
						Becomes dense, with some gravel			
			16	41					
-5	35					**Bottom of boring at 33.5 feet**			

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Figure A-6

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 6

Sheet 1 of 1

Date(s) Drilled	**11/13/02**	Logged By	**S. Duke**	Checked By	**S.T. Freeman**
Drilling Method	**Hollow-Stem Auger**	Drill Bit Size/Type	**4-1/4-inch-ID, 8-inch-OD auger**	Total Depth of Borehole	**19.5 feet**
Drill Rig Type	**CME 85**	Drilling Contractor	**A & R Drilling**	Approximate Surface Elevation	**34 feet MSL**
Groundwater Level(s)	**Not encountered**	Sampling Method	**Modified California lined with 2-inch-dia. brass tubes**	Hammer Data	**Downhole hammer; 140 lbs / 30-inch drop**
Borehole Backfill	**Drill cuttings (tamped)**	Location	**Refer to site plan**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
	0					Asphalt over gravel base course			
						FILL Dense to very dense, moist, dark brown, SILTY SAND with GRAVEL (SM), fine- to medium-grained sand, fine to coarse gravel consists of shale and sandstone fragments			Composite of 1 and 2: GR = 17% SA = 50% FI = 33% Gs = 2.74
30			1	60					
	5		2	50/4"					
			3	50/3"		←Strong, yellowish brown sandstone cobble in sampler shoe			
25			4	90					
	10		5	50/5"					
			6	74					
20			7	41		Dense, moist, reddish brown, SILTY SAND (SM), fine- to medium-grained sand, some clay, few gravel			Discrete Sample 7: GR = 8% SA = 65% FI = 27%
	15		8	40		Dense, moist, brown, CLAYEY SAND with GRAVEL (SC), fine- to medium-grained sand, fine to coarse gravel consists of shale and sandstone fragments			
15			9	36					
	20					**Bottom of boring at 19.5 feet**			
10	25								
5	30								
0	35								

Report: GP SOIL LOG; File: TLAGOON.GPJ; 12/20/2002

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Figure A-7

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 7

Sheet 1 of 1

Date(s) Drilled	**11/11/02**	Logged By	**S. Duke**	Checked By	**S.T. Freeman**
Drilling Method	**Hollow-Stem Auger**	Drill Bit Size/Type	**4-1/4-inch-ID, 8-inch-OD auger**	Total Depth of Borehole	**30.9 feet**
Drill Rig Type	**CME 85**	Drilling Contractor	**A & R Drilling**	Approximate Surface Elevation	**30 feet MSL**
Groundwater Level(s)	**25 feet bgs ATD**	Sampling Method	**Modified California lined with 2-inch-dia. brass tubes**	Hammer Data	**Downhole hammer; 140 lbs / 30-inch drop**
Borehole Backfill	**Drill cuttings (tamped)**	Location	**Refer to site plan**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
30	0					Asphalt over gravel base course			
						FILL Medium dense, moist, brown, SILTY to CLAYEY SAND (SM/SC), fine- to medium-grained sand			
			1	38					
						Becomes dark brown; increase in fines content, with few fine gravel-size fragments of shale/claystone and sandstone			
25	5		2	37					
						Becomes dense to very dense			
			3	66					No recovery at 6 ft. Start using catcher on samplers.
			4	50					Composite of 4 and 5: GR = 14% SA = 49% FI = 37%
20	10					Becomes very dense; decrease in fines content			
			5	76					
			6	83/10"		Hard, moist, dark reddish brown, SILTY CLAY (CL), trace fine-grained sand			
			7	50/4"		Dense to very dense, moist, yellowish brown, SILTY to CLAYEY SAND with GRAVEL (SM/SC), fine- to medium-grained sand, fine to coarse gravel consists of hard sandstone			Composite of 7 and 8: GR = 19% SA = 47% FI = 34%
15	15					With fine to coarse gravel-size fragments of shale and sandstone			
			8	65					
						Becomes dark brown; increase in clay content			
			9	57					Composite of 9 and 10: GR = 23% SA = 42% FI = 35% Gs = 2.73
10	20					Becomes brown; decrease in fines content			
			10	69					
						Becomes dense			
			11	42		Sandstone cobble in sampler shoe			
			12	54		**BEACH DEPOSITS** ▽ Dense, wet, dark gray, CLAYEY SAND (SC), fine-grained sand			
5	25					Dense, wet, gray, SILTY SAND (SM), fine- to medium-grained sand, few gravel			Composite of 13 and 14: GR = 14% SA = 73% FI = 13%
			13	50					
						Becomes medium dense			
			14	25					
0	30					Increase in gravel content			
			15	50/4"					
						Bottom of boring at 30.9 feet			
-5	35								

Report: GP SOIL LOG; File: TLAGOON.GPJ; 12/20/2002

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Figure A-8

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 7A

Sheet 1 of 1

Date(s) Drilled	**11/11/02**	Logged By	**S. Duke**	Checked By	**S.T. Freeman**
Drilling Method	**Hollow-Stem Auger**	Drill Bit Size/Type	**4-1/4-inch-ID, 8-inch-OD auger**	Total Depth of Borehole	**27.5 feet**
Drill Rig Type	**CME 85**	Drilling Contractor	**A & R Drilling**	Approximate Surface Elevation	**30 feet MSL**
Groundwater Level(s)	**26 feet bgs ATD**	Sampling Method	**Modified California lined with 2-inch-dia. brass tubes**	Hammer Data	**Downhole hammer; 140 lbs / 30-inch drop**
Borehole Backfill	**Drill cuttings (tamped)**	Location	**Refer to site plan**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
30	0					Asphalt over gravel base course			
						FILL Dense to very dense, moist, dark brown, SILTY to CLAYEY SAND (SM/SC), fine- to medium-grained sand, few fine to coarse gravel-size fragments of shale/claystone and sandstone			
			1	72					Composite of 1 and 2: GR = 12% SA = 54% FI = 34%
25	5		2	60					
						Increase in gravel content			
			3	73					Composite of 3 and 4: GR = 16% SA = 50% FI = 34%
			4	57					
20	10					Hard, moist, dark reddish brown, SILTY CLAY (CL), some fine gravel-size fragments of shale and sandstone			
			5	46					
						Very dense, moist, yellowish brown, SILTY to CLAYEY SAND with GRAVEL (SM/SC), fine- to medium-grained sand, fine to coarse sandstone gravel			
			6	79					Composite of 6 and 7: GR = 20% SA = 49% FI = 31% Gs = 2.72
						Very strong sandstone cobble in sampler shoe			
15	15		7	91					
						Becomes dense, dark brown; increase in clay content			
			8	47					Drilling becomes more difficult; possibly binding on siltstone/claystone.
			9	38					
10	20		10	48					Composite of 10 and 11: GR = 31% SA = 45% FI = 24%
			11	42					
5	25		12	38		**BEACH DEPOSITS** Medium dense, moist, gray, POORLY GRADED SAND with SILT (SP-SM), fine- to medium-grained sand ▽			
			13	29		Medium dense, wet, dark gray, CLAYEY SAND (SC), fine-grained sand			
0	30					**Bottom of boring at 27.5 feet**			
-5	35								

Report: GP SOIL LOG; File: TLAGOON.GPJ; 12/20/2002

GeoPentech
Geotechnical & Geoscience Consultants

Figure A-9

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 8

Sheet 1 of 2

Date(s) Drilled	**11/12/02**	Logged By	**S. Duke**	Checked By	**S.T. Freeman**
Drilling Method	**Hollow-Stem Auger**	Drill Bit Size/Type	**4-1/4-inch-ID, 8-inch-OD auger**	Total Depth of Borehole	**35.5 feet**
Drill Rig Type	**CME 85**	Drilling Contractor	**A & R Drilling**	Approximate Surface Elevation	**31 feet MSL**
Groundwater Level(s)	**26 feet bgs ATD**	Sampling Method	**Modified California lined with 2-inch-dia. brass tubes**	Hammer Data	**Downhole hammer; 140 lbs / 30-inch drop**
Borehole Backfill	**Drill cuttings (tamped)**	Location	**Refer to site plan**		

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
	0					Asphalt over gravel base course			
30						**FILL** Dense to very dense, moist, dark brown, SILTY to CLAYEY SAND with GRAVEL (SM/SC), fine- to medium-grained sand, fine gravel consists of sandstone and shale fragments			Composite of 1 and 2: GR = 24% SA = 45% FI = 31%
			1	61					
	5		2	67					
25			3	23		Medium dense, moist, yellowish brown, SILTY SAND with GRAVEL (SM), fine to coarse gravel consists of sandstone fragments			
			4	42		Dense, moist, dark reddish brown, SILTY to CLAYEY SAND (SM/SC), fine-grained sand, few fine gravel-size shale fragments			Composite of 4 and 5: GR = 12% SA = 50% FI = 38%
	10					Becomes very dense			
20			5	78					
			6	50/2"		Very dense, moist, yellowish brown, SILTY SAND with GRAVEL (SM), fine-grained sand, fine to coarse gravel consists of sandstone fragments			
			7	50/5"		Dense to very dense, moist, brown, SILTY to CLAYEY SAND with GRAVEL (SM/SC), fine-grained sand, fine to coarse gravel consists of shale and sandstone fragments			
	15					Decrease in gravel size and content			
15			8	44					Discrete Sample 8: GR = 27% SA = 42% FI = 31% Driller skipped sample at 18 ft.
	20					Increase in gravel size and content			
10			9	69/11"					
			10	50/4"					
						Becomes medium dense, dark brown; decrease in gravel content			
	25		11	37					
5						▽			
			12	46		**BEACH DEPOSITS** Dense, wet, bluish gray, SILTY to CLAYEY SAND (SM/SC), fine- to medium-grained sand, few fine gravel			Discrete Sample 12: GR = 12% SA = 71% FI = 17% Gs = 2.71
			13	45		Increase in gravel content			
	30					Becomes dense to very dense			
0			14	80					
			15	49		Coarse gravel in sampler shoe			
	35		16	44					

Report: GP SOIL LOG; File: TLAGOON.GPJ; 12/20/2002

GeoPentech
Geotechnical & Geoscience Consultants

Figure A-10

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 8

Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
	35		16	44		**BEACH DEPOSITS** (continued) Dense, wet, bluish gray, SILTY to CLAYEY SAND with GRAVEL (SM/SC) **Bottom of boring at 35.5 feet**			
-5									
	40								
-10									
	45								
-15									
	50								
-20									
	55								
-25									
	60								
-30									
	65								
-35									
	70								
-40									
	75								

Report: GP SOIL LOG; File: TLAGOON.GPJ; 12/20/2002

GeoPentech
Geotechnical & Geoscience Consultants

Figure A-10

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 9

Sheet 1 of 1

Date(s) Drilled	**11/12/02**	Logged By	**S. Duke**	Checked By	**S.T. Freeman**
Drilling Method	**Hollow-Stem Auger**	Drill Bit Size/Type	**4-1/4-inch-ID, 8-inch-OD auger**	Total Depth of Borehole	**21.5 feet**
Drill Rig Type	**CME 85**	Drilling Contractor	**A & R Drilling**	Approximate Surface Elevation	**31 feet MSL**
Groundwater Level(s)	**Not encountered**	Sampling Method	**Modified California lined with 2-inch-dia. brass tubes**	Hammer Data	**Downhole hammer; 140 lbs / 30-inch drop**
Borehole Backfill	**Drill cuttings (tamped)**	Location	**Refer to site plan**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
	0					Asphalt over gravel base course			
30						**FILL** Dense, moist, dark brown, SILTY to CLAYEY SAND with GRAVEL (SM/SC), fine- to medium-grained sand, fine to coarse gravel consists of shale and sandstone fragments			
			1	46					Composite of 1 and 2: GR = 20% SA = 46% FI = 34% Gs = 2.73
	5		2	48					
25			3	63		Becomes dark yellowish brown; decrease in clay content			
			4	28		Becomes medium dense, dark brown; increase in clay content			Discrete Sample 4: GR = 15% SA = 55% FI = 30%
	10					Becomes dense, light brown; decrease in clay content			
20			5	62					Composite of 5 and 6: GR = 31% SA = 35% FI = 34%
			6	55					
			7	50/3"		Becomes very dense; increase in gravel content			Drilling becomes more difficult.
	15								
15			8	50/5"		Very strong, bluish gray sandstone cobble in sampler shoe			
			9	50/3"		Becomes dark brown			Composite of 9 and 10: GR = 35% SA = 40% FI = 25%
	20								
10			10	76					
						Bottom of boring at 21.5 feet			
	25								
5									
	30								
0									
	35								

Report: GP SOIL LOG; File: TLAGOON.GPJ; 12/20/2002

Project: Topanga Lagoon Restoration
Project Location: Topanga, California
Project Number: 02006A

Log of Boring 10

Sheet 1 of 1

Date(s) Drilled	**11/12/02**	Logged By	**S. Duke**	Checked By	**S.T. Freeman**
Drilling Method	**Hollow-Stem Auger**	Drill Bit Size/Type	**4-1/4-inch-ID, 8-inch-OD auger**	Total Depth of Borehole	**33.5 feet**
Drill Rig Type	**CME 85**	Drilling Contractor	**A & R Drilling**	Approximate Surface Elevation	**35 feet MSL**
Groundwater Level(s)	**31.5 feet bgs ATD**	Sampling Method	**Modified California lined with 2-inch-dia. brass tubes**	Hammer Data	**Downhole hammer; 140 lbs / 30-inch drop**
Borehole Backfill	**Drill cuttings (tamped)**	Location	**Refer to site plan**		

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resistance, blows / foot	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	REMARKS AND OTHER TESTS
35	0					Coarse gravel road fill			
						FILL Very dense, moist, dark brown, SILTY to CLAYEY SAND with GRAVEL (SM/SC), fine- to medium-grained sand, fine to coarse gravel consists of sandstone and shale fragments			
			1	73					Composite of 1 and 2: GR = 20% SA = 45% FI = 35%
30	5		2	50/5"		← Very strong, bluish gray cobble in sampler shoe			
			3	50/4"					No recovery at 6 ft.
			4	82					
25	10		5	50/5"					
						Dense, moist, yellowish brown, SILTY to CLAYEY SAND (SM/SC), fine- to medium-grained sand, few fine to coarse gravel-size fragments of sandstone and shale			
			6	60					Composite of 6 and 7: GR = 10% SA = 50% FI = 40%
						← Shell fragments (in sampler tip) Becomes mostly reddish brown			
20	15		7	40					
						Becomes dark brown; increase in fines content			
			8	60					
						Becomes medium dense			
			9	38					
15	20					Medium dense to dense, moist, dark brown, SILTY to CLAYEY SAND with GRAVEL (SM/SC), fine- to medium-grained sand, fine to coarse gravel consists of shale and sandstone fragments			Composite of 10 and 11: GR = 39% SA = 39% FI = 22%
			10	30					
			11	42					
						Becomes dense to very dense, dark gray, with dark gray shale fragments			
10	25		12	53					
						Becomes dark brown			
			13	50/3"					Composite of 13 and 14: GR = 35% SA = 41% FI = 24%
						Becomes medium dense, yellowish brown, with yellowish brown sandstone fragments			
			14	38					
5	30					**BEACH DEPOSITS** Dense, moist, brown, SILTY SAND (SM), fine- to medium-grained sand, few fine gravel-size shale fragments; wet below 31.5 feet ▽			
			15	50					
			16	53					
						Bottom of boring at 33.5 feet			
0	35								

Report: GP SOIL LOG; File: TLAGOON.GPJ; 12/20/2002

GeoPentech
Geotechnical & Geoscience Consultants

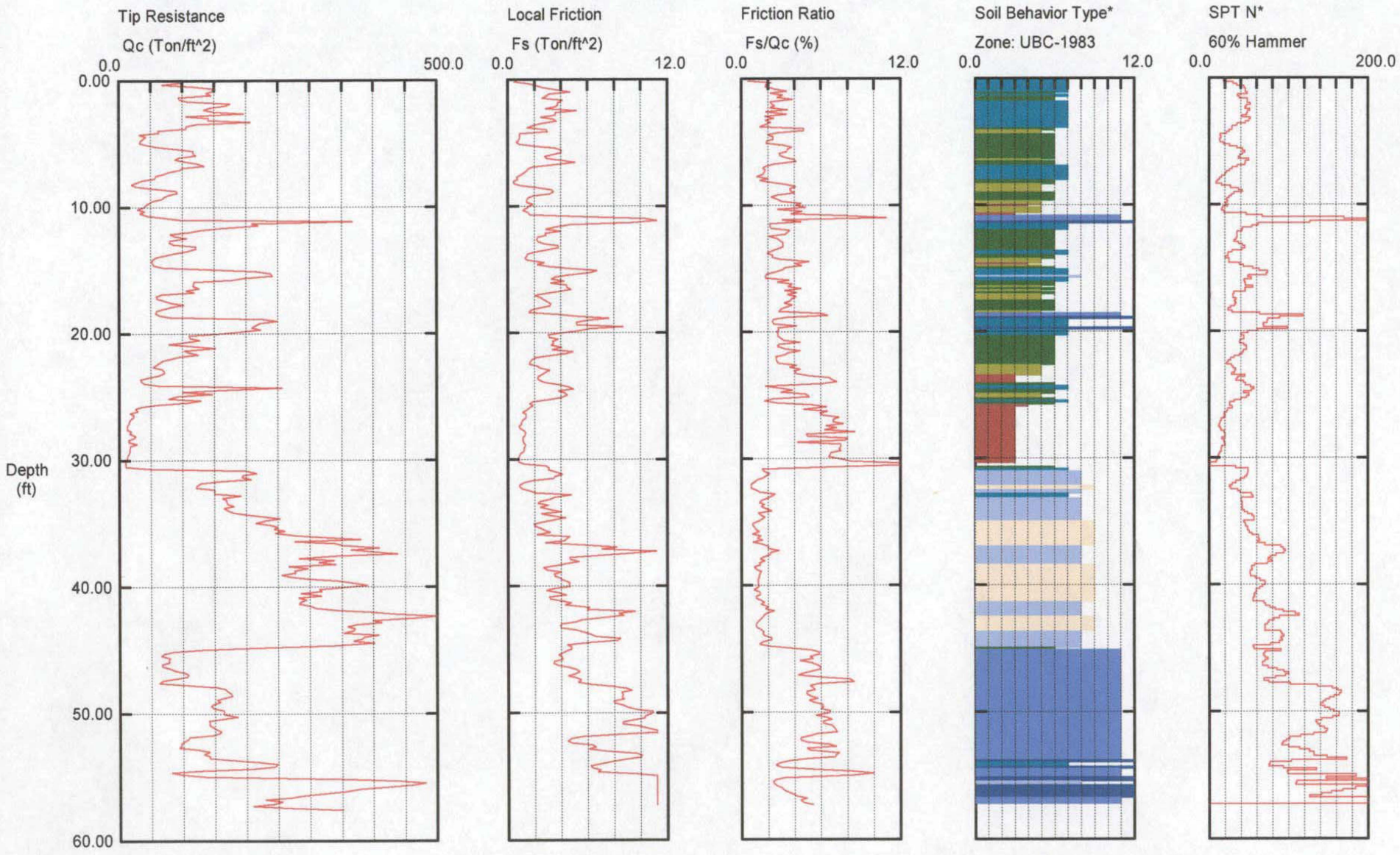
Figure A-12

*Soil behavior type and SPT based on data from UBC-1983

GeoPentech

Operator: John-Andy
Sounding: CPT-2
Cone Used: 409/JH-AP/R#3

CPT Date/Time: 11-12-02 10:20
Location: Topanga Bridge
Job Number:



Maximum Depth = 57.58 feet

Depth Increment = 0.16 feet

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

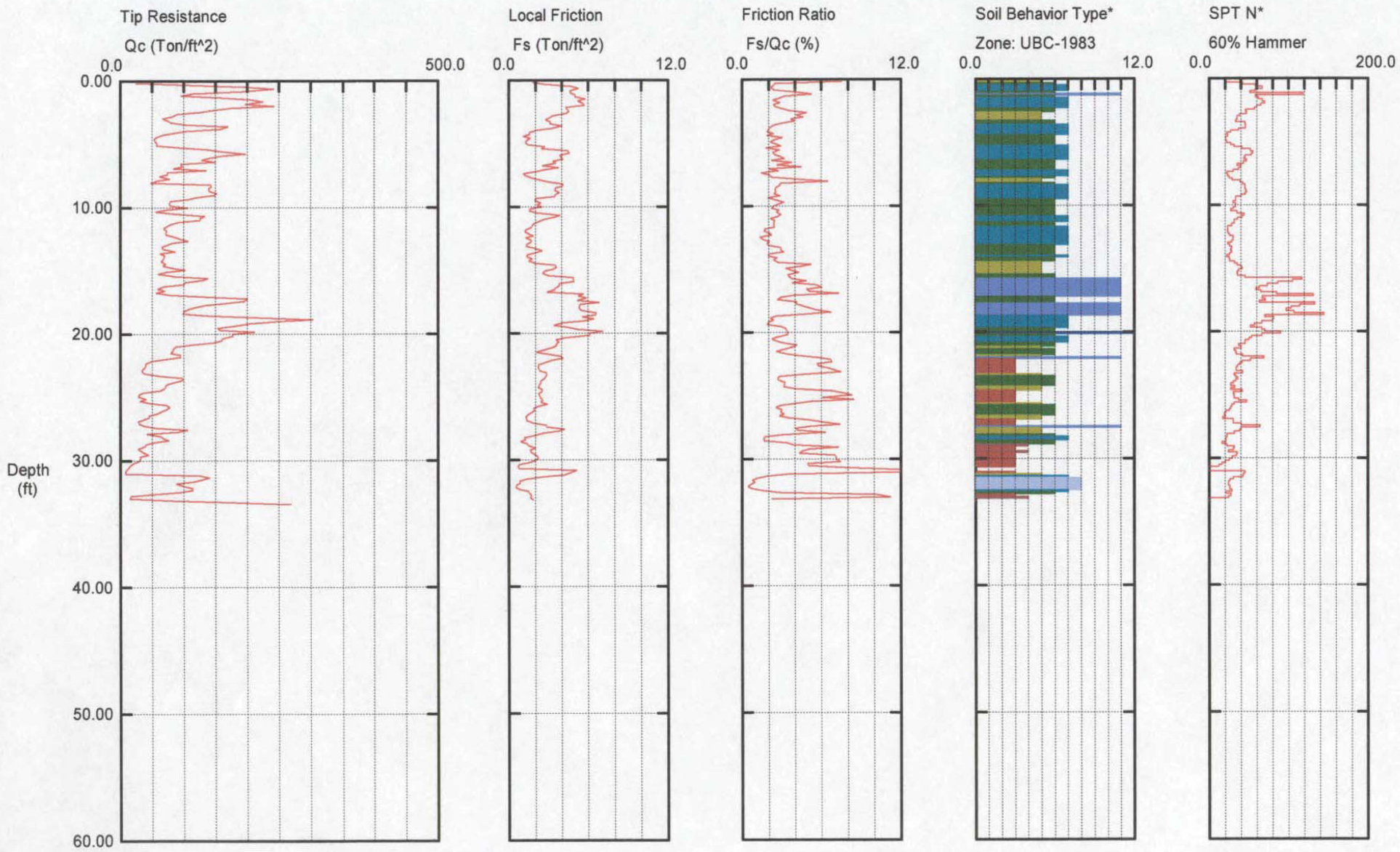
sdf-42

*Soil behavior type and SPT based on data from UBC-1983

GeoPentech

Operator: John-Andy
Sounding: CPT-3
Cone Used: 409/JH-AP/R#3

CPT Date/Time: 11-12-02 11:41
Location: Topanga Bridge
Job Number:



Maximum Depth = 33.46 feet

Depth Increment = 0.16 feet

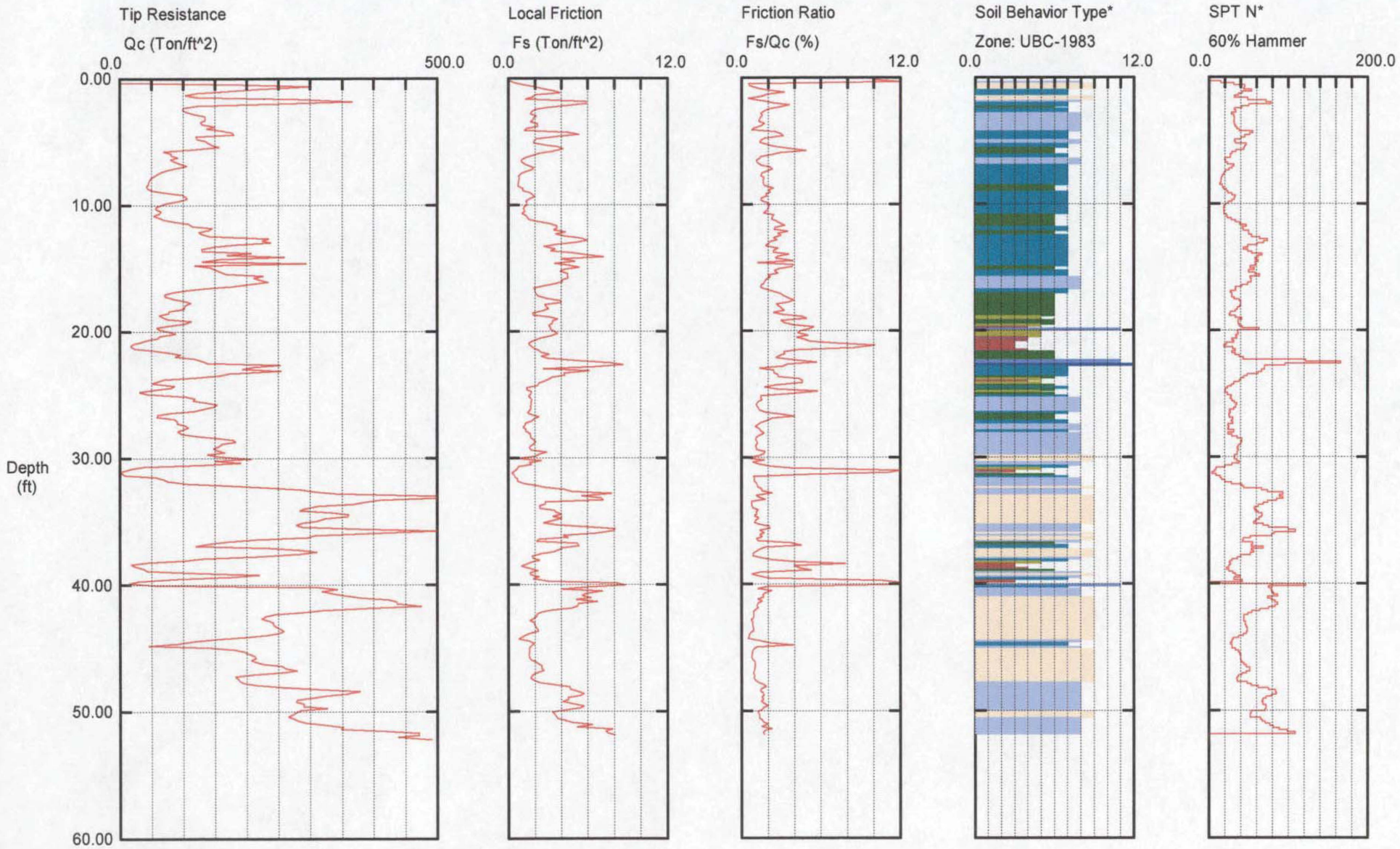
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

GeoPentech

Operator: John-Andy
Sounding: CPT-7
Cone Used: 409/JH-AP/R#3

CPT Date/Time: 11-12-02 09:06
Location: Topanga Bridge
Job Number:



Maximum Depth = 52.17 feet

Depth Increment = 0.16 feet

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

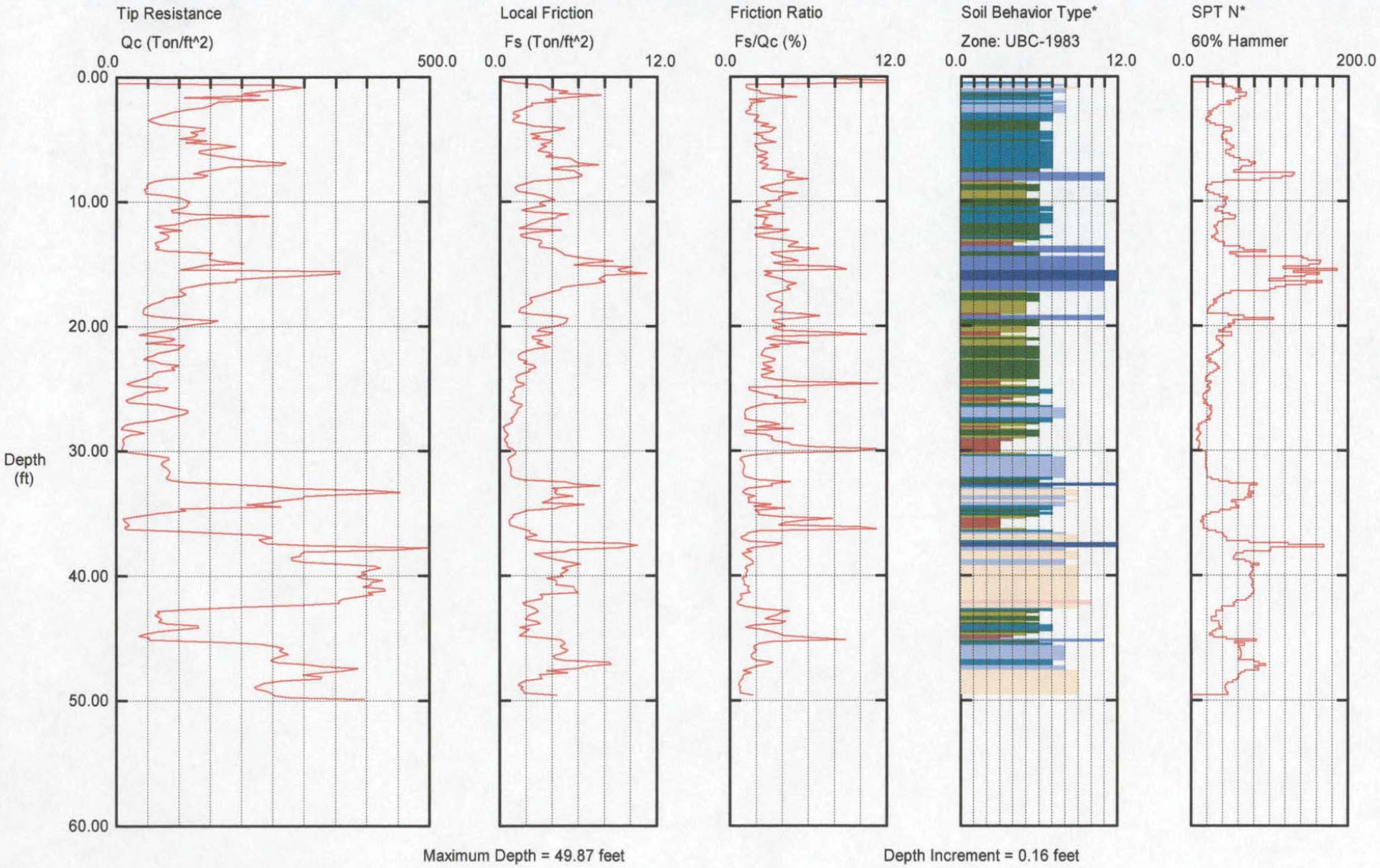
sdf-40

*Soil behavior type and SPT based on data from UBC-1983

GeoPentech

Operator: John-Andy
Sounding: CPT-7A
Cone Used: 409/JH-AP/R#3

CPT Date/Time: 11-12-02 07:49
Location: Topanga Bridge
Job Number:



Maximum Depth = 49.87 feet

Depth Increment = 0.16 feet

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

sdf-39

APPENDIX B

As-Built Data

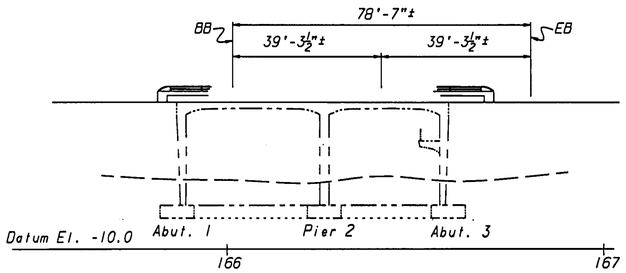
Current PCH Bridge (Bridge No. 53-0035)

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
07	LA	1	41.0/62.9	33	34

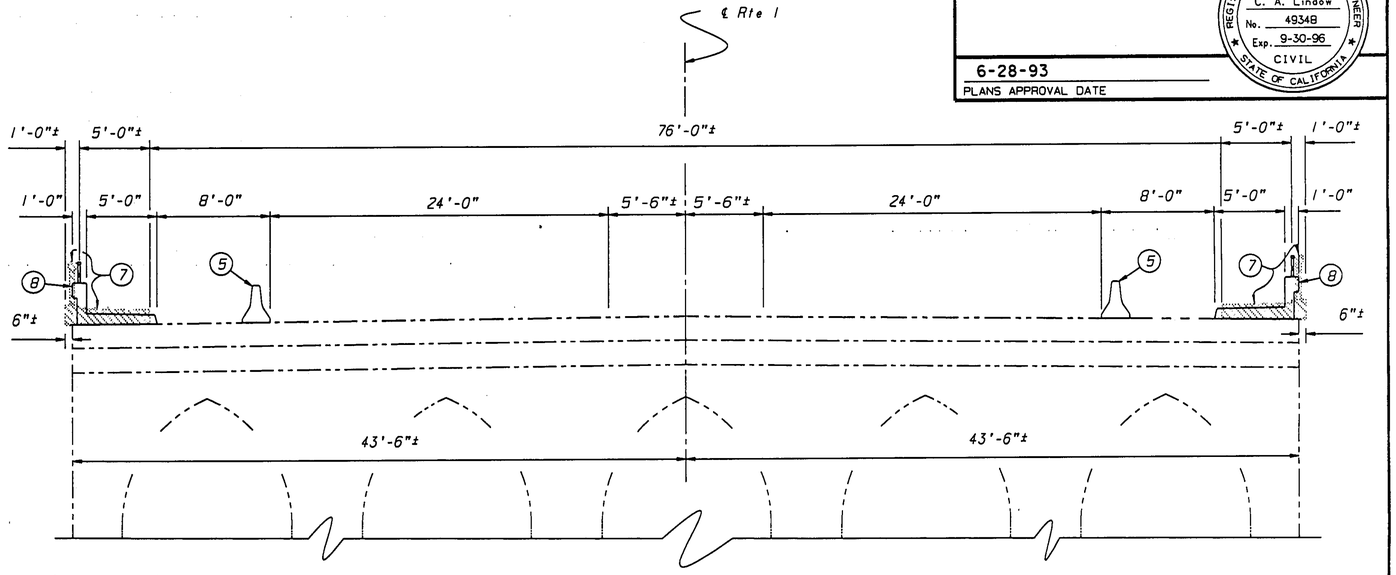
C. A. Lindow
REGISTERED ENGINEER - CIVIL

REGISTERED PROFESSIONAL ENGINEER
C. A. Lindow
No. 49348
Exp. 9-30-96
CIVIL
STATE OF CALIFORNIA

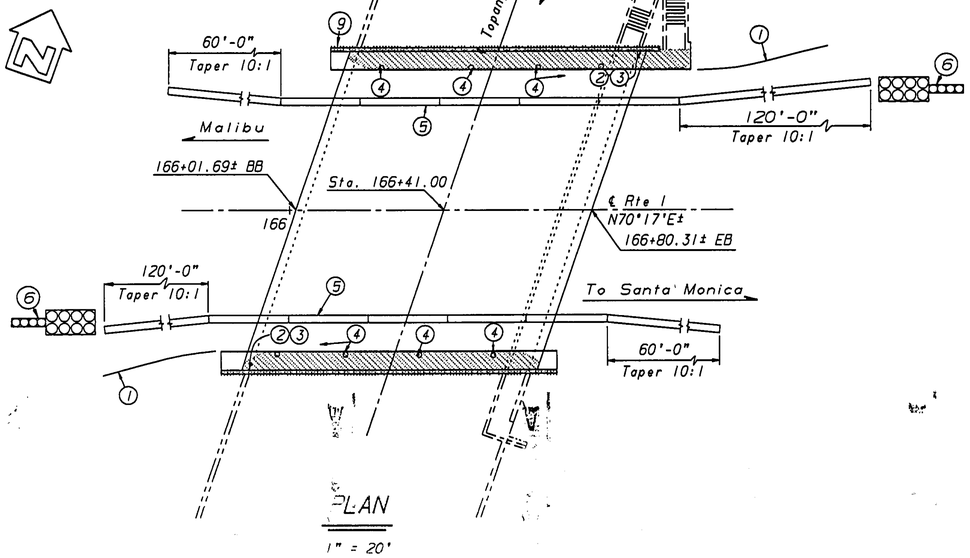
6-28-93
PLANS APPROVAL DATE



ELEVATION
1" = 20'



TYPICAL SECTION
3/16" = 1'-0"



PLAN
1" = 20'

Notes:

1. MBGR (see Road Plans)
2. Paint "Br. No. 53-0035"
3. Paint "Topanga Creek Bridge"
4. Existing deck drains to remain
5. Temporary railing Type K
6. Temporary crash cushion
7. Existing metal barrier and concrete sidewalk to be removed
8. New Concrete Barrier Type 26 (Mod) with Tubular Hand Rail
9. Approx. location water valve

Indicates concrete removal

Indicates existing

NOTE:
THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

Standard Plan Sheet No.
Detail No.

INDEX TO PLANS

SHEET NO.	TITLE
1	GENERAL PLAN
2	BARRIER RAIL DETAILS

STANDARD PLANS DATED JULY, 1992

NO CORRECTIONS ON THIS SHEET
AS BUILT SW 2/97
CORRECTIONS BY M. Rodriguez
CONTRACT NO. 07-116244
DATE 9-12-94

B11-51	TUBULAR HAND RAILING
B11-54	CONCRETE BARRIER TYPE 26
T2	TEMPORARY CRASH CUSHION, SAND FILLED
T3	TEMPORARY RAILING (TYPE K)

QUANTITIES

TEMPORARY RAILING (TYPE K)	540 LF
TEMPORARY CRASH CUSHION MODULE	LUMP SUM
BRIDGE REMOVAL (PORTION), LOCATION E	LUMP SUM
TUBULAR HANDRAILING	170 LF
CONCRETE BARRIER (TYPE 26 MODIFIED)	170 LF

DESIGN ENGINEER

HYDRAULICS	Issam Noureddine 12-92	DESIGN	Chris Lindow	LOCAL AGENCY DESIGN			
DETAILS	BY George Williford 12-92	CHECKED	Chris Lindow	LAYOUT	BY Issam Noureddine	CHECKED	Chris Lindow
QUANTITIES	BY J. Dempsey	CHECKED	Chris Lindow	SPECIFICATIONS	BY K.F. Meier	PLANS AND SPECS COMPARED	K.F. Meier

DS OSD 2138 (CADD 4/89)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN 1

CU 07
EA 116241

BRIDGE NO. 53-0035
POST MILE 40.99

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY): 12-3-92 | 1-4-93 | 2-18-93 | 3-2-93 | 3-18-93 | 3-17-93

TOPANGA CREEK BRIDGE (MODIFY)

GENERAL PLAN

SHEET 1 OF 2

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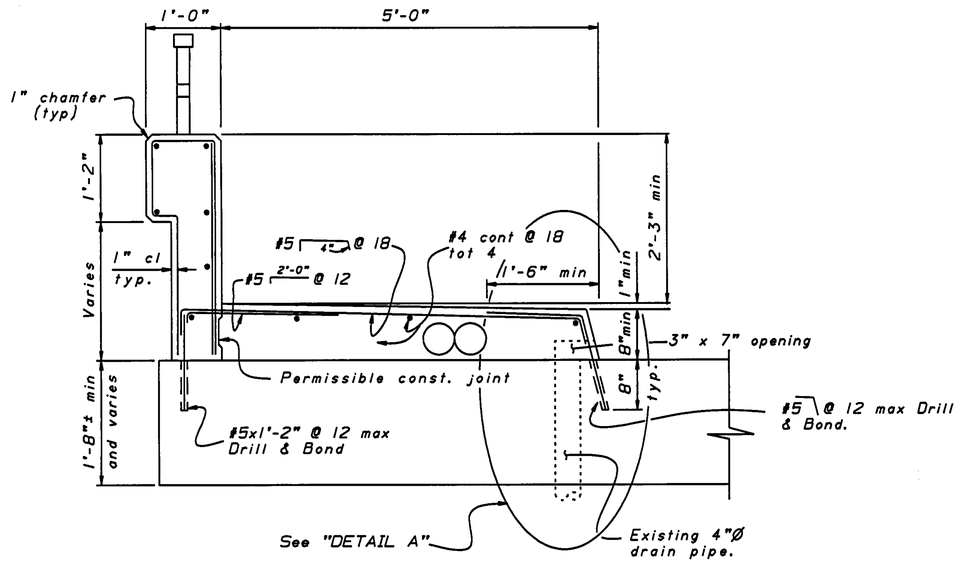
DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
07	LA	1	41.0/62.9	34	34

C. A. Lindow
REGISTERED ENGINEER - CIVIL

REGISTERED PROFESSIONAL ENGINEER
C. A. Lindow
No. 49348
Exp. 9-30-96
CIVIL
STATE OF CALIFORNIA

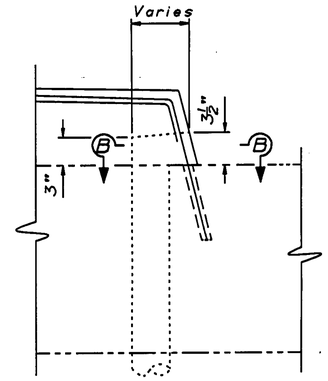
6-28-93
PLANS APPROVAL DATE



CONCRETE BARRIER TYPE 26 (MOD)

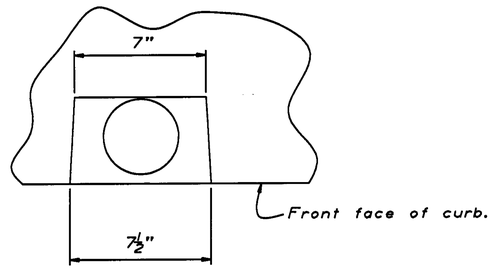
1" = 1'-0"

B11-51 B11-54



DETAIL A

1 1/2" = 1'-0"



SECTION B-B

3" = 1'-0"

NOTE:
THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

NO CORRECTIONS THIS SHEET
AS BUILT
CORRECTIONS BY M Rodriguez
CONTRACT NO. 07-116244
DATE 4-12-96

DESIGN	BY Issam Noureddine 12-92	CHECKED Chris Lindow	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF STRUCTURES STRUCTURE DESIGN 1	BRIDGE NO. 53-0035
DETAILS	BY George Williford 12-92	CHECKED Chris Lindow			POST MILE 40.99
QUANTITIES	BY J. Dempsey	CHECKED Chris Lindow		CU 07 EA 116241	

TOPANGA CREEK BRIDGE (MODIFY)
BARRIER RAIL DETAILS

OS 050 2139 (CADD 4/89)
ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3
DISREGARD PRINTS BEARING EARLIER REVISION DATES
REVISION DATES (PRELIMINARY STAGE ONLY) 12-8-92 3-2-93 3-9-93 3-15-93 3-18-93
SHEET 2 OF 2

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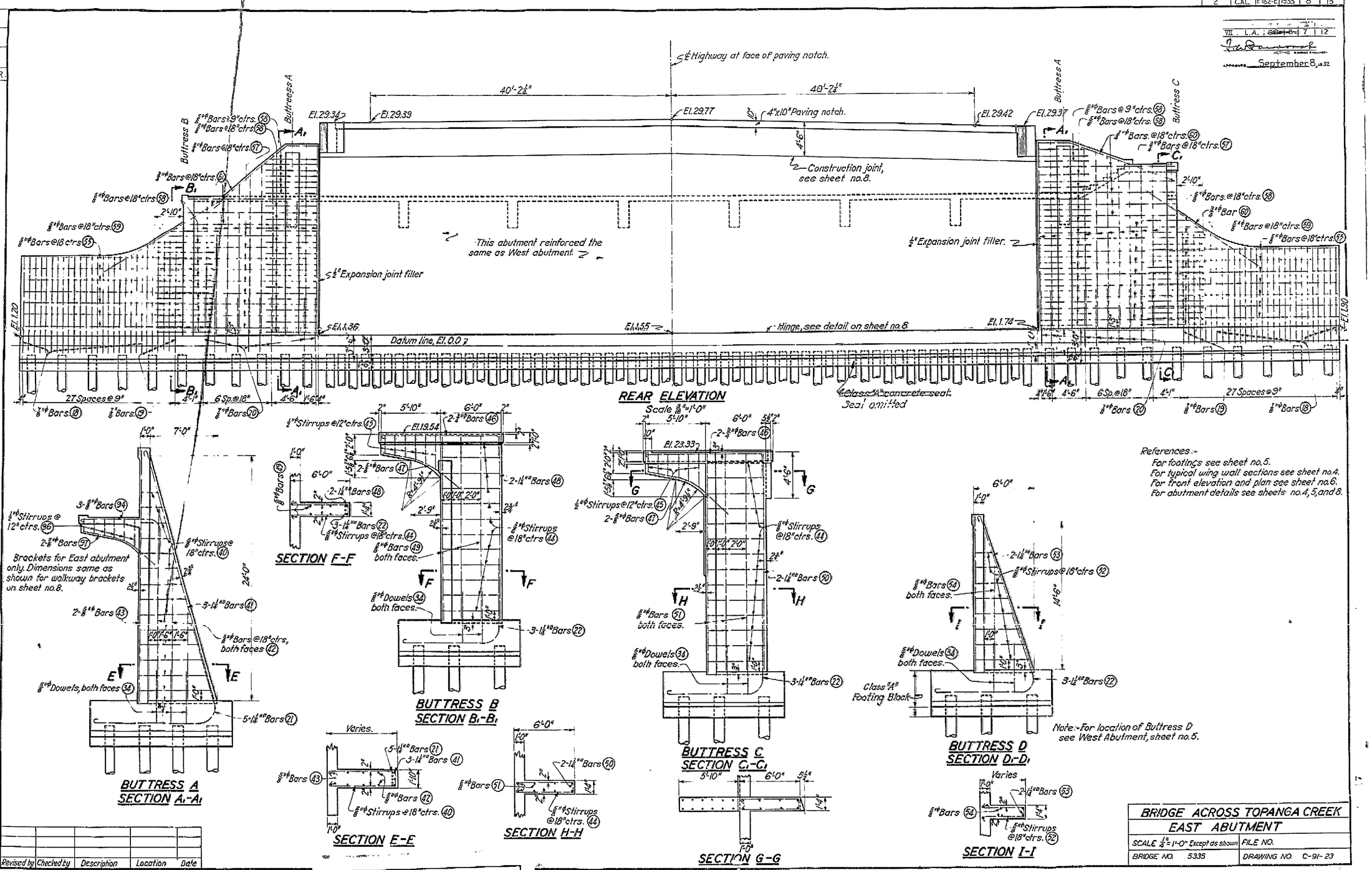
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
2	CAL.	F 182-E	1933	8	13

List of Revisions And Prints	
8-12	Prints For Quantities
8-12	Prints For District
9-2	Prints For B.P.R.

VII L.A. 60 B 7 12

ACTING BRIDGE ENGINEER

APPROVED September 8, 1932



References:-
For footings see sheet no.5.
For typical wing wall sections see sheet no.4.
For front elevation and plan see sheet no.6.
For abutment details see sheets no.4, 5, and 8.

Note:- For location of Buttress D see West Abutment, sheet no.5.

Revised by	Checked by	Description	Location	Date

BRIDGE ACROSS TOPANGA CREEK
EAST ABUTMENT

SCALE ⅛"=1'-0" Except as shown	FILE NO.
BRIDGE NO. 53335	DRAWING NO. C-91-23

AS BUILT PLANS
Contract No. 41116
Date Completed
Document No. 70002641

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

DATE _____ SIGNATURE _____ TITLE _____

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Date	Prints to
8-12	Prints for Quantities
8-12	" " District
9-2	Prints For B.P.R.

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
2	CAL.	E-182-E	1933	9	13

DIST.	COUNTY	ROUTE	SHEET	TOTAL SHEETS
XII	L.A.	60-E	8	12

September 8, 32

BRIDGE DEPARTMENT
MICK H. FILLMORE

Frame symmetrical about ℄

39.31' parallel to ℄ highway

34'-0"

1'-0"

2'-2"

4"x10" timber buffer bolted into paving notch with ⅞"ϕx12" bolts @4'± ctrs; except where pavement is to be placed immediately.

1⅜"ϕ dowels, see detail below

El. 29.85 at crown

El. 29.77 at crown

⅞"ϕ spacers (111) @18" ctrs, parallel to ℄ highway

1⅜"ϕ@12" ctrs (107)

1¼"ϕ @12" ctrs (108)

Supporting bars (112)

3-¾"ϕ each face (113)

⅞"ϕ@12" ctrs (108)

Construction joint

1"ϕ (101)

1¼" (105) and (106)

For spacing of slab bars see also sheet No. 10. section S-S.

See Sheet No 11 for railing details

R=12'-11½"

R=12'-11½"

5'-6"

11'-6"

3'-6"

Construction joint

El. 19.54

4-⅞"ϕ (95)

⅝"ϕ@12" ctrs (95)

⅝"ϕ@12" ctrs (94)

⅝"ϕ stirrups @12" ctrs (96)

2-⅞"ϕ (97)

R=336'-10"

1'-6⅝"

1'-5⅝"

2'-3"

3'-1"

2'-9"

2"

1"ϕ @12" ctrs (92)

⅝"ϕ@18" ctrs (90)

1¼" @12" ctrs (91)

1"ϕ @12" ctrs (93)

2½"

2½"

⅝"ϕ @12" ctrs (26) galvanized

⅝"ϕ (90)

El. 1.95 @ ℄ highway

For reinforcing details of footing see sheet No. 5

1¼"ϕ (100)

1"ϕ (101)

Joint placed at top only.

Construction joint

⅝"ϕ@18" ctrs (90)

⅝"ϕ@12" ctrs (30) galvanized

⅝"ϕ (90)

¾"ϕ (92)

El. 2.00 at ℄ highway

10'-0"

6" pavement

1'-0"

1'-6"

2'-6"

1¼"ϕ (93)

⅝"ϕ@6" ctrs (31)

Class "A" Conc. Seal. Seal omitted

El. -3.00±, see sh. No. 9.

El. -2.00±

2'-0" 2'-6" 2'-6" 2'-0"

9'-0"

Dimensions parallel or normal to center lines of piers, unless otherwise shown.

El. 2.05 @ ℄ highway

4"ϕ drains @6'-0"± ctrs. with stone backing

Class "A" Footing Block

2'-3" 1'-6" 4'-9"

3'-0"

1'-6" Class "A" Conc. Seal. Seal omitted

2'-0" 2'-6" 2'-6" 2'-0"

9'-0"

⅝"ϕ@12" ctrs (94) 2" (94) ⅝"ϕ @12" ctrs (95) continuous

2" 2" (97) (96)

1'-4"

SECTION Q-Q

Scale: ½"=1'-0"

2½" 2½" 2'-0"

6" expansion joint filler

6" pavement

3" 3"

5" 4" 4" 5"

1'-3" 1'-3"

Asphalt

Paint first concrete surfaces with 2 coats of asphalt. Then fill the whole space with asphalt.

8" 4" 4" 8"

1'-6" 1'-6"

HINGE OF ABUTMENTS

Scale: 1"=1'-0"

HINGE OF CENTER PIER

Scale: 1"=1'-0"

3'-2⅝"

1'-4½"

2'-3"

6"

5sp @10"

5'-2"

4"paving notch

2'-2"

5sp @10"

1'-7⅝"

4'-8⅝"

PLACING OF DOWELS FOR END POST OF RAIL

Scale: ½"=1'-0"

Revised by	Checked by	Description	Location	Date

AS BUILT PLANS
Contract No. 41VC6
Date Completed
Document No. 70002617

BRIDGE ACROSS TOPANGA CREEK

FRAME

SCALE: ½"=1'-0"	FILE NO.
BRIDGE NO. 53.35	DRAWING NO. C-91-24

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DATE_____ SIGNATURE_____ TITLE_____

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Date	Prints To
8-12	Prints for Quantities
8-12	" - District
9-12	Prints For B.P.R.

U.S. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET No.	TOTAL SHEETS
2	CAL	E-182-(1)	1933	5	13

VII	L.A.	60	B	5	12

ACTING BRIDGE ENGINEER

APPROVED September 8, 1933

Upstream Wing

Buttress A7

Buttress D

Buttress A

Buttress D1

16 rows of 3-⅝"ø spacers @ 18" ctrs. (20)

3 rows of 4-⅝"ø spacers (11)

40'-2¼"

40'-2¼"

El. 29.39

El. 29.43

El. 29.85

El. 29.52

El. 29.48

10" paving notch

Construction Joint
See also Sheet No.8

95-1"ø @ 12" ctrs. (22)

96-1"ø @ 12" ctrs. (21)

¾" Expansion Joint Filler

¾" Expansion Joint Filler

℄ Highway of face of paving notch

Reinforcement of this wing same as downstream wing of this abutment.

El. 1.80

Datum El. 0.00

El. 1.64

El. 1.45

El. 1.20

El. 1.10

⅞"ø @ 12" ctrs. (26)

Hinge, see detail on sheet No. 8

⅝"ø @ 18" (55)

⅝"ø @ 18" ctrs. (56)

⅝"ø @ 18" ctrs. (57)

⅝"ø @ 18" ctrs. (58)

⅝"ø @ 9" or 18" ctrs. (58)

⅝"ø @ 18" ctrs. (57)

⅝"ø @ 18" ctrs. (57)

Class "A" Conc. Seal. Seal omitted

℄ Strut

℄ Strut

℄ Strut

REAR ELEVATION.

⅝"ø @ 18" (20)

⅝"ø @ 9" (19)

⅝"ø @ 9" (18)

4-1⅛" 4-6" 63 Sp. @ 18" 4-1" 27 Sp. @ 9" 4"

N

M

A

B

C

℄ Highway

6-1¼"ø (28)

4-1¼"ø (28)

7"

7'-0"

Sta. 166+03.98

Front face of abutment

6-1¼"ø (23)

Key 3" deep

Key 3" deep

96-⅞"ø @ 12" ctrs. (24)

96-⅞"ø @ 12" ctrs. (24)

95-⅝"ø hoops @ 12" ctrs. (23)

6-1¼"ø (27)

Reinforcement of this wing same as downstream wing

6-1¼"ø (29) 4-1¼"ø (29)

4-1¼"ø (25)

6-1¼"ø (25)

4-1¼"ø (24)

2'-6" 2'-6"

1" top and bottom (27)

8'-0"

64'-6"

29'-6"

21'-6" 1'-4" 12'-8" 1'-10" 2'-8"

40'-0"

47'-0"

48'-6"

40'-0"

PLAN OF FOOTING

⅞"ø @ 18" ctrs. (21)

1" top and bottom (15)

4-1¼"ø (13) (22)

⅞"ø stirrups @ 18" ctrs. (17)

1" about equally spaced top and bottom (16)

⅞"ø stirrups @ 18" ctrs. (17)

⅜"ø stirrups @ 18" ctrs. (17)

2-1¼"ø (14)

(34)

(34)

Concrete dimensions for this wing same as shown for upstream wing

4 Sp. @ 9" 2-3" 16 Sp. @ 9" 2-7" 27 Sp. @ 9"

References
Front elevation, plan and wing wall sections, sheet No. 4
Buttresses sheet No. 7 Abutment details sheet No. 8.

Front face of abutment

⅞"ø @ 18" ctrs. (20)

⅞"ø Stirrups @ 18" ctrs. (17)

5-1¼"ø (21) in buttress

⅞"ø dowels (34) in buttresses both faces

⅞"ø stirrups @ 18" ctrs. (17)

Class "A" Footing Block

1¼"ø (13)

1¼"ø (14)

1"ø (16)

Class "A" Conc. Seal Seal omitted

1"ø (15)

SECTION A-A

Front face of abutment

⅞"ø @ 9" ctrs. (18)

⅞"ø stirrups @ 18" ctrs. (17)

Class "A" Footing Block

1¼"ø (13)

1¼"ø (14)

⅞"ø stirrups @ 18" ctrs. (17)

Class "A" Conc. Seal Seal omitted

1"ø (15)

SECTION B-B

Front face of abutment

⅞"ø @ 12" ctrs., galvanized (26)

Class "A" Footing Block

1¼"ø (28)

1¼"ø (27)

⅞"ø hoops @ 12" ctrs. (23)

⅞"ø @ 12" ctrs. (24)

⅞"ø spacers @ 4'-3" ctrs. (36)

Seal omitted

1"ø (27)

SECTION C-C

Revised By	Checked By	Description	Location	Date

BRIDGE ACROSS TOPANGA CREEK
WEST ABUTMENT

SCALES ⅜" & ¼" = 1'-0"	FILE NO.
BRIDGE NO. 53.35	DRAWING NO. C-91-B

AS BUILT PLANS
Contract No. 41VC6
Date Completed
Document No. 1000 2617

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DATE _____ SIGNATURE _____ TITLE _____

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FED. AID DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
2	CAL.	E182-E	1933	5	13

List of Revisions and Prints

8-12	Print for Quantities
8-18	" " District.
9-2	Prints for B.P.R.

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
BRIDGE DEPARTMENT
M

H.D.S.
Bridge Section

Number	Design	Date
Original	J.C.	7-32
Quantities	E.A.	8-32
Detail	J.C.	7-32
Check up	F.M.	8-32
Corrections	E.A.	8-32
Corrections	J.C.	8-32
Corrections	E.A.	8-32

Design Section

Project No. (Fed.) E182-E
Project No. (State)
Bridge No. 53-35
Name of Stream Topanga Creek
Name of Road Topanga Canyon Blvd.
Length of Bridge 40'-0"
Width of Bridge 47'-0"
Clear Roadway 44'-0"
Number of Spans 1
Character of Foundation Concrete
Character of Superstructure Reinforced Concrete
Skew 0°
Traffic Census
Design Loading
Check Structure Current

Checked

L.A. 50-4-12
R.V. Rowland
ACTING ENGINEER
APPROVED September 8, 32

40'-0" | 48'-6" | 47'-0"

14'-0" | 21'-6" | 4'-6" | 1'-4" | 12'-8" | 1'-10"

El. 29.48 | El. 26.50 | El. 29.85 see plan. | El. 29.39 | El. 26.50 | El. 12.24 | El. 12.30

El. 11.60. | El. 11.66 | El. 1.10. | Datum. El. 0 | El. 1.26 | El. 1.45 | El. 1.64 | El. 1.80

17-Rows of 3-⅝"ϕ spacers @ 18" ctrs. (90)
3-Rows of 4-⅝"ϕ spacers. (111)
Construction joint See Sheet No. 8.
96-½"ϕ @ 12" ctrs. (91)
½" Expansion joint filler.
℄ Highway at front face of abutment.
½" expansion joint filler
6" channel paving
Hinge, see detail Sheet No. 5
R=180'
Class "A" Concrete seal. Seal omitted
Reinforcement of this wing same as downstream wing.

FRONT ELEVATION

Buttress D | Buttress A | El. 29.48 | El. 29.52. | 4" Paving notch | Sta. 166+01.69 El. 29.85. | Sta. 165+03.98 | El. 29.39 El. 29.43 | Buttress A. | Buttress D.

5'-9¾" | 40'-2½" | 40'-2½" | 5'-9¾"

Curb line. | Edge of slab. | ℄ Highway | Curb line. | Edge of slab.

PLAN

For footing details see sheet No. 5.

SECTION M-M

2"-1'-0" | 2'-1" | 1'-6" | 2½" | 2½" | 2'-4" | 1'-6" | 2'-0"

5/8"ϕ @ 18" ctrs. (62) | 5/8"ϕ @ 18" ctrs. (61) | 5/8"ϕ @ 18" ctrs. (55) | 3/4"ϕ @ 9" ctrs. (18) | 4"ϕ French drains @ 6'-0" ctrs.

Construction joint | Class "A" Footing Block

SECTION N-N

2"-1'-0" | 2'-1" | 1'-6" | 2½" | 2½" | Varies | 1'-0"

5/8"ϕ @ 18" ctrs. (63) | 5/8"ϕ @ 18" ctrs. (53) | 3/4"ϕ @ 18" ctrs. (57) | 5/8"ϕ (55) (66) (67) | 7/8"ϕ @ 18" ctrs. (20)

4"ϕ French drains @ 6'-0" ctrs. | Construction joint | Class "A" Footing Block

SECTION O-O

2"-1'-0" | 2'-1" | 2½" | 2½" | 1'-0"

3/4"ϕ (65) (66) | 5/8"ϕ (56) or 3/4"ϕ (57) see rear elevation sheet No. 5. | 5/8"ϕ @ 18" ctrs. (63) | 5/8"ϕ @ 18" ctrs. (59) | 7/8"ϕ @ 18" ctrs. (20)

Construction joint | Class "A" Footing Block

SECTION P-P

(18) (19) | 2½" | (58) | (57) | (58) | (65) (66) (67)

Note: Sections M-M, N-N, O-O, and P-P are typical for all wing walls.

References.
For rear elevation and footing see Sheet No. 5.
For buttress details see sheet No. 7.
For section through abutment see Sheet No. 8.

AS BUILT PLANS
Contract No. 41KK6
Date Completed
Document No. 1000 2617

BRIDGE ACROSS TOPANGA CREEK	
WEST ABUTMENT	
SCALES 1/8" AND 1/4"=1'-0"	FILE NO.
BRIDGE NO. 53-35	DRAWING NO. C-91-20

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DATE _____ SIGNATURE _____ TITLE _____

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Date	Prints to
8-12	Prints for Owner
8-12	" District
9-12	Prints for B.P.R.

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO	TOTAL SHEETS
2	CAL	E 182-E	1933	7	13

VII L.A. ~~60-B~~ G 12

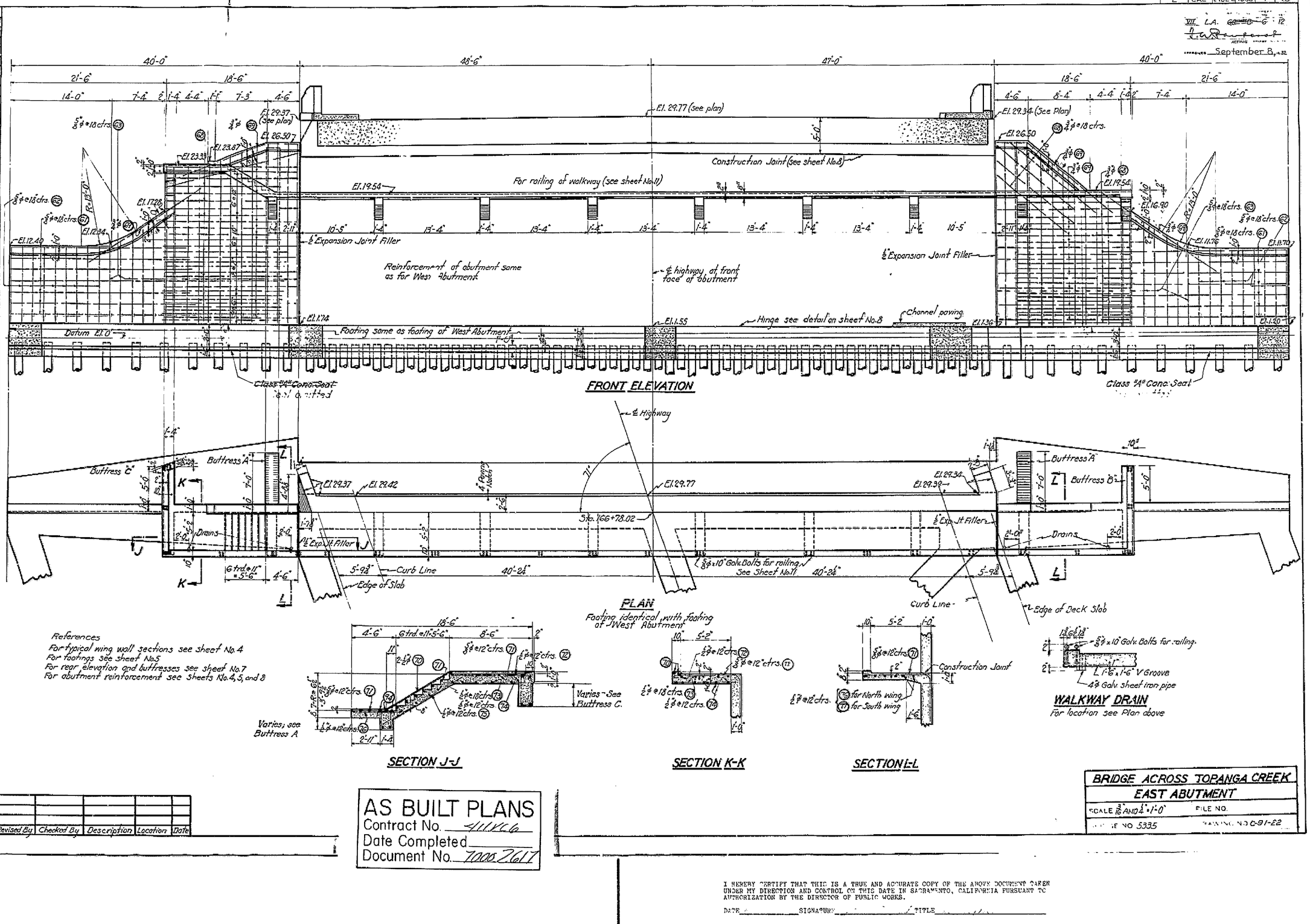
Acting

September 8, 1932

BRIDGE DEPARTMENT

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

V.C. 7-32
E.A. 8-32
V.C. 7-32
ENGR'D 8-32
E.A. 8-32
V.C. 8-32
E.A. 8-32
HDS



References
For typical wing wall sections see sheet No. 4
For footings see sheet No.5
For rear elevation and buttresses see sheet No.7
For abutment reinforcement see Sheets No.4, 5, and 8

Revised By	Checked By	Description	Location	Date

AS BUILT PLANS
Contract No. 4111C6
Date Completed
Document No. 7000 2617

BRIDGE ACROSS TOPANGA CREEK
EAST ABUTMENT
SCALE ⅜" AND ¼"=1'-0" FILE NO.
BRIDGE NO 53-35 DRAWING NO. C-81-22

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DATE _____ SIGNATURE _____ TITLE _____

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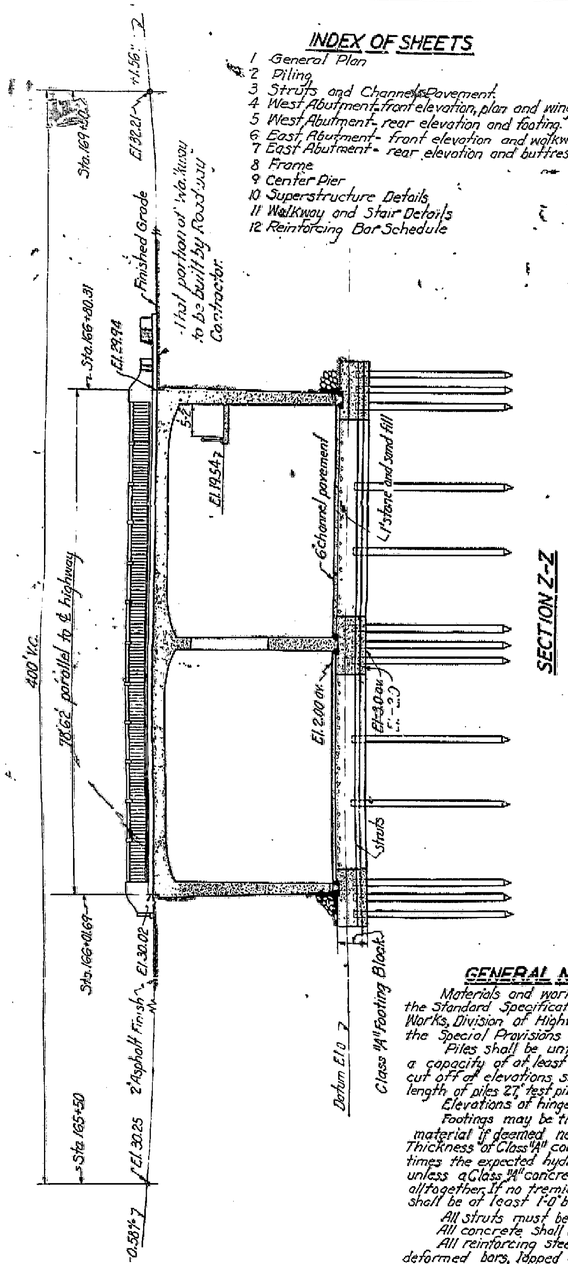
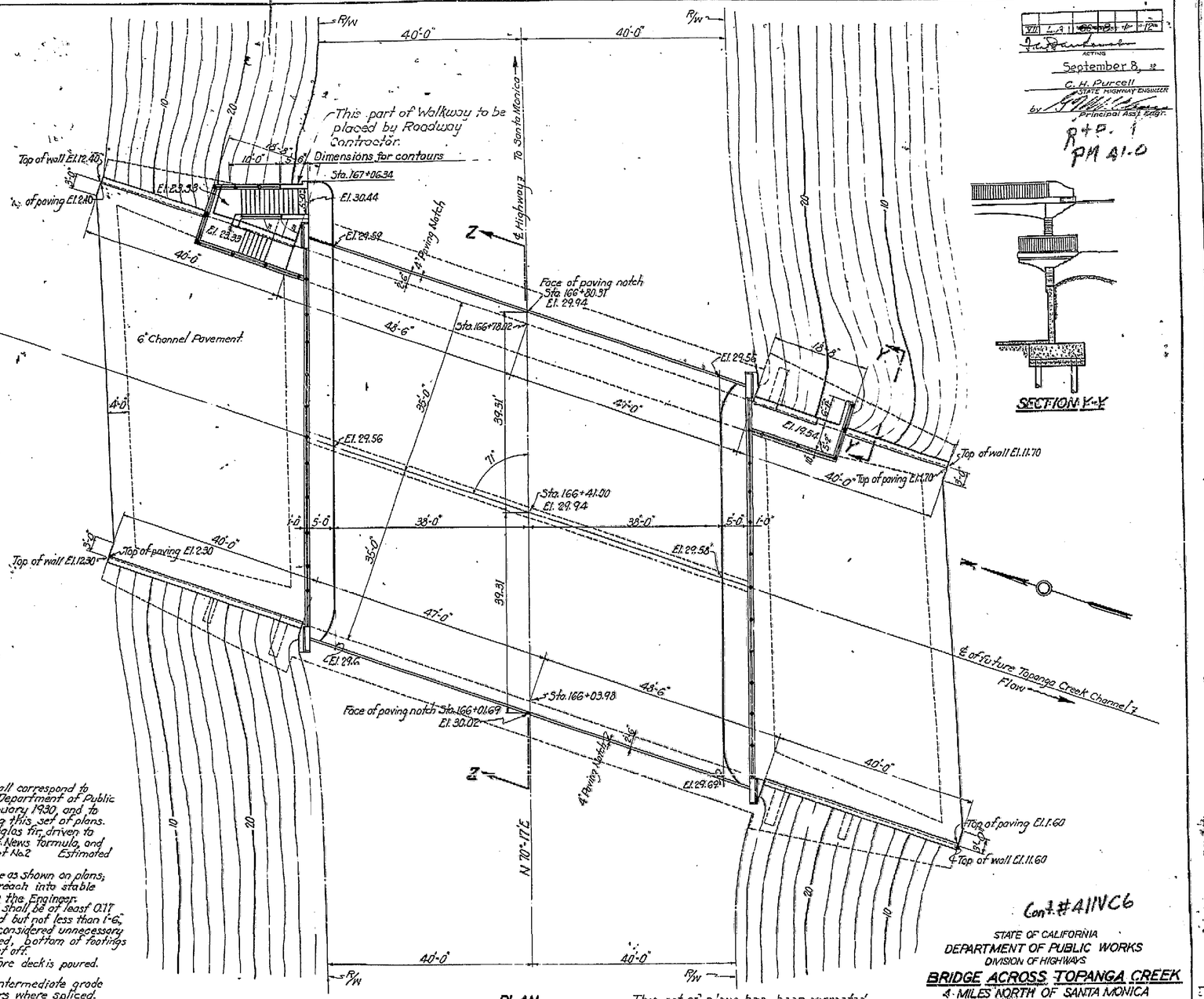
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
2	CAL	E-182-E	1933	2	13

INDEX OF SHEETS

1 General Plan
2 Piling
3 Struts and Channel Pavement
4 West Abutment- front elevation, plan and wing sections.
5 West Abutment- rear elevation and footing.
6 East Abutment- front elevation and walkway.
7 East Abutment- rear elevation and buttresses.
8 Frame
9 Center Pier
10 Superstructure Details
11 Walkway and Stair Details
12 Reinforcing Bar Schedule



SECTION Z-Z



SECTION Y-Y

September 8, 33

C. H. Purcell
STATE HIGHWAY ENGINEER
by
Principal Asst. Engr.

R+P. 1
PM 41.0

GENERAL NOTES

Materials and workmanship shall correspond to the Standard Specifications of the Department of Public Works, Division of Highways of January 1930, and to the Special Provisions accompanying this set of plans.

Piles shall be untreated Douglas fir, driven to a capacity of at least 22 tons Eng. News formula, and cut off at elevations shown on sheet No. 2. Estimated length of piles 27', test piles 35'.

Elevations of hinge lines shall be as shown on plans; Footings may be thickened to reach into stable material if deemed necessary by the Engineer. Thickness of Class "A" concrete seal shall be at least 0.17 times the expected hydrostatic head but not less than 1'-6", unless a Class "A" concrete seal is considered unnecessary altogether. If no tremie seal is used, bottom of footings shall be at least 1'-0" below pile cut off.

All struts must be poured before deck is poured.

All concrete shall be Class "A".

All reinforcing steel shall be intermediate grade deformed bars, lapped 45 diameters where spliced.

Above footings no construction joints shall be made, except those shown on plans.

Asphalt surfacing and fills are not included in bridge contract. Fills shall be kept equally high on both sides of the bridge at all times, and shall be brought up in layers sloping away from the abutments.

PLAN

Elevations of finished asphalt surfacing shown. Contours shown are for final slopes.

This set of plans has been corrected to correspond to the "As Built" blue prints dated 3-20-33, as submitted by the Resident Engineer, J.H. Horn

Cont. #41IVC6

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BRIDGE ACROSS TOPANGA CREEK

4 MILES NORTH OF SANTA MONICA
IN LOS ANGELES COUNTY

GENERAL PLAN	
SCALE 1"=10'-0"	FILE NO.
BRIDGE NO. 53-35	DRAWING NO. C-91-17

AS BUILT PLANS
Contract No. 41IVC6
Date Completed
Document No. 70002617

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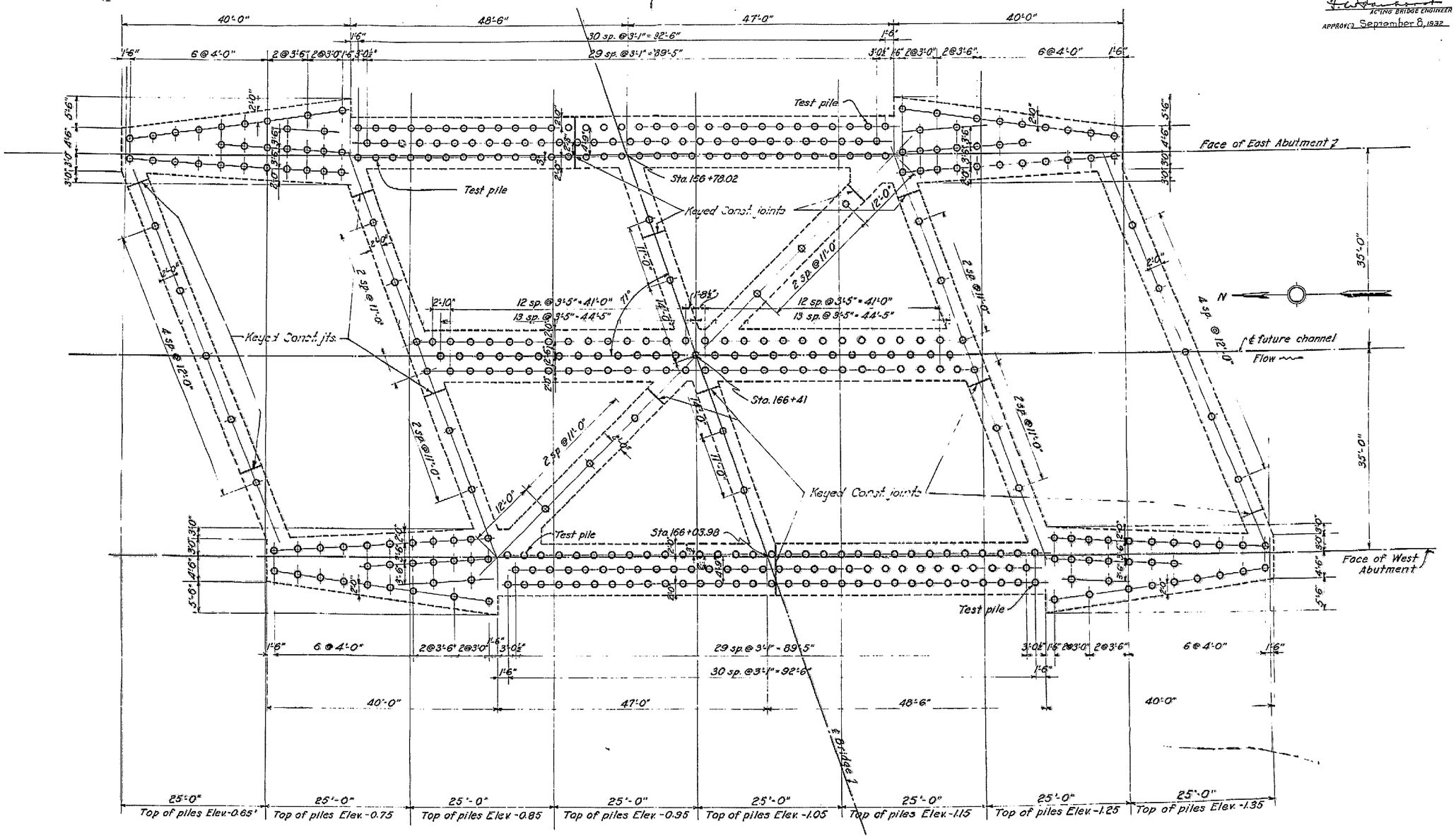
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
2	CAL.	E-182-E	1933	3	13

DIST.	COUNTY	ROUTE	SEC.	SHEET NO.	TOTAL SHEETS
VII	L.A.	~~190~~ 6		2	12

ACTING BRIDGE ENGINEER

APPROVED September 8, 1932



Design load 22 Tons per pile.
Pile material: Untreated Douglas Fir.

BRIDGE ACROSS TOPANGA CREEK

PILING

SCALE: 8" = 1'-0"	FILE NO.
BRIDGE NO. 53.35	DRAWING NO. C-91-18

Revised by	Checked by	Description	Location	Date

AS BUILT PLANS
Contract No. 41176
Date Completed
Document No. 70062617

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DATE _____ SIGNATURE _____ TITLE _____

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FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
2	CAL.	E-182-E	1933	4	13

DIST.	COUNTY	ROUTE	SEC.	SHEET NO.	TOTAL SHEETS
VII	L.A.	~~60~~ 16		3	12

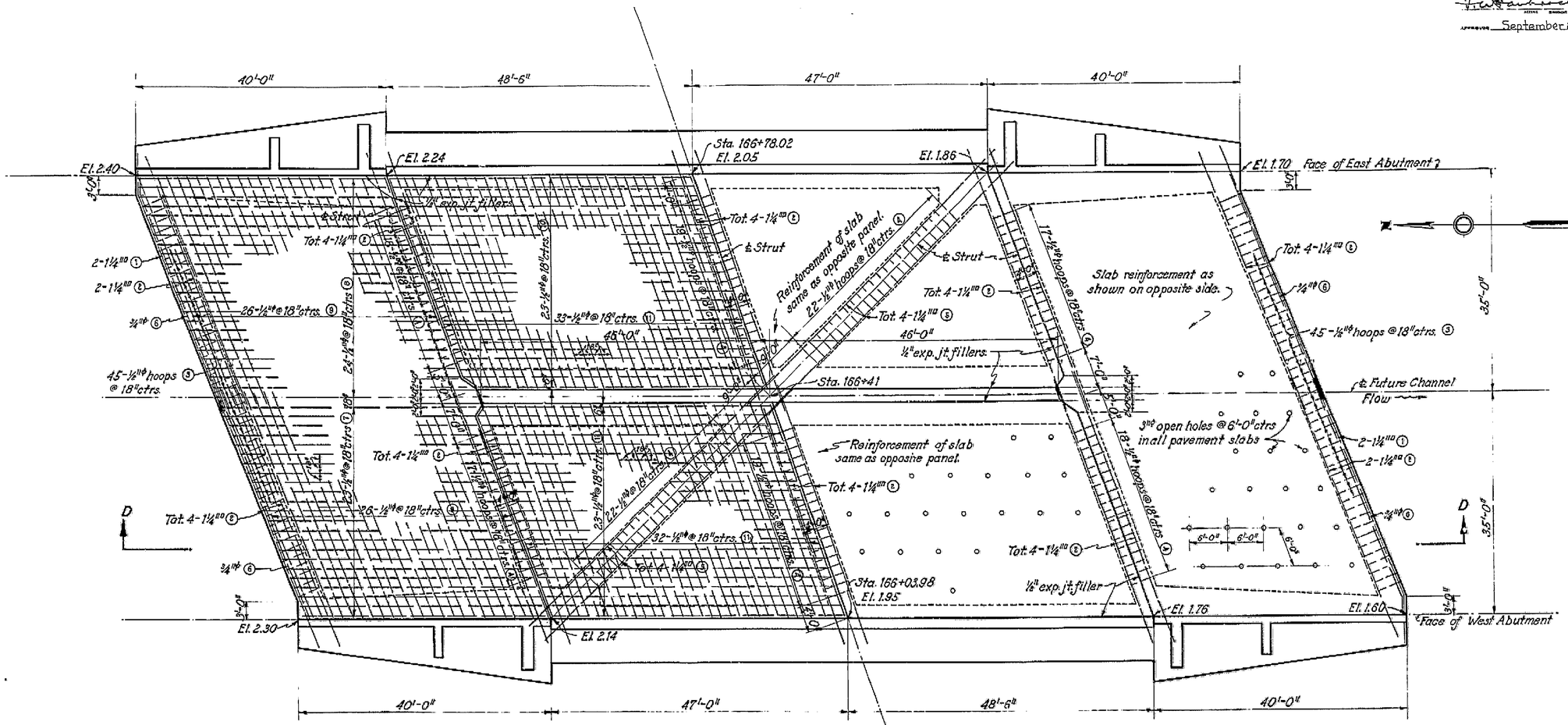
APPROVED September 8, 1933

List of Revisions And Prints

8-11-	Prints For Quantities.
8-12-	Prints For District.
93	Prints For B.P.R.

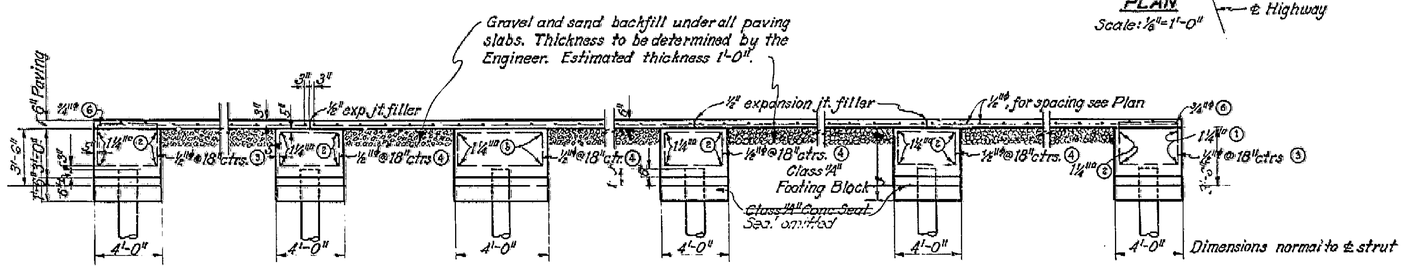
DEPARTMENT OF PUBLIC WORKS DIVISION OF ARCHITECTURE BUREAU OF BUILDINGS BRIDGE DEPARTMENT

Designed by	J.C. 7-32
Checked by	E.A. 8-32
Drawn by	J.C. 7-32
Traced by	P.G.G. 8-32
Tested by	E.A. 8-32
Quantities by	A.H.C. 8-32
Detailed by	P.G.G. 8-32
Design Period	H.D.S.



PLAN
Scale: ⅛"=1'-0"

℄ Highway



TYPICAL SECTION D-D
Scale: ¼"=1'-0"

Notes: Elevations shown refer to top of finished pavement slab.

BRIDGE ACROSS TOPANGA CREEK
STRUTS AND PAVEMENT

SCALE: As Noted	FILE NO.
BRIDGE NO. 53.35	DRAWING NO. C-91-19

AS BUILT PLANS
Contract No. 4111 VC 6
Date Completed
Document No. 7000 2617

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DATE _____ SIGNATURE _____ TITLE _____

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FED. ROAD DIST. No.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
7	CAL.	E-182-E	1933	11	13

List of Revisions And Prints	
8-12-	Prints For Quantities
8-12-	Prints For District
9-[illegible]	Prints For B.P.R.

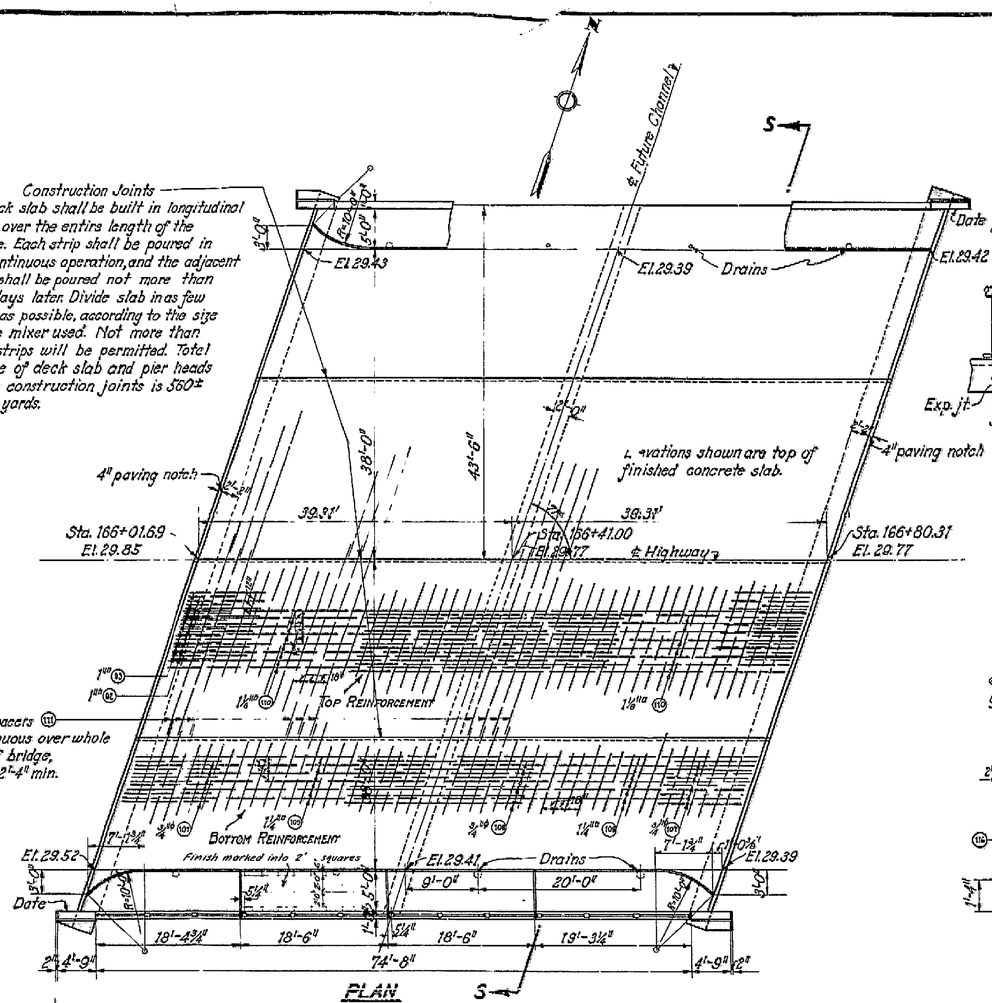
VII L.A. 69-16.10 12

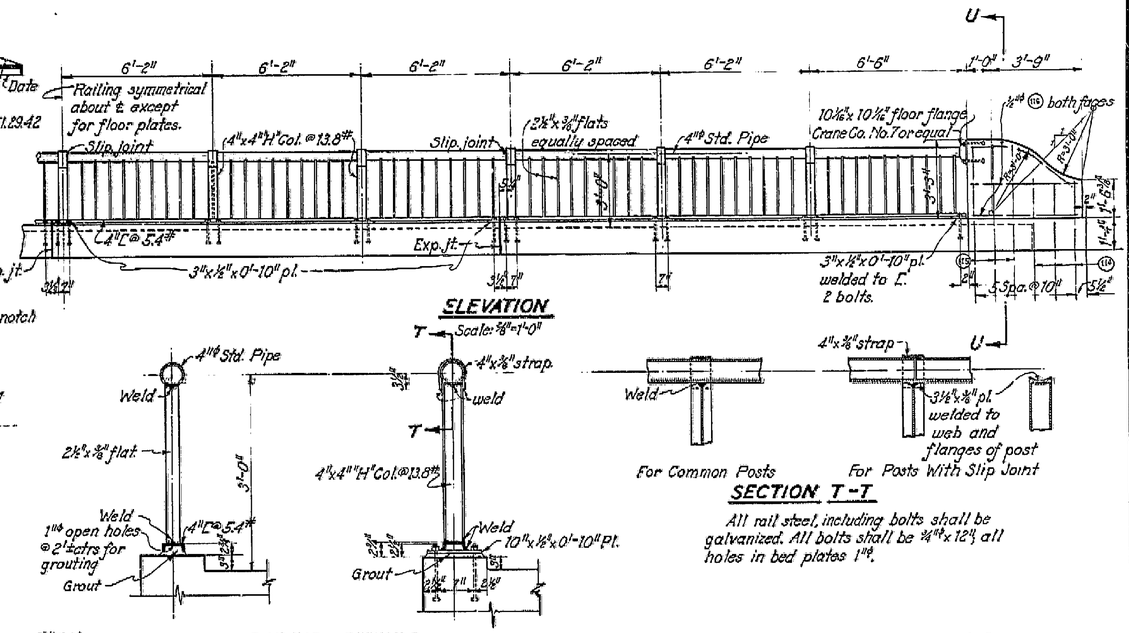
[illegible] ACTING

September 8, 1932

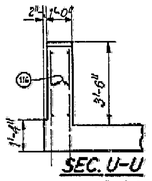
Construction Joints

Deck slab shall be built in longitudinal strips over the entire length of the bridge. Each strip shall be poured in one continuous operation, and the adjacent strip shall be poured not more than two days later. Divide slab in as few strips as possible, according to the size of the mixer used. Not more than four strips will be permitted. Total volume of deck slab and pier heads above construction joints is 560± cubic yards.

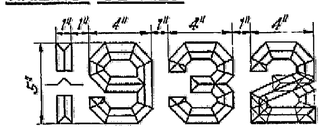




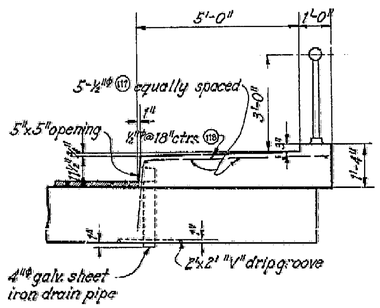
All rail steel, including bolts shall be galvanized. All bolts shall be ¾"ø x 12" all holes in bed plates 1" ø.



RAILING DETAILS



Date to be recessed into inside faces of two rail posts as shown on plan.

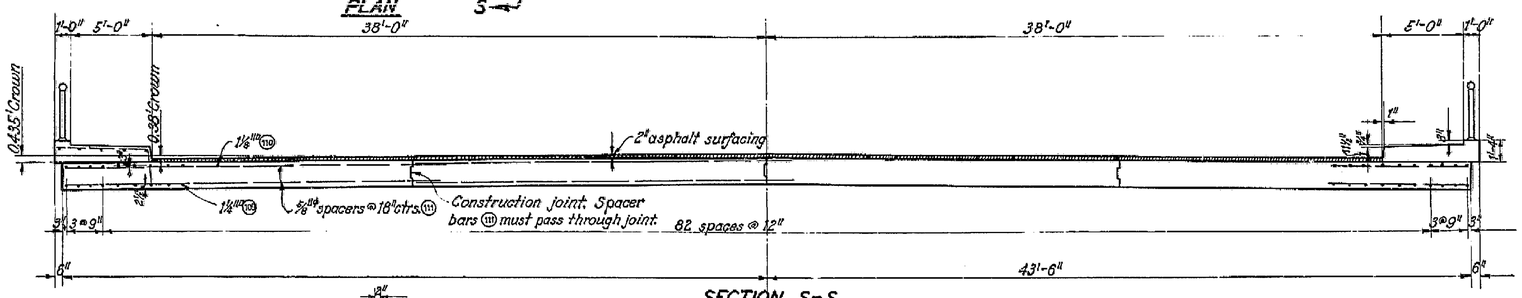


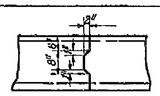
SIDEWALK AND DRAIN DETAILS

For location of drains see Plan
Scale: ½"=1'-0"

NOTE.

Stairway surfaces shall be wood float finished rather rough. Sidewalks and walkway shall be wood float finished and marked into 2 ft squares.





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BRIDGE ACROSS TOPANGA CREEK	
SUPERSTRUCTURE DETAILS	
SCALE: AS NOTED	FILE NO.
BRIDGE NO. 53.35	DRAWING NO. C-91-26

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Fed. Road Dist. No.	State	Fed. Aid Proj. No.	Fiscal Year	Sheet No.	Total Sheets
2	CAL	E-182-E	1933	12	13

List of Revisions And Prints

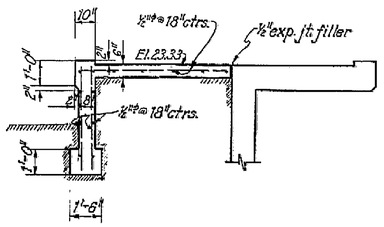
8-12- Prints For Quantities

8-12- Prints For District.

Prints For F.P.R.

VII L.A. 50-B 11.12

September 8, 1933



SECTION W-W

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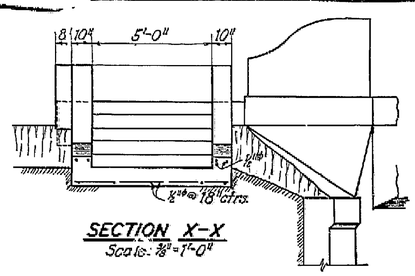

SECTION X-X

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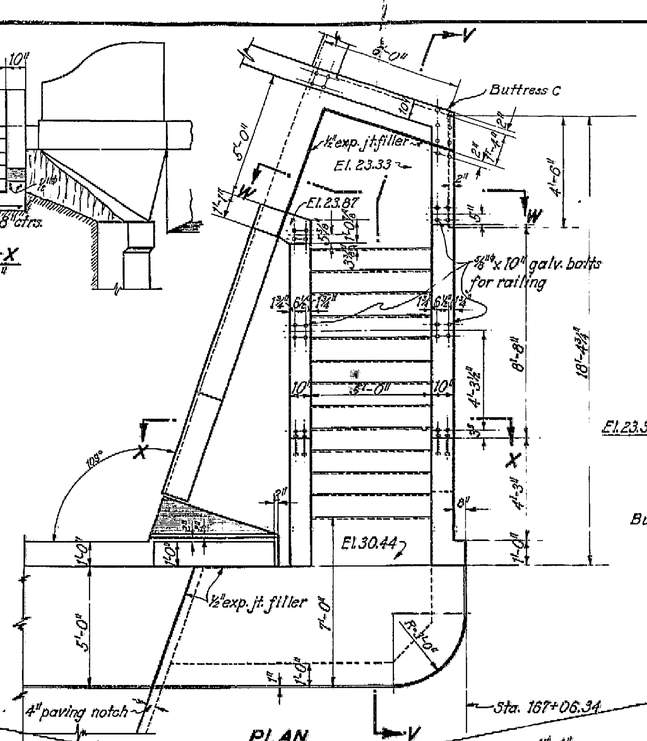
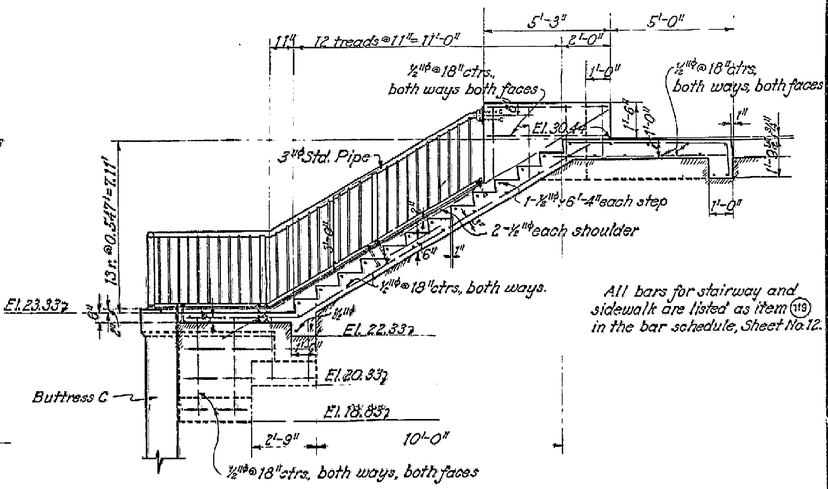


PLAN

Scale: ⅜"=1'-0"

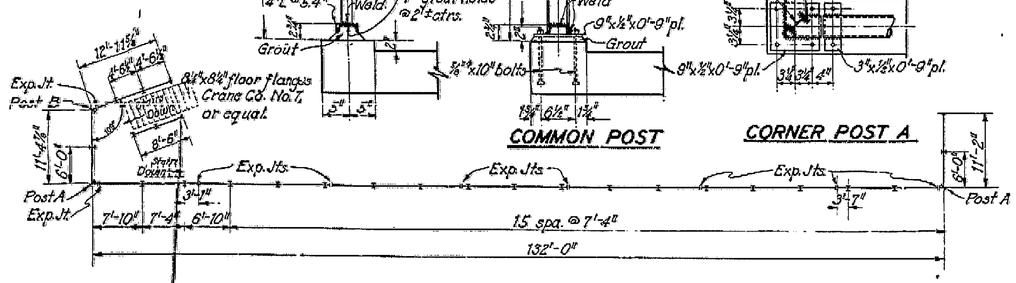


All bars for stairway and sidewalk are listed as item (119) in the bar schedule, Sheet No. 12.

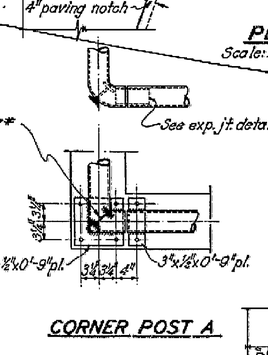
SECTION V-V

Scale: ⅜"=1'-0"

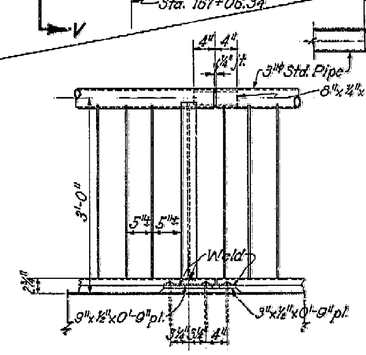
The portion of walkway resting on fill to be built by Roadway Contractor.



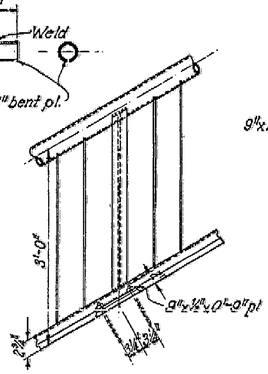
COMMON POST



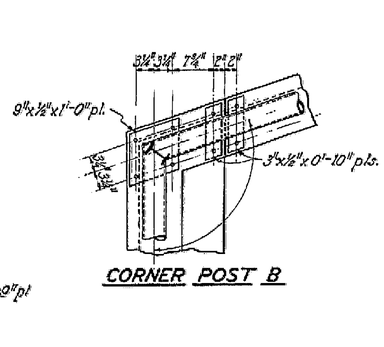
CORNER POST A



COMMON POST AND EXPANSION JOINT



STAIR POST



CORNER POST B

DIAGRAM OF WALKWAY RAILING AND TYPICAL DETAILS

Scales: Diagram - 1"=10'-0" Details:- 1"=1'-0"

All materials for railing, including bolts, shall be galvanized. All bolts shall be ⅝"ø x 10" and project 2". All holes in bed plates shall be ⅞"ø.

BRIDGE ACROSS TOPANGA CREEK	
WALKWAY DETAILS	
SCALE : AS NOTED	FILE NO.
BRIDGE NO. 53.35	DRAWING NO. C-91-27

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Contract No. 411VC6
Date Completed
Document No. 70052617

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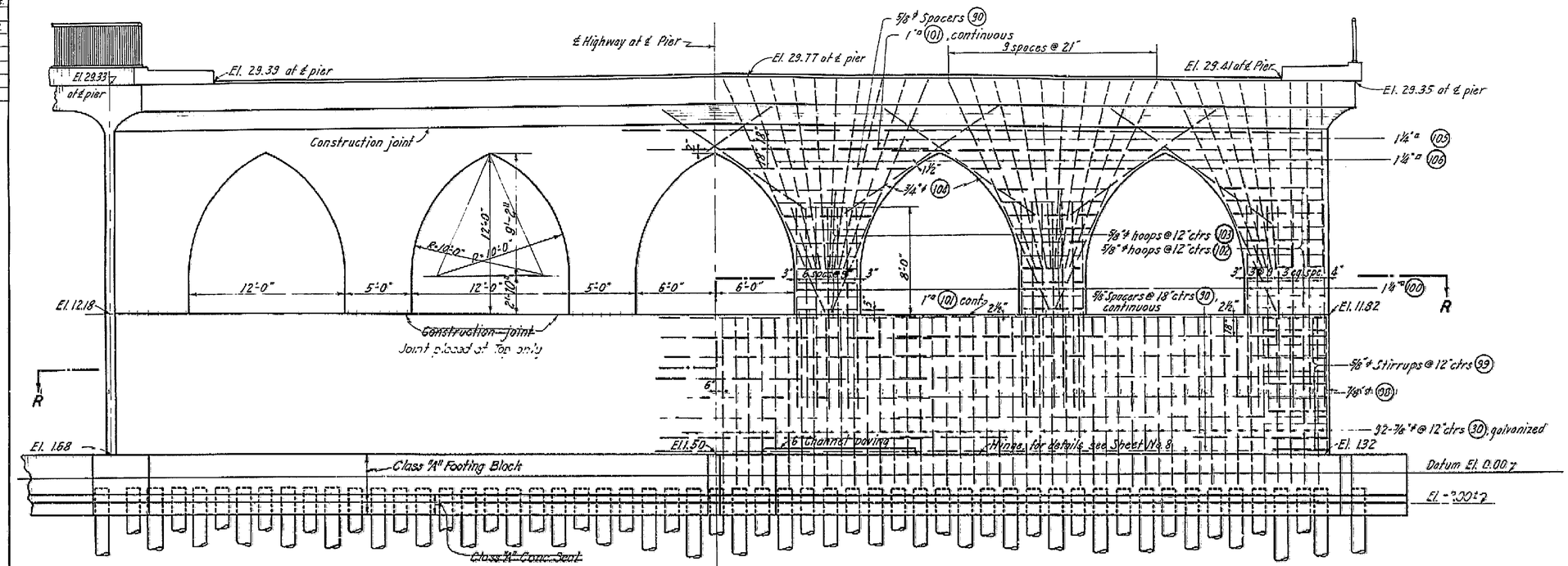
FED. ROAD DIS. NO.	STATE	FED. AID PROJ. NO.	F.S. SCH. YEAR	SHEET No.	TOTAL SHEETS
2	CAL	E-182-E	1933	10	13

DATE	REVISION AND PRINTS TO
-12	Prints for quants.
-12	- -District
-12	Prints For B.P.R.

VII L.A. 160 D 3 12

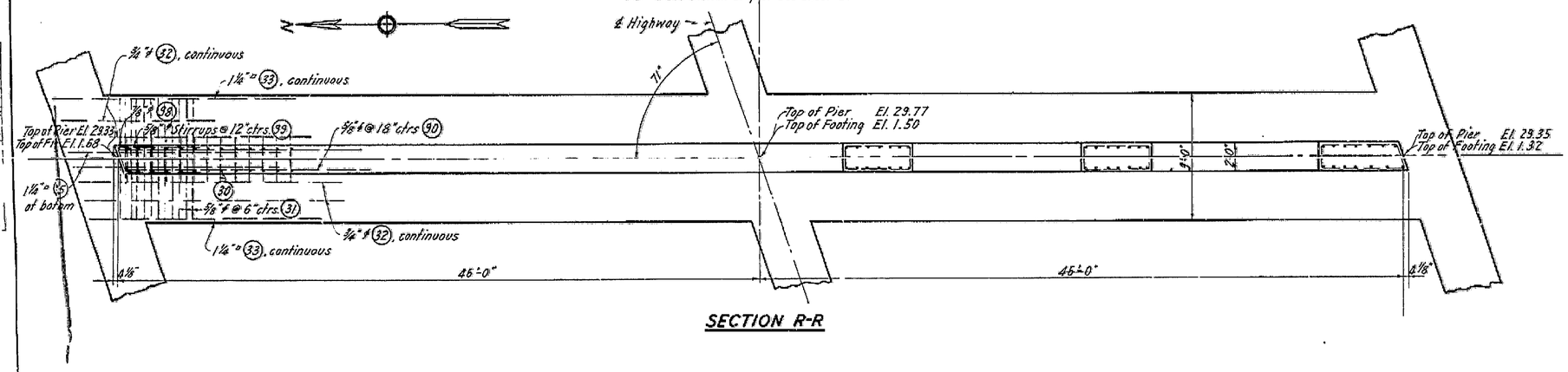
ACTING BRIDGE ENGINEER

SUBMITTED September 8, 1932



ELEVATION

Reinforcement symmetrical about ℄ and equal in both faces.
For cross section of pier see Sheet 8.



SECTION R-R

BRIDGE ACROSS TOPANGA CREEK

CENTER PIER

A.	½" = 1'-0"	FILE NO.	5335
B.		DRAWING NO.	C-91-25

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Date Completed
Document No. 70002617

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STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
BRIDGE DEPARTMENT

J.C. 8-32
E.A. 8-32
J.C. 8-32
A.D. 8-32
J.C. 8-32
A.M.C. 8-32
C.H.M. 8-32
H.D.S.

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Appendix P

Topanga Lagoon Restoration Project Water and Sediment Quality Study Technical Report (ESA 2023) and Water Quality Pre-Construction Baseline Report (RCDSMM and Bay Foundation 2022)

The Appendices herein contain supporting information. These Appendices contain highly detailed figures and other graphic information, which are difficult to translate for screen reading software; therefore, the Appendices have not been translated into an auditory format. If you have a disability and/or have difficulty accessing any material in this document, please contact us by mail, email, or telephone, and we will work with you to make all reasonable accommodations. Please indicate 1) the nature of the accessibility need; 2) your preferred format; 3) the material you are trying to access and its location within this document; and 4) how to reach you if questions arise while fulfilling your request. You can direct your requests to:

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Calabasas, CA 91302-1909
Phone: (310) 945-8512
Email: john.ota@parks.ca.gov

TOPANGA LAGOON RESTORATION PROJECT

Water and Sediment Quality Study Technical Report

Prepared for
Resource Conservation District
of Santa Monica Mountains

February 2024

ESA

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Water and Sediment Quality Study Technical Report

Prepared for
Resource Conservation District
of Santa Monica Mountains

February 2024

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TABLE OF CONTENTS

Topanga Lagoon Restoration Project Water and Sediment Quality Study Technical Report

Page

Section 1, Introduction and Background 1
1.1 Introduction 1
1.2 Project Description 1
1.2.1 Topanga Lagoon 2
1.2.2 Pacific Coast Highway Bridge 2
1.2.3 Topanga Beach 5
1.3 Project Objectives and Purpose 5
1.4 Existing Water Quality 6
1.5 Prior Water and Sediment Quality Studies 7
1.5.1 Water Quality Pre-Construction Baseline Report (RCD and The Bay Foundation 2022) 7
1.5.2 Water Quality Study (RCDSMM 2004) 9
1.5.3 A Regional Survey of the extent and magnitude of eutrophication in Mediterranean estuaries of southern California, USA (McLaughlin et al 2013) 10
1.5.4 Topanga Source ID Study (Dagit et al 2014) 10
1.5.5 Long-term monitoring of molecular markers can distinguish different seasonal patterns of fecal indicating bacteria sources (Riedel et al 2015) 13
1.5.6 Jurisdictional Delineation Report (WRA 2020 and ESA 2023) 13
1.5.7 Ecohydrology Report (ESA 2022) 16
1.5.8 Beneficial Reuse Soil Characterization (GeoPentech 2022) 16
1.5.9 Initial Site Assessment Report (Geocon 2022) 17
1.5.10 Technical Report for Hydraulics, Sediment Transport and Sea Level Rise Analyses (Moffatt & Nichol 2022a) 18
1.5.11 Sediment Beneficial Reuse Study (Moffatt & Nichol 2022b) 19
1.5.12 Revised Draft Sampling and Analysis Plan (Moffatt & Nichol 2023) 21

Section 2, Water and Sediment Quality Benefits due to Restoration under Project Build Alternatives 23
2.1 Summary of Restoration (Build) Alternatives 23
2.2 Water and Sediment Quality Benefits due to Restoration Alternatives 25

Section 3, Potential Impacts 27
3.1 Potential Temporary Impacts from the Project During Construction 27
3.2 Potential Impacts from the Project Post-Construction 29

Section 4, References 31

Page

Figures

Figure 1 Project Location 3
Figure 2 Study Area Soils Map 14

Tables

Table 1 303(d) Pollutant Assessments in Topanga Beach and Topanga Creek 6
Table 2 Prior Water and Sediment Quality Studies 7
Table 3 Sieve Statistical Summary of Fill Material 17
Table 4 1-D Model Results Comparisons Among Alternatives and SLR Impacts 19
Table 5 Restoration in Acres under Alternatives 25

SECTION 1
Introduction and Background

1.1 Introduction

The California Department of Parks and Recreation (CDPR) has prepared an Environmental Impact Report (EIR) as Lead Agency pursuant to the requirements of the California Environmental Quality Act (CEQA) in coordination with Los Angeles County Department of Beaches and Harbors (DBH) and the California Department of Transportation (Caltrans). The EIR assesses the potential effects of implementing the Topanga Lagoon Restoration Project (hereinafter referred to as "Project"). The Project involves the expansion of the Topanga Creek and Lagoon ecosystem, the replacement of the aging PCH bridge (SR-1 #53-0035), and the relocation of DBH facilities on Topanga Beach under threat of sea level rise (SLR). The Project also evaluates beneficial reuse options for excavated sediment to be placed at a nearshore location near the Project area. Topanga Creek is listed on the Regional Water Quality Control Board (RWQCB) 303(d) list for lead in the upper watershed and bacteria within the Topanga Lagoon and Topanga Beach area. The proposed restoration will include excavation, grading, and disposal of existing lagoon sediment.

Four alternatives were identified to restore the Topanga Lagoon. Three Action (Build) Alternatives and one No Action/Managed Decline or No Build Alternative. These alternatives allow consideration of the benefits and challenges of the different restoration approaches, and a final "preferred" alternative will be selected at the end of the environmental review process that best meets the Project's needs. This Water and Sediment Quality Study Technical Report (WSDQSTR) has been prepared in support of the Project and provides a summary of the existing water and sediment quality conditions as a basis to assess both the water and sediment quality benefits due to the Project and potential impacts to the environment from the Project.

1.2 Project Description

The Project is located on the unincorporated Pacific Ocean coastline at the base of the Santa Monica Mountains of Los Angeles County, California within the Santa Monica Mountains National Recreation Area. The Project area includes two publicly managed areas, lower Topanga State Park managed by CDPR, and Topanga Beach managed by DBH. The closest access to the Project area is from the Pacific Coast Highway (PCH) and Topanga Canyon Boulevard (TCB) (**Figure 1**).

1.2.1 Topanga Lagoon

Topanga Lagoon is in the Topanga Creek watershed within both Topanga State Park and Topanga Beach, at the terminus of Topanga Creek. Topanga Creek drains an 18-square-mile watershed in the Santa Monica Mountains to the Pacific Ocean. It conveys flood flows to the lagoon during rain events and low flows during dry weather. A beach berm, which typically develops during summer wave conditions, seasonally restricts direct flow into the Pacific Ocean. The beach berm is breached during storms with sufficient flow volumes and velocities, and during combined large coastal storm wave and tide events. This episodically allows seawater to inflow into the lagoon, thus creating a connection, and fish passage opportunities (Moffatt & Nichol 2022a). The lagoon crosses under the PCH Caltrans bridge.

Once over 30 acres, the Topanga Lagoon is currently 0.56-acre, and constrained by 30 feet of fill from construction of the PCH bridge on both the east and west sides. Construction of the 1933 bridge destroyed roughly 93 percent of the original lagoon wetland habitat area. Despite the existing use patterns and restrictions, Topanga Lagoon still hosts a robust population of the federally endangered tidewater goby (*Eucyclogobius newberryi)* and the only currently reproducing population of the federally endangered steelhead trout (*Onchorynchus mykiss*) within the Santa Monica Mountains (CDPR and Resource Conservation District of the Santa Monica Mountains [RCD] 2022). The lagoon habitat is significantly degraded due to the importation of fill dirt used to support the PCH bridge that impeded the natural hydrologic connection to the ocean. The current configuration is too constrained to support a healthy ecosystem. The Project would expand the existing lagoon footprint to approximately 7 to 10 acres.

1.2.2 Pacific Coast Highway Bridge

The PCH opened in the late 1920s as part of the Roosevelt Highway, a 1,400-mile road that traced the western margin of the United States. The Roosevelt Highway represented the first direct link between Newport Beach and Laguna Beach and between Ventura and Santa Monica. Passing directly through many beach towns, the Roosevelt Highway was renamed Pacific Coast Highway in 1941 (KCET 2012). The original alignment of PCH in 1920's included an approximately 250 ft bridge that spanned the large lagoon. In 1933, the road within the Project area was moved north, widened and a 79-foot-long bridge (53 0035, Post Mile 40.6-41.2) was constructed over Topanga Lagoon to replace the original longer bridge (Caltrans 2003).

The PCH bridge does not currently qualify for removal based on condition, although it was built in 1933. However, it's replacement is listed as the top priority fish passage restoration project for Caltrans District 7 in the California Fish Passage Assessment Database (PAD 716891) and is also identified as a priority recovery action by the National Oceanic and Atmospheric Administration (NOAA) Southern California Steelhead Recovery Plan (2012). In addition, Caltrans is contributing Independent Quality Assurance efforts to support the Proposed Project to end of construction at no cost because the project benefits the environment, the region, the economy, and the State Highway System. In coordination with Caltrans, the Proposed Project would lengthen the PCH bridge to 460 ft to accommodate the restoration and expansion of the lagoon.

SOURCE: NearMap, 2022-02-03 (Aerial); ESA, 2022

Topanga Lagoon Restoration Project

Figure 1

Project Location

ESA

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1.2.3 Topanga Beach

Topanga Beach is located just south of where TCB meets the Pacific Ocean at PCH. Topanga Beach includes an ocean frontage of 21.5 acres, receives approximately 750,000 visitors each year and is popular with surfers due to the orientation of the beach (DBH 2021). Topanga Beach is accessible via Bus 534 at stop PCH and TCB and provides a metered parking lot, beach wheelchairs, restrooms, a picnic area, and showers. Like other beaches along the coastline, future SLR is a threat to Topanga Beach. According to the high estimates of SLR scenario, beach erosion analysis suggests that Topanga Beach could lose the entire beach by 2040 (Noble 2016). To protect essential visitor services at Topanga Beach, the Proposed Project would relocate the beach parking lot, lifeguard headquarters and restroom, and helipad inland and upslope.

1.3 Project Objectives and Purpose

The objectives of the Proposed Project are as follows:

- Expand the lagoon ecosystem to improve estuarine hydrologic functions and to protect endangered species.
- Enhance coastal resilience for essential facilities in the Project area.
- Optimize beneficial reuse of excavated sediment by increasing sediment replenishment via nearshore placement and long-term conveyance increased by a wider bridge to the littoral cell while maintaining the integrity of the surf break.
- Protect the surf break and beach recreation.
- Improve water quality and restore coastal wetland habitat and species diversity within the Topanga Creek watershed.
- Increase safety and coastal access for pedestrians and cyclists, including for visitors with disabilities.
- Improve evacuation and emergency service routes through the Project area.
- Improve and enhance coastal access and recreational facilities.
- Manage and maintain the lagoon ecosystem consistent with the guidelines in the Topanga State Park General Plan.
- Replace the narrow 1933 PCH bridge to accommodate lagoon restoration and recovery of anadromous steelhead trout.
- Establish a visitor-serving “Gateway Corner” at the northwest corner of the intersection of PCH and TCB, consistent with the Topanga State Park General Plan goal of providing a coastal gateway to the park.
- Manage historic and archaeological resources in the Project area consistent with the guidelines in the Topanga State Park General Plan

The purpose for the Project is to: restore the ecosystem, especially habitat for two federally protected species, the tidewater goby and the steelhead trout; and protect and enhance visitor services by providing resiliency against SLR and beach erosion. The Project provides habitat improvement but also addresses future coastal resilience and SLR planning.

1.4 Existing Water Quality

The Project area is located in the Santa Monica Bay Watershed Management Area (WMA). The two largest watersheds within the WMA are Malibu Creek and Ballona Creek. The smaller Topanga Creek Watershed is located partway between Malibu and Ballona. Many of the beaches within the WMA are impaired for bacteria, while the nearshore and offshore zones are impaired due to polychlorinated biphenyls (PCBs) and dichloro-diphenyl-trichloroethane (DDT).

The State Water Resources Control Board and Los Angeles County Regional Water Board manage surface water quality in the Project area by establishing statewide water quality control policies and regulations. The *Los Angeles County Regional Water Board's Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties* (Basin Plan) contains the Region's water quality regulations and programs to implement the regulations. The Basin Plan is a resource for the Regional Board and others who use water and/or discharge wastewater in the Los Angeles Region. Following adoption by the Regional Board, the Basin Plan and subsequent amendments are subject to approval by the State Water Board, the State Office of Administrative Law, and the United States Environmental Protection Agency (USEPA).

A Total Maximum Daily Load (TMDL) is a numerical determination of the maximum amount of a given pollutant that a surface water can absorb and still meet the water quality standards that protect human health and aquatic life. Waterbodies that do not meet water quality standards are identified as "impaired" for the particular pollutants of concern and TMDLs must be developed, adopted and implemented to reduce those pollutants and clean up the waterbody. A TMDL determines a pollutant reduction target and allocates load reductions necessary to the source(s) of the pollutant.

Topanga Beach is State 303(d) listed as impaired for Indicator Bacteria from a nonpoint source. A TMDL has been established since 2003 for Topanga Beach. Topanga Creek does not have an established TMDL but is also State 303(d) listed as impaired for lead from an unknown source. Pollutant assessments for Topanga Beach and Topanga Creek are listed in **Table 1**. Water and sediment quality sampling and monitoring at Topanga Lagoon has occurred since the 2000s (**Table 2)**.

TABLE 1
303(D) POLLUTANT ASSESSMENTS IN TOPANGA BEACH AND TOPANGA CREEK

Water Body	Pollutant	Source
Topanga Canyon Creek	Lead (Metals)	A Source Unknown
Topanga Beach	Indicator Bacteria (Pathogens)	Nonpoint Source
Topanga Beach*	DDT (Dichlorodiphenyltrichloroethane) (Pesticides)	A Source Unknown
Topanga Beach*	PCBs (Polychlorinated biphenyls) (Toxic Organics)	A Source Unknown

* The Santa Monica Bay Watershed Management Area (WMA) is listed as impaired due to DDT and PCBs in the nearshore and offshore zones (RWQCB 2022a). Topanga Beach is within the Bay, which is why it is included in the 303(d) listing.

TABLE 2
PRIOR WATER AND SEDIMENT QUALITY STUDIES

Report	Date	Author
Water Quality Pre-Construction Baseline Report	June 2022	RCD and The Bay Foundation
Water Quality Study	October 2004	RCD
A Regional Survey of the extent and magnitude of eutrophication in Mediterranean estuaries of southern California, USA	August 2013	McLaughlin et al
Topanga Source ID Study	October 2014	Dagit et al
Long-term monitoring of molecular markers can distinguish different seasonal patterns of fecal indicating bacteria sources	March 2015	Riedel et al
Jurisdictional Delineation Report	August 2020	WRA
Ecohydrology Report: Fish Passage, Fish Habitat Suitability, and Habitat Zone Elevations	January 2022	ESA
Beneficial Reuse Soil Characterization	April 2022	GeoPentech
Initial Site Assessment	May 2022	Geocon
Technical Report for Hydraulics, Sediment Transport and Sea Level Rise Analyses	June 2022	Moffatt & Nichol
Sediment Beneficial Reuse Study	October 2022	Moffatt & Nichol
Revised Draft Sampling and Analysis Plan	April 2023	Moffatt & Nichol

1.5 Prior Water and Sediment Quality Studies

1.5.1 Water Quality Pre-Construction Baseline Report (RCD and The Bay Foundation 2022)

The Water Quality Pre-Construction Baseline Report compiles several study periods and focuses specifically on the lower creek and lagoon area. This report documents the conditions prior to restoration in order to eventually evaluate the success of the restoration effort once complete. The report discusses methods and results of bacteria monitoring, in-situ data sonde monitoring, grab sample and nutrient monitoring, algae monitoring, and water temperature monitoring. In addition to the compilation of previous studies, this report includes results of its own monitoring conducted by the Bay Foundation: in-situ data sonde monitoring conducted from June to November 2021 using a Hach Hydrolab HL7 multiparameter data sonde, monthly grab samples collected beginning in October 2021, and water temperature monitoring using a HOBO Tidbit v2 temperature logger from January 2020 to December 2021.

Results are summarized below, as presented in the report:

- "Fecal Indicator Bacteria (FIB) grades reported by Heal the Bay for Topanga Beach at the mouth of Topanga Lagoon are variable and even with low rainfall years the wet season grades are frequently low. Summer dry season grades vary with rainfall and higher rain years correspond to lower grades.

- Surface salinity levels in the main body of Topanga Lagoon were mostly low, with a few higher saline events observed when overwash or tidal exchange occurred. No stratification has been documented. Between 2012-2014, mean salinity was 1.5 ppt, with a maximum of 5 ppt and minimum of 0 ppt. This pattern continues to be observed with little to no stratification of salinity documented and is consistent with the data gathered by the Hach HydroLab H7 data sonde in 2021.
- Although average pH (7.6-8.2) was slightly on the alkaline side, even maximum recorded levels (7.9-8.5) remained within the tolerance limit range for most aquatic species. Again, this pattern appears to be holding with both our 2020-2021 grab sample and sonde data.
- Water temperature documented by the Hach Hydrolab HL7 showed diurnal cycles ranging from a low of 12 °C in the fall to a high of almost 29 °C in August 2021. Additional water temperature data collected by the HOBO Tidbits in the main lagoon and further upstream of the PCH bridge where there is riparian canopy cover shows a wider temperature difference.
- Dissolved Oxygen levels in Topanga Lagoon vary diurnally but typically remain above 5 mg/l.
- Overall turbidity ranged between 0-25 NTU with spikes that could be a result of people, dogs or birds stirring up the sediments.
- Electrical Conductivity values ranged from a low of 2 up to over 30 µS between July – November 2021.
- An Oxygen Reduction Potential value of between +300-500 mV is considered healthy. The data from July – November 2021 falls within this range.
- Nitrate levels in Topanga Lagoon and creek were consistently well below the 1 ppm threshold for concern for aquatic species (EPA 2012) in 2012-2014, with a single maximum reading of 0.18 ppm in December 2013. The standard for drinking water is <10 ppm. Levels of nitrate greater than 3.5 ppm are thought to contribute to increased algal production and eutrophication in Southern California streams. Natural background readings vary depending on underlying geologic conditions but can range from 0.0- 0.08 ppm (EPA 2012). The pending TMDL limit for Malibu Creek is <1 ppm (EPA 2012). Compared to both maximum and average levels documented at Topanga Lagoon (max=0.87, mean=0.14) in 2003-2004, levels in 2021 (max = 0.22, mean = 0.12 (n=3)) are even lower and consistent throughout the creek and lagoon.
- Nitrite-N can have serious health effects for infants and is the cause of the blue baby syndrome (EPA 2014). The tolerance levels for aquatic species are not well documented. The target for nitrite–N is 1 ppm (RWQCB 1994 with 2011 updates). All sites within Topanga Lagoon and creek are consistently well below that threshold with a maximum of 0.05 ppm and mean of 0.01 ppm (n=30) recorded between 2012-2014. Although there are only 3 samples from 2021, the maximum recorded was 0.04 ppm with a mean of 0.03 ppm in the main lagoon. Samples upstream were similarly low (maximum 0.04 ppm, mean of 0.03 ppm).
- Between 2008-2009, discrete total nitrogen (TN) and total phosphorus (TP) samples were collected in Topanga Lagoon and analyzed via persulfate digest and colorimetrically using an auto analyzer during both wet and dry weather conditions. The calculated annual TN load was 187 kg, which was the lowest recorded of all 23 estuaries (range=187- 48,018kg Tijuana River Estuary) sampled in southern California. The annual TP of 25 kg was also the lowest recorded and matched only by Bolsa Chica and the range was from 25-82,988 kg at the Tijuana River Estuary (McLaughlin et al. 2013).

- Common sources of orthophosphate levels exceeding 0.65 ppm in freshwater include organic elements from septic systems, graywater systems and inorganic sources like fertilizers and soaps from detergents. Natural readings range from 0.0-0.65 ppm.
- Maximum orthophosphate levels exceeded the target of 0.10 ppm for all locations throughout Topanga Lagoon and Creek at some point during the 2012-2014 study when the maximum level occurred during a first flush event (0.16 ppm 1/24/13) in Topanga Lagoon. The non-storm event maximum at the lagoon was 0.93 ppm (3/6/2014) with a mean of 0.07 ppm). Mean level of 0.11 ppm was documented in 2003-2004 at Topanga Lagoon with a maximum of 0.37 ppm (Dagit et al. 2004). Levels in 2021 range between 0.1 and 0.28 ppm.
- Algae cover was recorded in Topanga Lagoon in a variety of methods over the years. Macrocystis was observed floating (unattached) in Topanga Lagoon, especially following high tide/overwash or breach events. *Cladophora sp*. and *Phyllospadix sp*. were occasionally observed as well. *Ruppia sp*. were observed seasonally, with peak abundance in summer and early fall when 100 % of the substrate could be covered.
- Based on the 2008-2009 data, Topanga Lagoon was ranked 11 of 23 estuaries, which puts it in the mid-range of overall condition for southern California based on the metrics of peak season macroalgal abundance, annual mean phytoplankton biomass and 10 percentile dissolved oxygen (McLaughlin et al. 2013)." (RCD and The Bay Foundation 2022)

1.5.2 Water Quality Study (RCDSMM 2004)

The Topanga Creek Watershed Water Quality Study Final Report was a cooperative effort between the RCD and the Los Angeles County Department of Public Works Watershed Planning Division to document conditions in the Topanga Creek Watershed. Ten sites throughout the watershed were monitored monthly or weekly from October 2003-2004. Site 1 was located at Topanga Lagoon knee deep off the east wing wall and monitored weekly. Data collection included physical (site conditions and water temperature), chemical (salinity, dissolved oxygen [DO], pH, conductivity, Nitrate-Nitrogen, Ammonia, Phosphates, and turbidity) and biological parameters (algae, total and fecal coliform bacteria and enterococcus, Bacterial DNA and Viral Pathogens). Levels of sediment input into the creek were measured indirectly via turbidity. This study did not include sampling for heavy metals, pesticides, total suspended solids or any other potential pollutants because the previous study in 1999-2001 did not suggest that any of these parameters were a problem. Site 1 results are summarized below:

- Site Conditions: Out of 55 sample dates, there were two occasions, each associated with storm events, when color changes or foam were noted at Site 1.
- Water Temperature: The maximum, minimum, and average water temperatures recorded at Site 1 had yearly averages of 20.7, 16.75, and 18.55 degrees Celsius, respectively.
- Water Depth: The maximum, minimum, and average depths recorded were 90, 25, and 50.50 cm, respectively.
- Salinity: The maximum, minimum, and average Salinity recorded were 13, 0, and 3.2 ppt, respectively.
- Dissolved Oxygen: The maximum, minimum, and average Dissolved Oxygen Ranges recorded were 19.65, 5.55, and 11.07 DO mg/l, respectively.
- pH: The maximum, minimum, and average pH recorded were 8.3, 7, and 7.67, respectively.

- Conductivity: The maximum, minimum, and average Conductivity recorded were 9200, 1180, and 2417 uS, respectively.
- Nitrate-Nitrogen: The maximum, minimum, and average Nitrate recorded were 0.87, 0, and 0.14 ppm, respectively.
- Ammonia-Nitrogen: The maximum, minimum, and average Ammonia recorded were >1, 0, and 0.11 ppm, respectively.
- Phosphates (Ortho-phosphates): The maximum, minimum, and average Phosphates recorded were 0.37, 0, and 0.11 ppm, respectively.
- Turbidity: The maximum, minimum, and average Turbidity recorded were 44.7, 0.55, and 2.53 NTU, respectively. Overall, turbidity was variable in the lagoon and appeared related to flow and algal levels.
- Algae: Algae cover was recorded for the lagoon as a whole. The growth of algae appeared to be more related to seasonal weather trends and amount of canopy cover rather than to nutrient availability. Of the 55 dates sampled, Site 1 was observed with 18 days with no algae, 10 days with Light (<5%) algae, 7 days with Moderate (5-25%) algae, 17 days with High (25-50%) algae, and 3 days with Dense (>50%) algae. The average density was 1.55. High levels of bacteria are often found associated with over 25% algal cover.
- Total and Fecal Coliform Bacteria Enterococcus: Site 1 and had 71% total coliform, 43% fecal coliform and 71% enterococcus exceedances.
- Bacterial DNA and Viral Pathogens: Samples collected from Site 1 in December 2003 tested positive for detection of Human Enterococcus.

1.5.3 A Regional Survey of the extent and magnitude of eutrophication in Mediterranean estuaries of southern California, USA (McLaughlin et al 2013)

This study assessed the magnitude and extent of eutrophication at 27 segments in 23 estuaries in the Southern California Bight between October 2008 and 2009, including Topanga Lagoon. Three indicators were measured (macroalgae biomass and cover, phytoplankton biomass, and DO concentration) to categorize eutrophic condition in each estuary. The Topanga Lagoon segment was ranked as high in peak macroalgal abundance and annual mean phytoplankton biomass and moderate in 10th percentile DO. The annual total nitrogen load of the Topanga Lagoon was ranked as 1 of the 27 segments studied. The overall rank for the Topanga Lagoon was 11 out of 27 (one being highest condition and 27 being the lowest condition).

1.5.4 Topanga Source ID Study (Dagit et al 2014)

The Topanga Source Identification Study was done to analyze the locations where bacterial exceedances of fecal indicator bacteria (FIB) occurred and to identify the possible sources of the fecal contamination in lower Topanga Creek and at Topanga Beach. The study also presents Best Management Practices to potentially reduce, mitigate, or eliminate the fecal contaminant inputs to improve water quality at Topanga Beach.

Sampling was conducted at 14 locations in the Topanga watershed, with most being located in the lower watershed from the ocean upstream to Topanga Bridge. Sampling was conducted at the first flush rain events between 2012 and 2014. Microbial source tracking technology was used, which can help identify unique sources of fecal pollution. The study identified four hypotheses to test and presented their results. These results are summarized below.

- The upper watershed is not contributing to the exceedances observed at Topanga Beach. Based on the data collected thus far, FIB levels in the creek upstream of the lagoon do not appear to correlate with exceedances observed at Topanga Beach.
- Concentrations of FIB and nutrients decrease as the creek flows downstream from town through the Narrows.
- From Owl Falls to Scratchy Trail and Topanga Bridge, benthic macroinvertebrate species diversity increases as the creek flows downstream. However, overall SCC-IBI scores are low throughout Topanga Creek.
- Testing of the septic systems along PCH indicated that the system at the Ranger residence at the Topanga Ranch Motel was possibly leaking, so repairs were completed in summer 2013. It is no longer leaking. The system at the Feed Bin was also a potential source of leachate and requires repair and further testing to evaluate the input potential into Topanga Creek. The other systems within Topanga State Park do not appear to be leaking, nor does the County Lifeguard facility.
- Contributions from Topanga Lagoon are correlated with FIB levels in the ocean during rain events and when the lagoon is connected to the ocean directly.
- Dogs and gulls are a significant source of fecal contamination to the lagoon and ocean and likely contribute to exceedances of Enterococci (ENT) state water quality standards at the ocean and lagoon sites.
- Human marker was detected infrequently in the creek, lagoon and ocean.

The study also includes a physical habitat assessment and nutrient and in-situ testing to analyze the physical and chemical water quality conditions in the main stem of the creek, and along Topanga Beach and Lagoon. The summary of these results, as presented in the study, are listed below.

- Rainfall was below normal for both years the study took place, and significant rain events were few and far between. Therefore, flow was consistently low throughout the study period as well.
- The average wetted width of the creek remained fairly constant throughout the study but average depths decreased in some locations in 2014.
- Water temperature, pH, and specific conductivity were relatively stable and consistent with previous data collected (Dagit et al 2004, 2000-2012 RCDSMM unpublished data).
- Habitat types remained consistent during the course of the study with riffles, runs and glides dominant in the lower reach of the creek (below 3600 m) and a more complex mix of flow habitats (cascade/fall, riffle, run, glide and pool) found upstream. None of the flow habitats in study reaches were dry during either year.

- Geomorphology and gradient affect the types of flow habitats present, with the lower gradient reach below 3600 m (< 3%) being dominated by run-riffle complexes and the upper gradient (3-6%) being pool dominated.
- Smaller substrates such as fines and gravel were more frequent in the lower reach, whereas larger substrate such as cobbles, boulder, and bedrock were more frequent in the upper reach, which has a higher gradient (> 3%).
- Instream habitat complexity includes abundance levels of filamentous algae, aquatic macrophytes, boulders, woody debris, undercut banks, overhanging vegetation, living tree roots and artificial structures. In 2014, both the lower and upper reaches had greater habitat complexities than in 2013 despite the low flows.
- The proportions of cover values for several riparian vegetation types were also estimated for the lower and upper reaches. Trees and saplings > 5m had the highest proportion of sparse cover in both the lower and upper reaches.
- Overall, both reaches of Topanga Creek have relatively stable banks that can support a complex assemblage of aquatic organisms. The higher level of fines and gravel in the lower reach are highly mobile. Snorkel survey and habitat typing focused on habitat for endangered steelhead trout documented the pulses of sediment moving downstream with storm events over time (Dagit and Krug 2011). While the specific location of the sediment slugs varies over time, and results in decreased pool habitat in certain reaches, the overall amount of pool habitat and refugia for fish remained fairly constant, despite a very wet year in 2005. Overall, channel morphology has also remained fairly constant over time (Dagit and Krug 2011).
- In-situ parameters (water temperature, dissolved oxygen, pH, conductivity, salinity) were, in general, within the standard tolerance ranges for wildlife.
- Nutrient and algae levels were, in general, low throughout the study period, with only occasional exceedances.
- On average, nitrate and orthophosphate levels decrease from Owl Falls (OF, 6500 m; the site closest to town) downstream to the lagoon but this decline is more pronounced between OF and Scratchy Trail (4800 m)
- On average, Brookside Drive (BR, 1700 m) had the highest levels of Ammonia.
- Owl Falls had the highest nutrient levels and Scratchy Trail has the lowest nutrient levels on average.

While the report finds that human marker was detected infrequently in the creek, lagoon and ocean, it notes the following as a recommended best management practice (BMP) for Topanga Beach:

> "Continue coordinated enforcement to reduce the number of homeless and transients camping in and around the beach and under the PCH underpass. A mass balance calculation of input of one direct deposit to the lagoon (~200g of human feces) was calculated to result in an exceedance of ENT (Riedel et al. 2014 submitted). Direct deposits were observed at both the lagoon and beach on multiple occasions during the study. Direct deposits associated with the transient population is again an enforcement issue but one that could potentially reduce exceedances." (Dagit et al 2014)

In summary in regard to bacteria sources at the beach, this study concluded that:

- The upper watershed is not contributing to the exceedances observed at Topanga Beach. Based on the data collected thus far, FIB levels in the creek upstream of the lagoon do not appear to correlate with exceedances observed at Topanga Beach.
- Contributions from Topanga Lagoon are correlated with FIB levels in the ocean during rain events and when the lagoon is connected to the ocean directly.
- Dogs and gulls are a significant source of fecal contamination to the lagoon and ocean and likely contribute to exceedances of ENT state water quality standards at the ocean and lagoon sites.
- Human marker was detected infrequently in the creek, lagoon and ocean. However, a single "direct deposit" of human feces to the lagoon resulted in an exceedance of ENT.

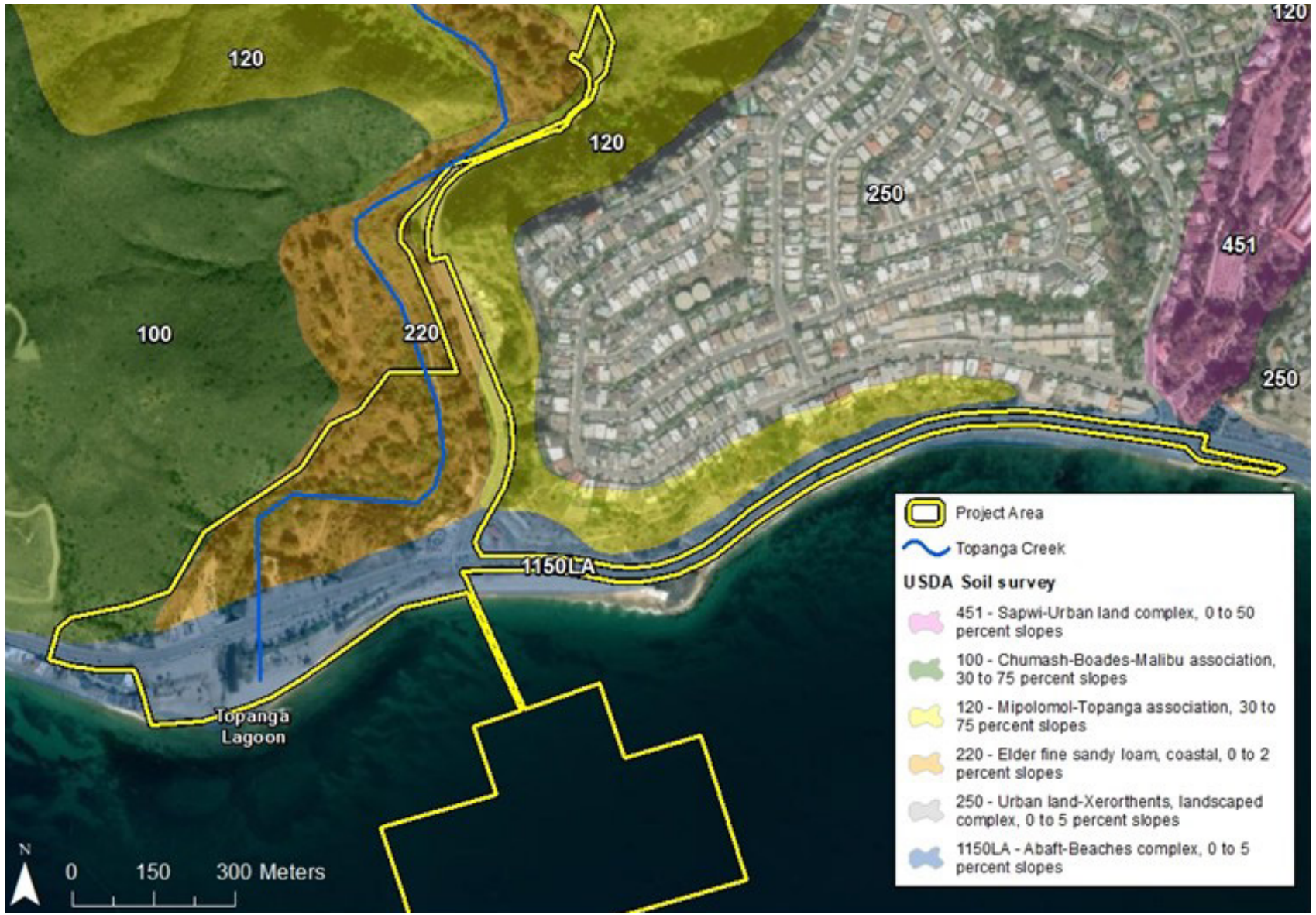
1.5.5 Long-term monitoring of molecular markers can distinguish different seasonal patterns of fecal indicating bacteria sources (Riedel et al 2015)

This microbial source tracking study used a dog-, a gull- and two human-associated molecular markers at 10 sites over 21 months to identify FIB sources at Topanga Beach. Per the study, "Historical data suggest that episodic discharge from the lagoon at the mouth of Topanga Creek is the main source of bacteria to the beach. A decline in creek FIB/markers downstream from upper watershed development and a sharp increase in FIB/markers at the lagoon sites suggest sources are local to the lagoon. At the lagoon and beach, human markers are detected sporadically, dog marker peaks in abundance mid-winter, and gull marker is chronically elevated. Varied seasonal patterns of FIB and source markers were identified showing the importance of applying a suite of markers over long-term spatial and temporal sampling to identify a complex combination of sources of contamination." (Riedel et al 2015)

1.5.6 Jurisdictional Delineation Report (WRA 2020 and ESA 2023)

The 2020 Jurisdictional Delineation Report describes the methods and results of a delineation of aquatic resources with the Project area. The WRA conducted the delineation on January 16, 2020, to identify wetlands and non-wetland waters potentially subject to jurisdiction by the U.S. Army Corps of Engineers under Section 404 of the CWA and/or Section 10 of the Rivers and Harbors Act. This report also identifies wetlands and other features potentially subject to the jurisdiction of the California State Water Resources Control Board under the Porter-Cologne Act.

The delineation site visit included soil sample collection and analysis to determine if hydric soils were present. The report includes an analysis of the soil types present in the study area, indicating that the study area contains four soil types: Abaft-Beaches complex, 0 to 5 percent slopes; Elder fine sandy loam, coastal, 0 to 2 percent slopes; Chumash-Boades-Malibu association, 30 to 75 percent slopes; and Mipolomol-Topanga association, 30 to 75 percent slopes. Descriptions of each soil series, as stated in the report, are provided below and the distribution of these soil types is depicted in **Figure 2**.



D201901073.01 - Topanga Lagoon CEQA NEPA\05 Graphics-GIS-Modeling-USE AZURE\Illustrator

SOURCE: Project Boundary (E PD, Moffat & Nichol, RCDSM M 9/20/2023), NRCS Web Soil Survey, 2021
Service Layer Credits: Esri, HERE, Garmin, Intermap, Increment P corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Topanga Lagoon Restoration Project

Figure 2
Soils Map

ESA

Abaft-Beaches complex, 0 to 5 percent slopes:

The Abaft series consists of very deep, excessively drained soils that formed in sands from mixed sources. Abaft soils are on stabilized dunes and beach areas along the coast. Slopes range from 0 to 25 percent. A representative profile for this series consists of a pale brown (10YR 6/3) stratified loamy sand surface layer 5 inches thick. This layer is underlain by pale brown (10YR 6/3) stratified loamy sand and brown (10YR 4/3); 2 percent clay that extends to a depth of 25 inches.

Elder fine sandy loam, coastal, 0 to 2 percent slopes:

The Elder series consists of very deep and deep, well-drained soils that formed in alluvial material derived from mixed rock sources. Elder soils are on alluvial fans and in flood plains and have slopes of 0 to 15 percent. A representative profile for this series consists of a dark gray (10YR 4/1) fine sandy loam surface layer 23 inches thick. This layer is underlain by gray (10YR 5/1) sandy loam that extends to a depth of 36 inches and light brownish gray (10YR 6/2) fine sandy loam layer that extends to 72 inches.

Riverwash is a mixture of sand, gravel, and cobblestones that contains little or no silt and clay. It is the loose mass of material that occupies stream channels and is exposed at low water. Riverwash is subject to movement in spring during periods of runoff and during stream flooding

Chumash-Boades-Malibu association, 30 to 75 percent slopes:

The Chumash soils consist of very shallow and shallow to soft bedrock, well-drained soils that formed in residuum and colluvium derived from shale and sandstone. Chumash soils are on hills and mountains. Slopes are 5 to 75 percent. Chumash soils have a yellowish-brown (10YR 5/4) gravelly loam layer on the soil surface from 0 to 23 inches.

The Boades series consists of shallow to soft bedrock, well-drained soils that formed in residuum and colluvium derived from bedded shale and sandstone. Boades soils are on hills and mountains. Slopes are 5 to 75 percent. Boades series soils have a brown (10YR 5/3) loam layer on the soil surface up to 14 inches with highly fractured, bedded, weathered shale with fractures 1 to 2 inches apart, and with about 10 to 15 percent soil in fractures with common very fine roots that extends to 60 inches.

The Malibu series consists of moderately deep to soft bedrock, moderately well-drained soils that formed in residuum and colluvium derived from inter-bedded shale and sandstone. Malibu soils are on hills and mountains. Slopes are 4 to 75 percent. A representative profile for this series consists of a brown (10YR 5/3) loam surface layer 19 inches thick. This layer is underlain by reddish-brown (5YR 4/4) clay layer that extends to a depth of 27 inches and highly fractured, bedded, weathered shale and sandstone with about 10 to 15 percent soil in fractures up to 60 inches.

Mipolomol-Topanga association, 30 to 75 percent slopes:

The Mipolomol series consists of very shallow or shallow to fractured bedrock, well-drained soils that formed in residuum and colluvium derived from bedded shale and sandstone. Mipolomol soils are on hills and mountains. Slopes are 30 to 75 percent. Mipolomol series soils have a brown

(10YR 5/3) channery loam layer on the soil surface layer 12 inches thick with highly fractured bedded shale with fractures 1 to 3 inches apart, and with about 5 to 10 percent soil in fractures with few very fine roots that extends to 20 inches.

The Topanga series consists of shallow to fractured bedrock, well-drained soils that formed in residuum and colluvium derived from bedded shale and sandstone. Topanga soils are on hills and mountains. Slopes are 30 to 75 percent. A representative profile for this series consists of a grayish brown (10YR 5/2) gravelly loam surface layer 15 inches thick. This layer is underlain by yellowish-brown (10YR 5/4) gravelly clay loam that extends to 18 inches.

1.5.7 Ecohydrology Report (ESA 2022)

As part of the Topanga Lagoon Ecohydrology Study (ESA 2022), ESA analyzed the Topanga Lagoon mouth opening and closing dynamics to inform the restoration design. To accomplish this, ESA developed and ran a lagoon mouth dynamics and water level model. ESA's lagoon hydrology/mouth morphology model, or Quantified Conceptual Model (QCM), provided a greater understanding of existing mouth dynamics as well as analyzed breach conditions, estimating daily mouth conditions, and assessing the impact of restoration on lagoon and mouth function.

The results of the QCM showed that compared to existing conditions, the Alternative 2 grading design increases the wetted lagoon volume perched above the tides. In this alternative, streamflow may take longer to fill the larger lagoon volume before breaching the sand berm separating the lagoon from the ocean. As a result, there is potential for some increase in the duration of lagoon mouth closure during wet season. The model shows no change in closure during the dry season.

For Alternatives 3 and 4, the grading design also increases the wetted lagoon volume perched above the tides, though not as significantly as Alternative 2. In Alternatives 3 and 4, the lagoon expansion is above most lagoon water levels. Therefore, the modeling shows no significant change in lagoon volume or opening and closure for Alternatives 3 and 4 compared to existing conditions.

1.5.8 Beneficial Reuse Soil Characterization (GeoPentech 2022)

This investigation reviewed existing subsurface data and collected additional subsurface data to characterize the physical properties of the soils proposed to be removed by the Project. The results of this study are intended to assist with the evaluation of the soil's acceptability for beach replenishment or ocean disposal. Additional subsurface data collected for this investigation included ten hollow stem auger boreholes completed between December 20 and 22, 2021 and laboratory testing of selected samples from the 2021 borings. Laboratory testing included moisture content, dry density, Atterberg limits, No. 200 sieve wash, and grain size distribution. Geotechnical testing was also completed.

Geologic and subsurface conditions were determined to include artificial fill and Beach Deposits. Groundwater was observed during current and previous field investigations, with groundwater surface generally encountered in the Beach Deposits between elevations +1 to +3 ½ feet MSL.

Laboratory testing resulted in the average particle-size curve as a silty/clayey sand with gravel. The statistical summary of the fill sieve analysis is shown in **Table 3** below.

TABLE 3
SIEVE STATISTICAL SUMMARY OF FILL MATERIAL

	Percent Passing		
Sieve Size	**Minimum**	**Maximum**	**Mean**
No. 4 (4.75 mm)	56.6%	95.6%	75.8%
No. 30 (0.60 mm)	38.3%	84.8%	56.9%
No. 200 (0.075 mm)	17.7%	59.3%	29.5%

1.5.9 Initial Site Assessment Report (Geocon 2022)

An Initial Site Assessment of the Project was performed February 16, 2021 with the primary goal to determine the potential presence of "recognized environmental conditions" (RECs) defined as "the presence or likely presence of any hazardous substances or petroleum products in, on, or at a property: (1) due to release to the environment; (2) under conditions indicative of a release to the environment; or (3) under conditions that pose a material threat of a future release to the environment. De minimis conditions are not recognized environmental conditions." (Geocon West 2022) The 2022 report includes a review of the GeoPentech 2003 Initial Site Assessment Report of the Topanga Lagoon Restoration, which is summarized as reporting, "no known or potential sources of hazardous waste were identified either within the limits of the project or within areas immediately adjacent to the project limits. No RECs were identified."

The 2022 Initial Site Assessment Report concluded the following:

- The historic use of the property currently occupied by Oasis Imports as a service station, and the absence of records indicating the USTs have been removed, the potential presence of USTs represents an environmental concern for the Project Study Area.
- The potential for ADL in shallow soil in the shoulders of the roads due to the historical use as an automotive thoroughfare represents an environmental concern for the Project Study Area.
- There is a potential for ACM and LCP to be present within or on historical structures and the existing bridge structure. Additionally, asbestos and lead-containing paint may be present in surface soil adjacent to the dilapidated structures on the Topanga Ranch Motel property.
- Yellow traffic striping and pavement markings applied before 2005 potentially contained lead chromate pigment. Given that there is no assurance that striping and markings applied before 2005 have been completely removed or worn away, traffic striping and pavement markings observed within the Project Study Area generally have the potential to contain lead or chromium.

- Pole-mounted transformers have the potential to contain fluid that includes PCBs.
- Relocation or replacement of guard rails, power poles, fencing, and roadside signs on wooden posts may generate treated wood waste if the wooden posts are unable to be reused.

1.5.10 Technical Report for Hydraulics, Sediment Transport and Sea Level Rise Analyses (Moffatt & Nichol 2022a)

This report includes technical analyses on hydrology and hydraulics, sediment transport, sea-level rise (SLR) impacts, beach morphology, and fish passage assessment for the Project. The sediment transport analysis assesses sedimentation in Topanga Lagoon for alternative comparisons. This analysis included updating a previously developed and calibrated Mike11 one-dimensional model to reflect the latest topographic changes and compute the sediment transport under the four restoration alternatives. SLR impacts to the lagoon sedimentation are also considered and discussed. The results of the sediment transport modeling are summarized below, as presented in the report.

- The upper reach of the creek upstream of MM2 (Route 27 Bridge) is under a scour mode due to the steep slope. The scour volume increases with flow intensity, but it is not impacted by SLR or proposed lagoon grading.
- The lower reach downstream of MM2 is under a deposition mode due to flatter slopes. The sedimentation within lower Topanga Creek varies with flow conditions, but the overall deposition volume is very similar among alternatives with the exception of Alternative 2 under the high flow condition. The latter has slightly less sediment deposition volume, or more sediment being transported to the lagoon.
- The lagoon is under a deposition mode during average flow conditions, but more of a pass-through system under the high flow conditions. Alternative 2 has the largest deposition volume in the lagoon area among the four alternatives under both average and high flow conditions. The slightly larger deposition volume is mainly due to the increased lagoon area since the deposition depth of Alternative 2 is similar to other alternatives.
  - Under the high flow condition, the sediment deposition volume in the lagoon from high to low is Alternative 2, Alternative 3, Alternative 1, and Alternative 4.
  - Under the average flow condition, the sediment deposition volumes in the lagoon are very similar for all alternatives with slight differences. The sediment volume from high to low is Alternative 2, Alternative 3, Alternative 4, and Alternative 1.
- Sediment delivery to the ocean: during high flow storm events, the high-velocity flow erodes more sediment from the creek and watershed and transports more sediment from upstream to the ocean. The proposed grading does not change the sediment delivery appreciably. Alternative 2 slightly reduces the sediment delivery to the ocean, but not enough to cause any changes to offshore bathymetry since sediment delivery to the ocean from the Topanga watershed is minimal.
- SLR Impacts:
  - Sediment deposition volume in the lagoon increases with SLR for all alternatives and for both average and high flow periods.
  - Sediment delivery to the ocean decreases with increased SLR. Alternative 4 maintains slightly more delivery among the proposed alternatives, followed by Alternative 3, and

then Alternative 2. But the difference between alternatives is negligible and is not expected to cause any impact to the littoral cell.

– The reach upstream of MM2 is not impacted by SLR.

Table 4 provides a summary and comparisons of 1D sedimentation model results among the alternatives.

TABLE 4
1-D MODEL RESULTS COMPARISONS AMONG ALTERNATIVES AND SLR IMPACTS

Item	Order by Alternative	SLR Impact
Sediment Accretion in Lagoon[1]	Alternative 2 > Alternative 3 > Alternative 1 > Alternative 4	Increased sediment deposition with SLR. Alt 2 is most resilient to SLR

NOTE: The deposition depth in Alternative 2 is similar to Alternative 1 and Alternative 3 due to its larger lagoon footprint. Alternative 4 has relatively less lagoon deposition in depth than the other three alternatives.

1.5.11 Sediment Beneficial Reuse Study (Moffatt & Nichol 2022b)

This study analyzes and presents options for the sediment excavated from this restoration project. The sediment excavated from this restoration project may be used to benefit the surrounding coastal region by renourishing the shoreline. This study presents three sediment reuse options and the equipment required, schematics, and logistics of each option. The three options presented are:

Option 1: Mechanical Removal and Hydraulic Nearshore Placement

Under this option, fill material would be removed from the Project area through nearshore ocean placement. Placing the material in the nearshore in the approximately 35-acre area would be environmentally beneficial because it would allow naturally driven processes (waves, longshore drift, and tidal currents) to disperse it to the surrounding littoral zone and beaches, nourishing them with additional sand and pebbles/cobbles, while silts and clays move farther offshore. For these natural processes to take place, the material must be placed within the closure depth of the region (approximately 30 feet). Placement west of the Topanga Lagoon mouth and east of Mastro's Point was considered, but given the presence of important marine habitats, concerns about avoiding any impacts on the surf break, and construction limitations, the current area was selected.

Sidescan sonar survey, underwater video, and diver surveys were used to identify suitable sandy areas (**Appendix H,** *Topanga Marine Habitat Characterization Study*). The bottom substrate within the proposed placement area is primarily sand and the range of contours facilitates transport downcoast. The actual methods of placing materials within the nourishment area would be dictated by modeled dispersal and degradation rates, potential for turbidity, placement geometry, and the intent to minimize impacts on Essential Fish Habitat and other sensitive marine habitats.

Hydraulic nearshore placement would require that material be trucked on the beach to a staging area on the east side of Topanga Beach, where a sump pit or hopper would be used to mix the material into a slurry.[1] Seawater would be pumped directly into the container or pit using a small submersible pump on the end of an intake line. This intake line would be screened so that organisms, debris, or other materials would not be impinged on the screen or pumped in from the ocean. A crawler crane would adjust the position of the pump within the sump pit or hopper to pump the slurry through a submerged discharge line to the nearshore placement site. There could be sediment buildup at the end of the discharge line, so a small derrick barge and support tug would adjust the seaward end of the line as needed to prevent line burial and clogs. The pipe would be temporarily anchored and placed on risers as needed to prevent any unintended impacts on sensitive marine resources. It is anticipated that the maximum thickness of sediment at the placement point would be a mound 5–20 feet high that would be distributed throughout the dispersal area and slope down as it is washed away by wave action, longshore drift, and tides.

Sediments are expected to migrate downcoast, transported by the current toward the narrow beach at Coastline Drive. Based on data from the Coast of California Storm and Tidal Waves, movement of sediments would not affect the Topanga Point surf break, as the placement site is downcoast of the point. The beaches downcoast from Topanga Lagoon are fairly narrow and experience regular seasonal and episodic erosion, and as such, any sediment added to the respective littoral cell would beneficially provide erosional protection and add recreational space for the public.

Option 2: Mechanical Removal and Upland Landfill Disposal

Should trucks be used to transport some or all of the material to either the Calabasas, Sunshine, or Scholl Canyon Landfill, two different navigation routes would be used. For material heading to the Calabasas Landfill, trucks would be staggered to either travel west on PCH and north on Malibu Canyon Road or travel east on PCH to Interstate 10 (Santa Monica Freeway), then west on U.S. Highway 101, to reduce traffic congestion and the need for highway crossings. Trucks heading to either the Sunshine or Scholl Canyon Landfill would use PCH east to Interstate 10 (Santa Monica Freeway) and then Interstate 405 north to U.S. Highway 101 east.

The potential exists for as much as the top 3 feet of soil below the pavement approaches to the bridge to be contaminated with ADL. If ADL is shown to be present by soil testing at the time of excavation, this soil would be disposed of off-site at a hazardous materials landfill. Soils removed below a depth of 3 feet in a roadway excavation are assumed to be clean based on soil characterization studies and do not require any special handling.

Excavation and disposal of the maximum amount of excavated historic fill materials is anticipated to take up to 146 working days and approximately 32,000 truck trips. Construction would close portions of the beach for five to seven months, but a temporary access-way out to the surf break would be maintained at all times.

[1] A *hopper* is a metal sediment containment box that would be roughly 40 feet by 15 feet and placed on the beach.

Excavation and disposal work would be scheduled to avoid the busy summer months from Memorial Day to Labor Day and avoid grunion breeding season, as well as steelhead migration or other sensitive species needs. Ideally the excavation would be conducted in the fall before the rainy season, as this timing would both minimize impacts on the beach and facilitate movement with the onset of winter storms.

Note that nearshore placement is nearshore ocean placement.

1.5.12 Revised Draft Sampling and Analysis Plan (Moffatt & Nichol 2023)

The Revised Draft Sampling and Analysis Plan (SAP) describes methods and procedures to evaluate sediment from the proposed Topanga Lagoon Restoration project for its suitability for placement in the nearshore ocean. The SAP details the physical and chemical testing to determine suitability of the excavated material for nearshore ocean placement. Sampling of the proposed nearshore placement site and proposed project excavation site was conducted in 2022. Physical testing found that the median grain size of the fill material is within the range of existing sediments. Chemical testing found that the sediment quality was acceptable. The SAP concludes that the excavated fill should be considered for nearshore placement at the proposed site. It provides two placement alternatives (shifting placement site into deeper water, away from habitats and/or hauling to a landfill) in the case that the fine sediment content be considered too high for placement or numerical modeling shows “considered environmental impact to surrounding habitat.” Direct placement on the beach was assessed but deemed unfeasible due to differences in color and angularity between the material and existing beach sands.

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SECTION 2
Water and Sediment Quality Benefits due to Restoration under Project Build Alternatives

2.1 Summary of Restoration (Build) Alternatives

Under all Project Build Alternatives, the seasonally wetted and riparian habitat areas would be expanded from the existing 0.56 acre, to 7 to10 acres, while the more upland/transition areas would increase from the existing 21.4 acres to between 23 and 24 acres, depending on which alternative is selected. This would require removing much of the historically imported fill on-site to create a more natural topography and expanded open space area. The existing wetted lagoon area and riparian habitats would be protected with grading starting at the outer edge of existing riparian trees, preserving the current lagoon banks and the majority of the existing riparian willows and native hardwoods. The majority of native trees would be retained throughout the Project area, and the natural breaching pattern of the lagoon would be protected by grading outside the footprint of the existing wetted lagoon and landward of the beach berm at its mouth.

Under all Project Build Alternatives, the area of Topanga Beach for recreational users would increase slightly. The construction footprint includes the Topanga Beach lagoon/ocean interface on the landward side of the bar-built sand berm and extends approximately 350 feet upstream into Topanga Creek with removal of fill on both the west and east sides. Under all Project Build Alternatives, the fill material would either be trucked off site for disposal or beneficially reused in a near-shore placement location, subject to approval by the United States Army Corps of Engineers (USACE).

Under all Project Build Alternatives, the length of the existing 79-foot Caltrans bridge would be expanded to accommodate a widened lagoon riparian area, which would lower flow velocities to improve adult steelhead migration opportunities and increase refugia areas for tidewater gobies and juvenile steelhead, as well as the quantity and quality of lagoon habitats. To provide for a wider lagoon and improve fish migration and refugia, the existing Caltrans bridge would be replaced with a longer bridge. The main span of the new bridge would increase to 200 feet, with secondary side spans of 130 feet on either side, increasing the total bridge span length to 460 feet. This expanded length reduces flood impacts (M&N 2022), provides space for the creek and lagoon to evolve in response to SLR and provides pedestrian access under the roadway on both sides of the lagoon, as only access on the east side is currently available. The existing alignment of the bridge and PCH roadway is maintained for two of the Project Build Alternatives but is relocated slightly to the north in the Alternative 4, as discussed below.

The new bridge would continue to accommodate two lanes in each direction with no expansion of roadway capacity. Traffic flows will also be protected during construction by way of a temporary roadway and bridge alignment. All utilities would be continued during construction, and eventually relocated underground or attached to the new bridge. All phases of construction and staging for the new bridge would be similar under each alternative.

Under all Project Build Alternatives, Native American cultural sites would be protected in place, retaining an appropriate cover over the pre-contact period surface of no less than 2 to 4 feet, and necessarily limiting the lowering of the riparian bottomland surface to actual historic elevations.

Coastal access would be maintained during construction and improved under all Project Build Alternatives. This includes the creation of a trail system through the Project area and provision of pedestrian access under PCH on the east and west sides of the lagoon. Improved parking would be provided along the PCH and TCB corridors. A permeable emergency route from PCH to the beach level would be constructed on the west side of the lagoon to allow lifeguard access to both limit vehicle usage along the lagoon berm and provide access to the western beach even during times when the lagoon mouth is open. Parking at the beach level would be similar to existing conditions, and would only be accessible to staff, emergency vehicles, and disabled visitor parking spaces. The areas around the existing bus stops would be improved to be more welcoming to public transportation users.

Under all Project Build Alternatives, key DBH facilities on Topanga Beach would be relocated further from the ocean to protect structures from SLR. The existing lifeguard headquarters, beach restroom, and helipad would be demolished and rebuilt closer to the realigned access road, and at a higher elevation. The new buildings would be of similar size and materials to the existing building. A small two-car garage for staff would be added in the improvements. The new helipad site would re-locate to the east side of the lagoon for improved access by the lifeguards and emergency responders. The size, setbacks and built elements of the new helipad would conform to all Federal Aviation Administration and Los Angeles County requirements. The permitted onsite wastewater treatment system (OWTS) that services the beach restroom would remain to support the new facility unless a sewer hookup becomes available. The existing parking lot would be modified depending on the alternative. Americans with Disabilities Act (ADA) and staff parking and access at the beach level is retained in all alternatives.

A plan for determining the future configuration of the historic Topanga Ranch Motel is included in each of the Project Build Alternatives, as are potential locations for park facilities, concessions, and parking on CDPR property. Currently the Proposed Project area accommodates authorized and unauthorized parking opportunities. The Proposed Project would modify the parking opportunities, reducing the current free but unauthorized roadside parking on PCH along the bridge deck, and create additional parking spaces in designated areas adjacent along TCB. Some free parking on PCH would remain but would be reduced compared to existing conditions. **Table 5** provides a summary of restoration in acres under all Project Alternatives.

TABLE 5
RESTORATION IN ACRES UNDER ALTERNATIVES

Item	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Restoration area, total	0	13.6 acres	9.8 acres	10.8 acres
Restoration area, wetted	0	9.5 acres	7.1 acres	7.1 acres
Beach area	4.16 acres	4.39 acres	4.42 acres	4.56 acres
Fill Removal for Lagoon expansion	0	256,000 CY	166,000 CY	210,000 CY
Total Pervious Area	4.34 acres	18.8 acres	15.17 acres	16.64 acres
Total Impervious area	7.34 acres	6.03 acres	6.25 acres	6.56 acres

2.2 Water and Sediment Quality Benefits due to Restoration Alternatives

The restoration alternatives are intended to expand the lagoon ecosystem to improve estuarine hydrological and ecological functions, protect endangered species, and restore habitat and species within the Project area. Restoring and improving habitats and hydrological and ecological functions is expected to improve water and sediment quality conditions in the lagoon.

Overall, Alternative 2 will create new expanded wetted lagoon, riparian, and transition zone habitat. Alternatives 3 and 4 will expand and restore riparian and transition habitat above the existing lagoon. The restored riparian and transition zone habitat in Alternatives 2, 3, and 4 are expected to enhance the existing lagoon habitat and allow the lagoon to expand with future SLR, thereby creating lagoon habitat. Alternative 4 realigns the PCH bridge to the north and is therefore expected to improve overall habitat resiliency and increase beach area with SLR compared to other alternatives. These overall habitat benefits are assessed in the Topanga Lagoon Alternatives Analysis Report (M&N 2022b).

Based on similar case studies and the peer-reviewed literature, wetlands have been shown to be able to improve water quality. The project consists of expanding the wetland footprint through removal of historical infill, creating rain gardens as BMP solutions to improve treatment of stormwater from developed areas, and improving the ecological and hydrological conditions of the current wetlands and integrating the project with recreational features (CNA, 2022). The wetland restoration alternatives being considered are not designed to be flow-through treatment wetland systems, where nutrient removal would occur as water is diverted into specially designed treatment wetlands. However, wetlands along the side of riverbanks (riverine wetlands) have been documented to remove nutrients, although not at rates as high as those documented for specially designed treatment wetlands (Land et al. 2013).

Of the four alternatives, Alternative 2 provides the greatest increase in lagoon, wetland, and riparian habitats and greatest reduction in flow velocity in the lagoon. It also provides the largest lagoon and transition zone, and therefore could provide the most wetland and emergent and riparian vegetation to remove nutrients and assist in nutrient cycling. Expanded riparian habitats in Alternatives 3 and 4 are also expected to remove nutrients and assist in nutrient cycling to a

lesser extent. Excessive nutrients in coastal lagoons typically lead to algae blooms, which can affect water quality parameters, such as pH and dissolved oxygen. For instance, when algae and plants are photosynthesizing during the day, dissolved oxygen levels will be high, however, when they respire at night, or die, oxygen is depleted (RCDSMM and The Bay Foundation, 2022). The restoration alternatives therefore have the potential to remove nutrients and improve water quality conditions, including dissolved oxygen levels.

Aquatic organisms, especially steelhead trout, typically require a consistent level of 5 mg/L or above of dissolved oxygen to survive, and when levels drop below this, it can be detrimental to the aquatic wildlife (RCDSMM and The Bay Foundation 2022). Steelhead use of coastal lagoons in southern California seems less prevalent than in central California (ESA 2022). This is likely because in southern California, temperature increases and water quality and quantity decline to the point of lagoons being uninhabitable to even steelhead (Hayes and Kocik 2014). Juvenile steelhead have not been documented rearing in the Topanga lagoon. Dagit et al. (2018) concluded that "the size and condition of the lagoon is such that it likely does not promote rapid growth and based on the low number of fish ever observed in the lagoon, it's likely that fish do not spend too much time in the lagoon, but rather move through it quickly into the ocean." If juveniles do end up trapped and/or rearing in the closed lagoon, the restoration alternatives are expected to increase nutrient removal, improve water quality conditions including dissolved oxygen levels, and therefore improve conditions for juvenile steelhead and other aquatic organisms.

Note that the Topanga Lagoon Restoration Ecohydrology Report (ESA 2022) studied lagoon mouth opening and closure dynamics and showed that restoring and expanding the wetted lagoon volume perched above the tides in Alternative 2 increases the duration of mouth closure during the wet season. Alternative 2 is predicted to have an overall increase in duration of mouth closures because the increased lagoon volume takes longer to fill with streamflow and wave overwash before the lagoon breaches. This expanded area reduces storm flow velocities, improves adult steelhead passage when the lagoon is connected, creates fish habitat and improves refugia for juvenile steelhead and tidewater goby. For Alternatives 3 and 4, the grading design also increases the wetted lagoon volume perched above the tides, though not as significantly as Alternative 2. In Alternatives 3 and 4, the lagoon expansion is above most lagoon water levels. Therefore, there is no significant change in lagoon volume or opening and closure compared to existing conditions and less improvement to fish passage opportunities, fish habitat and refugia compared to Alternative 2. The study also notes that sea level rise is predicted to have a larger impact on mouth closure than restoration actions, with more mouth closure with sea level rise (ESA 2022).

SECTION 3
Potential Impacts

The water and sediment quality data summary presented in Section 1 and Section 2 provides the basis for the following assessment of the potential impacts from the Project on the environment during and following construction. Potential temporary impacts related to Project construction are discussed first followed by the potential long-term impacts following restoration completion. The discussion includes both identification of potential impacts and proposed measures to address them.

3.1 Potential Temporary Impacts from the Project During Construction

Would the construction of the project violate any water quality standards or waste discharge requirements?

Construction of the Project could cause the migration of sediments and soils during excavation, grading, and placement activities into receiving waters through dust emissions, construction equipment, and stormwater runoff or direct discharge into receiving waters, which would violate water quality standards and waste discharge requirements. However, the 401 Permit and Construction General Permit would require implementation of BMPs such as erosion and sediment controls, dust controls, controls for off-site sediment migration from construction equipment, and stormwater pollution prevention measures.

The Project would be required to comply with these permit requirements to control stormwater discharges from the construction site. To obtain coverage under this permit, the Project must electronically file a Stormwater Pollution Prevention Plan (SWPPP), and other compliance-related documents prior to construction. The SWPPP will need to identify BMPs that must be implemented to reduce construction effects on receiving water quality based on potential pollutants. BMPs will need to be identified that are directed at implementing both sediment and erosion control measures as well as other measures to control potential chemical contaminants. Examples of typical construction BMPs include scheduling or limiting certain activities to dry periods, installing sediment barriers such as silt fence and fiber rolls, and maintaining equipment and vehicles used for construction. Non-stormwater management measures include installing specific discharge controls during certain activities, such as paving operations, and vehicle and equipment washing and fueling. The SWPPP will also need to include descriptions of the BMPs to reduce pollutants in stormwater discharges after all construction phases have been completed at the site (post-construction BMPs). Project construction activities would be consistent with the Construction General Permit; compliance is required by law and the provisions of the permit and BMPs for construction and post-construction phases have proven effective in protecting water

quality at construction sites and down-gradient receiving waters. The Project would be required to comply with the 401 Permit and Construction General Permit to prevent impacts to receiving waters from sediment migration and direct discharges as detailed in a SWPPP and therefore, there would be no potential impacts.

Other potential water quality construction impacts would be with the installation of the 180-foot-long by 31-foot-wide temporary bridge made of prefabricated steel truss structure adjacent to the existing southbound lane of PCH and relocating utilities. The temporary bridge would accommodate two lanes of traffic while the new bridge is under construction. It would take approximately six months to construct and would be built to avoid having footings in the lagoon.

Once the temporary bridge is completed and traffic diverted, the old bridge would be removed in stages to facilitate construction of the new bridge, first northbound and then southbound. Prior to demolition of the old bridge, the area within the footprint of the bridge culvert would be dewatered. This would be accomplished by excluding fish from the work area to an appropriate adjacent upstream habitat supervised by a qualified biologist, then utilizing aquadams, portadams, or a cofferdam on either side of the culvert in lieu of driving sheet piles to mitigate the acoustic impacts. This control would be set up within a few feet of the culvert to lessen the temporary impact to the waterway. Pumps would be used to keep the work area dry during demolition. Water would be pumped into a staging pond for infiltration and eventual release into the ocean following water quality testing.

Shoring would be installed directly behind the culvert on both sides to support the soil underneath the active vehicular lane. The bridge deck and abutments would be removed with concrete saws and excavators with hoe-ram attachment to demolish the thick slabs supporting the culvert. Construction debris would be hauled off-site for disposal.

Piles would be cut three feet below the finished mudline or deeper. The latter would depend on the potential scour depth and/or scour impacts to the proposal piles. The second phase would be similar to the first. When completed, the water controls would be removed.

The construction of the temporary bridge, new bridge and removal of the old bridge will be subject to a 401 Permit and Construction General Permit and compliance with all permit requirements would result in less than significant impacts.

Would the on-site sediments that are excavated and placed in a permitted marine placement site impact water quality?

The Project would excavate sediments to increase the footprint of the lagoon and restore habitat. The sediment excavated as part of the project may be designated for placement in an off-site landfill or placed strategically in the nearshore to renourish the shoreline. Prior studies have assessed on-site sediment quality, including the Beneficial Reuse Soil Characterization (GeoPentech 2022). The Sediment Beneficial Reuse Study (Moffatt & Nichol 2022b) summarizes the sediment beneficial reuse options for the Project. Two 9-acre ocean disposal sites are proposed east of Topanga Point roughly 600 feet offshore of Topanga Beach.

The Revised Draft Sampling and Analysis Plan (SAP) (Moffatt & Nichol 2023) describes methods and procedures used to evaluate sediment from the proposed Topanga Lagoon Restoration project for its suitability for placement in the nearshore. The SAP details the physical and chemical testing that will be conducted to determine suitability of the excavated material for nearshore placement. Sampling of the proposed nearshore placement site and proposed project excavation site was conducted in 2022, physical and chemical testing was completed, and the SAP concludes that the excavated fill should be considered for nearshore placement at the proposed site.

The SAP notes the concern over potential impacts from nearshore sediment placement to nearshore habitat conditions. Preliminary efforts to avoid impacts were made, including locating the placement site outside of ecological resources and also at a far enough distance from the direction of longshore transport that would potentially move the sediment towards identified habitat to the West. However, a quantitative analysis would be required to accurately assess these concerns. A modeling study to better understand the potential movement of the placed sediment and its potential impacts will be performed to supply this detailed information. Should this upcoming study conclude that there are potential impacts to sensitive aquatic resources from the placement of fill in the proposed nearshore location, adaptive measures will be taken to avoid impacts. This may include a phased timeline to dredge discharge, adjusting discharge locations, and/or discharge rates. The SAP goes on to provide two placement alternatives (shifting placement site into deeper water, away from habitats and/or hauling to a landfill) in the case that the fine sediment content be considered too high for placement or numerical modeling shows significant environmental impact to surrounding habitat. Therefore, there would be no adverse impact as a result of nearshore placement.

3.2 Potential Impacts from the Project Post-Construction

Would the operations of the project violate any water quality standards or waste discharge requirements?

The Project would change impervious surfaces at the site. Alternative 2 would result in an overall reduction of impervious area while Alternatives 3 and 4 would result in an overall increase in impervious surfaces relative to existing conditions. The Project increases pervious areas by using design features such as decomposed granite. The Project's impervious surfaces, such as the new parking areas, sidewalks, and other elements, are designed to route runoff into new rain gardens. This combination of design features results in 85th percentile storm event flows conveyed in the post-development conditions generally matching the pre-development conditions. Therefore, the tributary storm water runoff from this project will not adversely affect persons, downstream properties or drainage facilities and is in adequate conformance with the LA County design criteria, guidelines, policies and procedures (CNA, 2022).

Would the project increase bacteria in the lagoon or at the beach?

The 2014 Topanga Source ID Study concluded that the upper watershed is not contributing to the bacteria exceedances observed at Topanga Beach. However, contributions from Topanga Lagoon are correlated with bacteria levels in the ocean during rain events and when the lagoon is connected to the ocean directly (Dagit et al, 2014). The 2014 Topanga Source ID Study also noted that dogs and gulls are a significant source of fecal contamination to the lagoon and ocean. The creation of additional wetlands under the Project may lead to an increase in bird and gull use of lagoon habitat, which could increase bacteria in the lagoon and ocean.

The expanded and restored seasonally wetted lagoon and riparian habitat areas under the Project Alternatives are expected to provide water quality treatment benefits. Restored vegetated wetland is expected to provide nutrient uptake and removal (Land et al, 2013) and reduce bacteria levels. Therefore, while an increase in bird and gull use may increase bacteria input to the lagoon, the expanded restored lagoon habitat may also reduce bacteria levels in the lagoon. The water quality treatment benefits of the restored vegetated wetland habitat is expected to outweigh the potential increase in bacteria inputs due to increase in bird and gull use.

The 2014 Topanga Source ID Study showed that while human marker was detected infrequently in the creek, lagoon and ocean, a single “direct deposit” of human feces to the lagoon resulted in an exceedance of ENT (Dagit et al, 2014). The Project’s proposed improvements to public access may help with achieving greater enforcement of the no dog and no camping on the beach rules, which could reduce dog and human sources (RCD and The Bay Foundation, 2022).

The Project would restore vegetated lagoon habitats that are expected to provide increased treatment of bacteria. Additionally, the Project’s improvements to public access may result in fewer violations of the no dog and no camping rule, reducing bacteria from “direct deposits.” Therefore, the Project is not anticipated to increase bacteria in the lagoon or at the beach and is not anticipated to negatively affect the implementation of the Bacteria TMDL at Topanga Beach.

Note that potential changes to the Topanga Beach surf break are assessed in the Surf Quality Impact Assessment for Topanga Lagoon Restoration (Integral Consulting Inc. 2023).

SECTION 4
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WATER QUALITY PRE-CONSTRUCTION BASELINE REPORT
TOPANGA LAGOON RESTORATION PROJECT
Topanga, CA

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TABLE OF CONTENTS

EXECUTIVE SUMMARY	4
BACKGROUND	6
HISTORIC WATER QUALITY STUDIES	8
PROJECT DESCRIPTION	10
BACTERIA MONITORING	10
METHODS	10
RESULTS	11
IN-SITU DATA SONDE MONITORING	12
METHODS	12
RESULTS	13
Salinity	13
pH	13
Water Temperature	14
Dissolved Oxygen	15
Turbidity	15
Electrical Conductivity (EC)	16
Oxygen Reduction Potential (ORP)	17
GRAB SAMPLE AND NUTRIENT MONITORING	17
METHODS	18
RESULTS	18
Salinity	18
pH	19
Conductivity	19
Nitrate-N	19
Nitrite - N	19
Orthophosphate	20
Ammonia – N	20
Turbidity	20
ALGAE MONITORING	21
METHODS	21
RESULTS	21
WATER TEMPERATURE MONITORING	22
METHODS	23
RESULTS	23
QA/QC PROTOCOLS	26
RECOMMENDATIONS	26
Pre-Construction	27

During Construction	27
Post-Construction	27
REFERENCES CITED	27
Appendix A. Monthly Grab Sample Data	31
Appendix B. Resumes	33

LIST OF TABLES	
Table 1. Summary of Beach Report Card Grades for Topanga Lagoon	11
LIST OF FIGURES	
Figure 1.. Locations of water quality sampling efforts in Topanga Lagoon	9
Figure 2. Salinity in the main body of Topanga Lagoon July – November 2021	13
Figure 3. pH in the main body of Topanga Lagoon July – November 2021	14
Figure 4. Water Temperature in the main body of Topanga Lagoon July – November 2021	14
Figure 5. Dissolved Oxygen in the main body of Topanga Lagoon July – November 2021	15
Figure 6. Turbidity in the main body of Topanga Lagoon July – November 2021	16
Figure 7. EC in the main body of Topanga Lagoon July – November 2021	16
Figure 8. ORP in the main body of Topanga Lagoon July – November 2021	17
Figure 9. Water temperatures measured in Topanga Lagoon January 2020 – December 2021	24
Figure 10. Percent time at each water temperature measured in Topanga Lagoon July 2020 – November 2021	24
Figure 11. Water temperatures measured in Topanga Lagoon Upstream (80m) annually from April 2014 – December 2021	25
Figure 12. Percent time at each water temperature measured in Topanga Lagoon Upstream (80m) annually from July 2013 – November 2021	26

EXECUTIVE SUMMARY

Topanga Creek has been listed by the Regional Water Quality Control Board 303(d) list for lead in the upper watershed and bacteria at Topanga Beach. No other pollutants of concern have been listed for the watershed. Topanga Creek has no storm water conveyance systems per se, but storm water is "conveyed" and enters the creek in a variety of ways. The data provided in this report compiles several study periods (2003-2004, 2008-2009, 2020-present) and focuses specifically on the lower creek and lagoon area only and data from 2022 will be added to the final report.

Fecal Indicator Bacteria (FIB) grades reported by Heal the Bay for Topanga Beach at the mouth of Topanga Lagoon are variable and even with low rainfall years the wet season grades are frequently low. Summer dry season grades vary with rainfall and higher rain years correspond to lower grades.

Surface salinity levels in the main body of Topanga Lagoon were mostly low, with a few higher saline events observed when overwash or tidal exchange occurred. No stratification has been documented. Between 2012-2014, mean salinity was 1.5 ppt, with a maximum of 5 ppt and minimum of 0 ppt. This pattern continues to be observed with little to no stratification of salinity documented and is consistent with the data gathered by the Hach HydroLab H7 data sonde in 2021.

Although average pH (7.6-8.2) was slightly on the alkaline side, even maximum recorded levels (7.9-8.5) remained within the tolerance limit range for most aquatic species. Again, this pattern appears to be holding with both our 2020-2021grab sample and sonde data.

Water temperature documented by the Hach Hydroloab HL7 showed diurnal cycles ranging from a low of 12 ^{o}C in the fall to a high of almost 29°C in August 2021. Additional water temperature data collected by the HOBO Tidbits in the main lagoon and further upstream of the PCH bridge where there is riparian canopy cover shows a wider temperature difference.

Dissolved Oxygen levels in Topanga Lagoon vary diurnally but typically remain above 5 mg/l.

Overall turbidity ranged between 0-25 NTU with spikes that could be a result of people, dogs or birds stirring up the sediments.

Electrical Conductivity values ranged from a low of 2 up to over 30 µS between July – November 2021.

An Oxygen Reduction Potential value of between +300-500 mV is considered healthy. The data from July – November 2021 falls within this range.

Nitrate levels in Topanga Lagoon and creek were consistently well below the 1 ppm threshold for concern for aquatic species (EPA 2012) in 2012-2014, with a single maximum reading of 0.18 ppm in December 2013. The standard for drinking water is <10 ppm. Levels of nitrate greater than 3.5 ppm are thought to contribute to increased algal production and eutrophication in Southern California streams. Natural background readings vary depending on underlying geologic conditions, but can range from 0.0- 0.08 ppm (EPA 2012). The pending TMDL limit for Malibu Creek is <1 ppm (EPA 2012). Compared to both maximum and average levels documented at Topanga Lagoon (max=0.87, mean=0.14) in 2003-2004, levels in 2021 (max = 0.22, mean = 0.12 (n=3)) are even lower and consistent throughout the creek and lagoon.

Nitrite-N can have serious health effects for infants, and is the cause of the blue baby syndrome (EPA 2014). The tolerance levels for aquatic species are not well documented. The target for nitrite–N is 1 ppm (LARWQCB 1994 with 2011 updates). All sites within Topanga Lagoon and creek are consistently well below that threshold with a maximum of 0.05 ppm and mean of 0.01 ppm (n=30) recorded between 2012-2014. Although there are only 3 samples from 2021, the maximum recorded was 0.04 ppm with a mean of 0.03 ppm in the main lagoon. Samples upstream were similarly low (maximum 0.04 ppm, mean of 0.03 ppm).

Between 2008-2009, discrete total nitrogen (TN) and total phosphorus (TP) samples were collected in Topanga Lagoon and analyzed via persulfate digest and colorimetrically using an auto analyzer during both wet and dry weather conditions. The calculated annual TN load was 187 kg, which was the lowest recorded of all 23 estuaries (range=187-348,018kg Tijuana River Estuary) sampled in southern California. The annual TP of 25 kg was also the lowest recorded and matched only by Bolsa Chica and the range was from 25-82,988 kg at the Tijuana River Estuary (McLaughlin et al. 2013).

Common sources of orthophosphate levels exceeding 0.65 ppm in freshwater include organic elements from septic systems, graywater systems and inorganic sources like fertilizers and soaps from detergents. Natural readings range from 0.0-0.65 ppm.

Maximum orthophosphate levels exceeded the target of 0.10 ppm for all locations throughout Topanga Lagoon and Creek at some point during the 2012-2014 study when the maximum level occurred during a first flush event (0.16 ppm 1/24/13) in Topanga Lagoon. The non- storm event maximum at the lagoon was 0.93 ppm (3/6/2014) with a mean of 0.07 ppm). Mean level of 0.11 ppm was documented in 2003-2004 at Topanga Lagoon with a maximum of 0.37 ppm (Dagit et al. 2004). Levels in 2021 range between 0.1 and 0.28 ppm.

Algae cover was recorded in Topanga Lagoon in a variety of methods over the years. *Macrocystis* was observed floating (unattached) in Topanga Lagoon, especially following high tide/overwash or breach events. *Cladophora* sp. and *Phyllospadix sp*. were occasionally observed as well. *Ruppia sp.* were observed seasonally, with peak abundance in summer and early fall when 100 % of the substrate could be covered.

Based on the 2008-2009 data, Topanga Lagoon was ranked 11 of 23 estuaries, which puts it in the mid-range of overall condition for southern California based on the metrics of peak season macroalgal abundance, annual mean phytoplankton biomass and 10 percentile dissolved oxygen (McLaughlin et al. 2013).

BACKGROUND

Review of historic maps indicates that Topanga Lagoon was almost 30 acres in size in the late 1800's. Since the 1930's, the Topanga Lagoon footprint has been less than 1 acre. It is a naturally bar-built lagoon, meaning it is closed off (disconnected) from the ocean by a beach sand berm for long periods of time. This results in ponded water in the lagoon area that has been the subject of extensive research over the years.

Topanga Creek has been listed by the Regional Water Quality Control Board 303(d) list for lead in the upper watershed and bacteria at Topanga Beach. No other pollutants of concern have been listed for the watershed. Topanga Creek has no storm water conveyance systems per se, but storm water is "conveyed" and enters the creek in a variety of ways.

The greater lagoon area is divided into a patchwork of ownerships and development, with many of the existing facilities showing signs of damage and that are projected to further deteriorate into the future. The northern portion of the lagoon area is owned by the California Department of Parks and Recreation (CDPR) as part of Topanga State Park. It includes remnants of the historic Topanga Ranch Motel and associated beach parking. Visitor services include a parking lot and restroom along with several concessions that lease space onsite. The aging PCH bridge owned by the California Department of Transportation (Caltrans) bisects the lagoon and constrains the size of its mouth and channel. The lifeguard tower, beach, restrooms, and parking areas south of the PCH are managed by Los Angeles County Department of Beaches and Harbors (DBH) and are currently experiencing significant impacts from coastal erosion and storm surges, which is projected to increase with sea level rise (SLR).

The open water areas of the lagoon are managed by both CDPR and DBH and are significantly degraded due to impaired/limited habitat and water quality concerns; unmanaged human use-syringes, human feces, and trash are commonly encountered. Bacterial exceedances have been chronic, and a study looking at the source of these fecal bacteria found that dogs and birds contribute the most, but that human feces can also be a factor (Dagit et al. 2014). The Los Angeles City Department of Sanitation Environmental Monitoring Division collects samples weekly as part of the requirements of their Municipal Separate Storm Sewer System Permit (MS4) and those data are compiled and reported by Heal the Bay via the online Beach Report Card. As part of several previous studies, grab samples were tested for nutrients, and a more focused look at eutrophication was conducted in 2008-2009.

Topanga Lagoon does not receive imported water nor is there groundwater extraction, and the hydrologic regime remains naturally rain driven. The sand bar at the mouth of the creek breaches only during storm events, leaving the lagoon as a primarily freshwater system with occasional overwash and tidal influence mostly during the winter months. This isolation from both the upstream creek inputs which flow sub-surface in summer and fall and ocean influences results in seasonal variability of water volume in the lagoon.

During summer and fall of the on-going drought, the lagoon has been reduced to a shallow pool with maximum depths of 120 cm and average depths of 50cm downstream of the PCH bridge, and surface water retreats inland towards the bridge during low flow, high temperature season. Upstream of the PCH bridge, the lagoon is constrained by steep fill banks for approximately 300 m and the average wetted width is approximately 5 m, with depths averaging 30 cm for much of the year. Above 300m it transitions into the main stem of Topanga Creek.

Water temperature is a focal concern that has been monitored for many years. The limited size of the open water area also exposes sensitive species to significant temperature changes with few retreat areas to use during drought, heat waves, and other extreme weather events.

To date steelhead smolts have rarely been observed in Topanga Lagoon, and there are no records of anadromous adults (Dagit et al. 2019). This species migrates from the ocean with a salinity of 34 ppt, to freshwater streams for spawning, thus tolerating a wide salinity range. Optimal temperatures for *O. mykiss* to support spawning, rearing, growth and smolt migration range from 10-16°C, but physical acclimation and/or genetic selection may extend that up to as high as 22°C (McEwan and Jackson 1996; Farrell et al. 2015; Richter and Kolmes 2005). Although increased summer water temperature can be a limiting factor for salmonids, *O. mykiss* especially in southern California are distinct in their ability to withstand higher temperatures; a critical thermal maximum of 26.7^{o}C has been reported by multiple sources (CDWR 1988; Carter 2005). Sloat and Osterback (2013) observed a thermal threshold for *O. mykiss* persistence in Santa Paula Creek of 31.5^{o}C.

Tidewater gobies have a wide tolerance for salinity levels from 0 to 42 parts per thousand (ppt) and water temperature levels from 8 to 25°Celsius (Irwin and Soltz 1984, Swift et al. 1989, Spies and Steele 2016).

Arroyo chub (*Gila orcuttii*) are rarely observed in Topanga Lagoon but are abundant throughout the upper creek. They have a wide temperature tolerance (10-24°C) and can also tolerate low levels of dissolved oxygen (Castleberry and Cech 1986, Feeney and Swift 2008).

The beach supports a significant run of California grunion *(Leuresthes tenuis*) and on occasion juveniles of these marine fishes have been found in Topanga Lagoon. There is limited data on tolerances of both motile juveniles and adult grunion but typically they

are found in waters having a salinity of at least 25 ppt although there are rare observations of presence with a salinity as low as 15 ppt (K. Martin, *personal communication*). They are not expected to tolerate the low salinity levels commonly found in the lagoon. No other fish species have been observed in Topanga Lagoon.

USFWS, CDFW and NMFS have all required that the existing wetted (perennial above-surface water) area of the lagoon be protected and maintained during construction. Therefore all the alternatives propose expanding wetland, transitional and upland habitat by grading radiating out from the edge of the existing wet limits. There is a balance between protecting existing fish habitat giving the opportunity for these elements to expand over time in response to changes in sea level inundation.

HISTORIC WATER QUALITY STUDIES

There have been two important comprehensive sampling and monitoring studies in the Topanga Creek Watershed. The first took place in 2003-2004 (Dagit et al. 2004) and the second more comprehensive Topanga Source Identification Study 2012-2014 (Dagit et al. 2014) used Microbial Source Tracking methods approved by the California Source Identification Project to identify the sources of Fecal Indicator Bacteria (FIB). Both studies found that although there were several "hot spots" in the upper watershed, total and fecal coliform bacterial exceedances were associated with storm events only by the time the water was tested at the Bridge on Topanga Canyon Blvd. that is located approximately halfway between the town and the ocean. Ocean exceedances were therefore coming from sources at the beach or lagoon and increased when there was a breach condition during storm events. The lagoon may serve either as a location where microbial levels may be increasing due to growth of FIB or to the presence of new inputs from dogs and birds.

Dog and gull marker levels indicated that these were a significant source of fecal contamination to the lagoon and ocean, and both dog and gull sources are likely contributing to exceedances of Enterococcus (ENT) and E. coli (EC) state water quality standards at the ocean sites. When ENT levels were in exceedance, gull marker levels were higher than when ENT levels were in compliance at BO, and TL. When dog marker levels in Topanga water samples were compared to levels at two reference beaches and one dog beach, dog marker levels at Topanga were similar to levels at the dog beach. No dog marker was detected at the two reference beaches sampled (Dockweiler and Malibu).

These results need to be examined in light of known transient encampments, which it was found could significantly skew results. A single "direct deposit" was sufficient to cause exceedances.

Depending on rainfall, Topanga Lagoon discharges episodically into the ocean as late as July. This correlation between Lagoon discharges and high FIB values in ocean water samples strongly suggested that Topanga Lagoon was the primary source of high FIB levels in the surf zone.

In addition to examining the FIB conditions, other variables such as nutrients (nitrates, nitrites, orthophosphates, ammonia), turbidity and algal cover were also documented. Again, the pattern indicated that nutrient levels decreased as the creek flowed downstream, and even the hot spots of the upper watershed remained on the low end of typical urban conditions.

Restoring ecological function to Topanga Lagoon by increasing the potential for wetland plants and processes to assist with reducing FIB levels was recommended.

From October 2008 – 2009, Topanga Lagoon was one of 23 estuaries in a regional study conducted by the Southern California Coastal Water Research Project (SCCWRP) to examine eutrophication. Macroalgae biomass and cover, phytoplankton biomass and dissolved oxygen concentration were monitored and used as indicators to examine seasonal trends in duration of hypoxic events.

Figure 1. Locations of water quality sampling efforts in Topanga Lagoon

PROJECT DESCRIPTION

The 30% design alternatives of Topanga Lagoon being considered during the CEQA/NEPA review were developed to emphasize important target elements of overall project goals that evolved based on extensive public, technical and landowner input. None of the alternatives propose impacting the archaeological resources and all are designed to protect existing lagoon habitat for tidewater gobies. Natural breaching patterns based on rainfall will also be preserved. The fill on the west side of the lagoon will be removed and provide opportunity for implementing dune habitat and living shoreline protections.

Additionally, there are design elements that are examined in each alternative that could potentially be incorporated into other alternatives. For example, the dendritic pattern of grading proposed on the west side of Alternative 2 could be used for Alternative 3 or 4 as well. Each of the proposed alternatives result in expanded wetted areas with opportunity for increased wetland, emergent, riparian, and upland transitional species.

Water quality is key to supporting all ecological functions and potentially reducing the number of FIB exceedances. Thus documenting the conditions prior to restoration will be key to evaluating the success of the restoration effort.

BACTERIA MONITORING

METHODS

LA City Environmental Monitoring Division collects grab samples to test for FIB, *Enterococcus* and *E. coli* in the surf zone in front of the lagoon mouth on Topanga Beach weekly in accordance with their MS4 Permit requirements. These results are shared with the public via the website managed by Heal the Bay (Beach Report Card www.beachreportcard.org).

Between 2012-2014, the RCDSMM Stream Team, in collaboration with Dr. Jenny Jay's lab at UCLA, conducted the Topanga Source Identification Study (TSID) and collected samples at the first flush (0.75" or more) storm event, twice monthly during the wet season (November – March) and once monthly during dry season (April- October).

Water samples collected from the Topanga Creek watershed were analyzed for fecal indication bacteria (FIB) levels and host-associated molecular markers for human, dog, horse, and gull. Details on the methods used are found in Dagit et al. (2014) but summarized briefly here.

To obtain FIB concentrations, Total Coliform (TC), *Escherichia coli* (EC), and enterococci (ENT) were measured with Colilert-18™ and Enterolert™ (IDEXX, Westbrook ME) reagents and protocols to determine the most probable number (MPN) of cells per 100 ml sample.

Two human-associated markers were measured using the HF183 Taqman (HF) (Haugland et al. 2010) and the BacHum Taqman (BH) assays (Kildare et al. 2007). Based on results from year one that showed strong correlation between HF and BH markers, only BH was used to confirm a human signal in samples positive for the HF183 marker (n=42) during the year two. Samples were also analyzed for animal sources with three additional markers. The Gull2 Taqman assay (Gull) was used to measure gull-associated marker and the DogBac Taqman assay (Dog) was used to measure dog-associated marker. A conventional endpoint PCR assay, HoF597 (Horse), was used to detect fecal inputs associated with horse waste. Marker selection was based on a previous multi-laboratory comparison study (Boehm et al. 2013).

RESULTS

As shown in Table 1, FIB grades for Topanga Beach at the mouth of Topanga Lagoon are variable and even with low rainfall years the wet season grades are frequently low.

Table 1. Summary of Beach Report Card Grades for Topanga Lagoon

Topanga Lagoon (aka SMB-1-18)	Summer Dry	Year round Dry	Year round Wet	Rainfall Summary (inches)
2002-03	A	B	F	17.92
2003-04	C	C	F	13.16
2004-05	A	C	F	61.58
2005-06	F	F	F	21.98
2006-07	F	D	F	4.62
2007-08	A	A	F	23.08
2008-09	B	C	F	15.16
2009-10	F	C	F	24.40
2010-11	F	F	F	31.44
2011-12	F	D	F	16.22
2012-13	B	C	F	9.99
2013-14	A	B	C	6.85
2014-15	A	F	F	13.49
2015-16	A	B	C	10.54
2016-17	B	C	F	26.34
2017-18	B	B	D	9.91
2018-19	A	C	D	32.55
2019-20	A	B	D	22.58
2020-21	A	A	C	5.66

TSID Summary

Based on TSID analysis, the lagoon is a source of FIB to the ocean. FIB levels were significantly increased when the lagoon was breached and connected to the ocean regardless of season. FIB in the surf zone do not primarily originate from an upstream creek source, except under extremely elevated FIB levels and high flow events (during first flush events). Dog and gull marker appear to be a significant source of FIB to the

lagoon and ocean and likely contribute to exceedances seen in FIB data. Human marker was detected infrequently in the lagoon and ocean at the mouth of Topanga Creek/lagoon.

Other impacts from transients, careless visitors, or dumping from RV's were observed throughout the study period. Human, dog, and bird feces were observed fairly consistently at Topanga Lagoon. The presence of bird feces (mainly gull) was not surprising. It is illegal for dogs to be on Topanga Beach, however dogs and their feces were observed frequently. Human feces were observed on several occasions in the pedestrian underpass below PCH, as well as along the creek and beach. Observations of human feces in the underpass often coincided with observations of transient activity. We also documented RV discharge along the shoulder of Topanga Canyon Blvd. that was associated with a strong urine smell, and suspected discharge into the culvert from the shoulder of PCH that connects directly to Topanga Lagoon.

IN-SITU DATA SONDE MONITORING

From June - November 2021, The Bay Foundation installed a Hach Hydrolab HL7 mulitparameter data sonde along the west bank in the main part of Topanga Lagoon as shown in Figure 1. The sonde continuously recorded temperature, pH, EC, turbidity, dissolved oxygen, ORP, and salinity at 30-minute intervals.

METHODS

Calibration and data uploading occurred monthly. Raw data was filtered to only include desired parameters (date-time object, date, time, temperature, pH, EC, turbidity, dissolved oxygen, ORP, salinity). Limits were imposed on data according to the HL Series Sensors manual (Hydrolab, 2019). EC limited to ≤ 100 mS/cm, turbidity limited to ≤ 3000 NTU, DO limited to ≤ 60 mg/L, ORP limited to ≥ -999 mV and ≤ 999 mV. Values outside of these ranges were replaced with NA values in R and blank cells in excel. No limits on remaining parameters (pH, temperature, salinity) as no values approached limits were imposed. The data frame was cleaned to represent time only in which sonde was deployed in water. Data values during transport before and after deployment were removed.

Due to density of data, graphs were prepared for three periods of deployment:

- 2021-07-13 10:00:00 and 2021-08-10 10:00:00.
- 2021-08-16 14:50:00 and 2021-09-23 08:00:00
- 2021-09-23 10:00:00 and 2021-11-02 10:00:00

Plots were created in ggplot2 (Wickham H, 2016). Trend-lines were generated with generalized added model (GAM and y ~ s(x, bs = "cs"), the default smoothing method in ggplot2 when visualizing data with 1000 + observations.

RESULTS

Data sonde results are presented in graphs based on the reporting period. These will be consolidated into a single graph for 2021 in the final version of this report.

Salinity

Topanga Lagoon is predominantly freshwater during the enclosed summer season, reaching into the low range of brackish by reaching up to 5ppt when overwash occurs. Salinity data collected from deployment to 08/19/2021 appears anomalous and will be omitted from analysis. Figure X. shows the range of salinity recorded by monitoring period from July – November 2021.

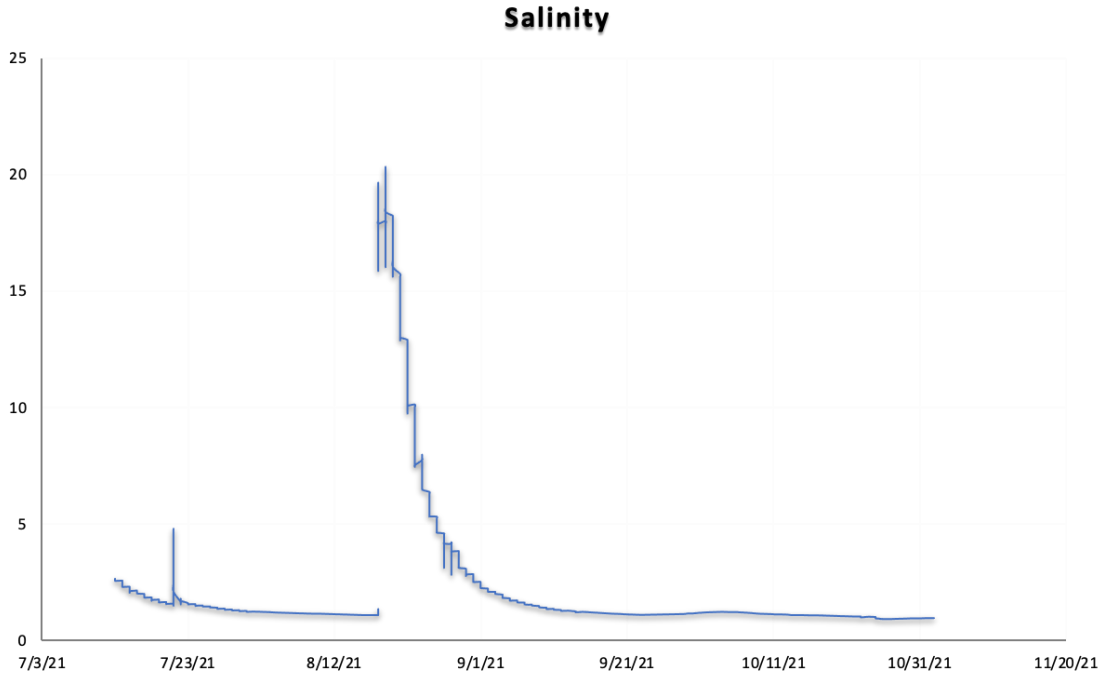

Figure 2. Salinity 7/16/2021 – 11/2/2021 from the data sonde in main lagoon. Note that the spike in August 2021 may be a result of calibration problems**.**

pH

The range of pH observed in Topanga Lagoon varied from a low of 7.5 to a high of 8.9 during the July – November 2021 deployment.

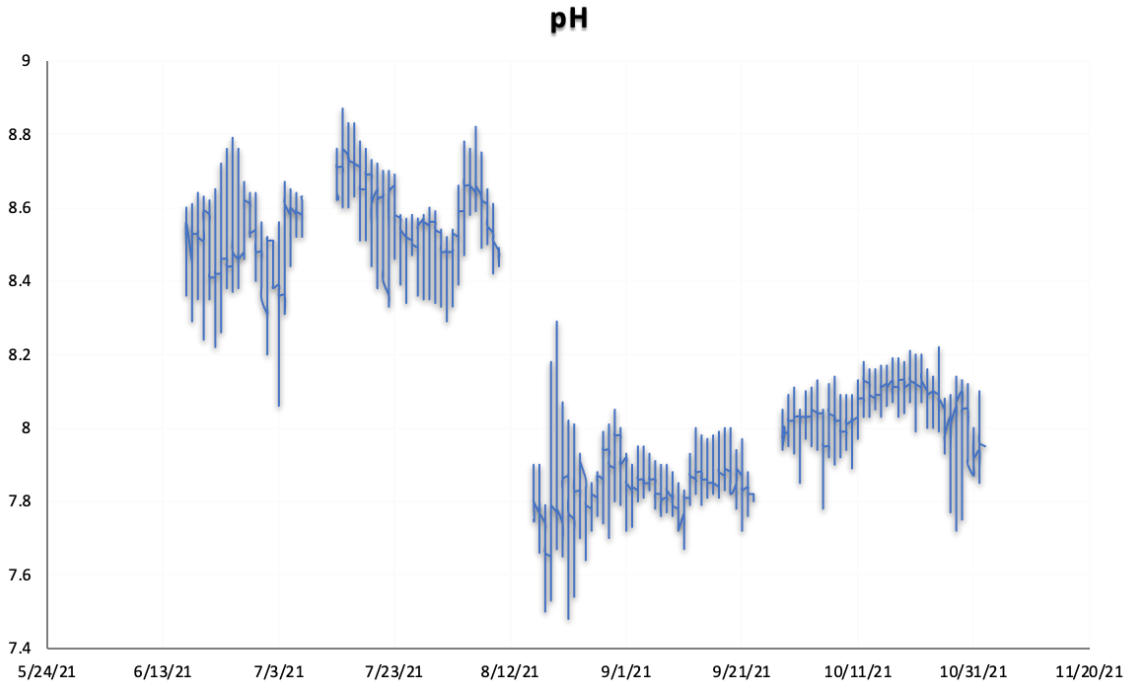

Figure 3. pH 6/16/2021 – 11/4/2021 from the data sonde in main lagoon

Water Temperature

Water temperature showed diurnal cycles ranging from a low of 12 ºC in the fall to a high of almost 29ºC in August 2021.

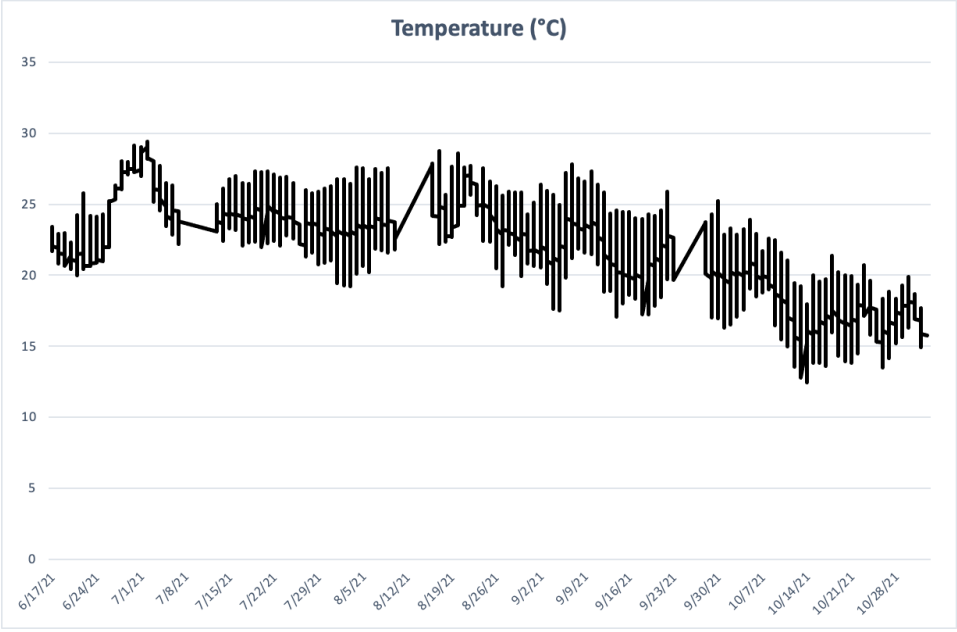

Figure 4. Water Temperature 6/16/2021 – 11/4/2021 from the data sonde in main lagoon.

Dissolved Oxygen

Dissolved oxygen (DO) levels naturally vary during the day, and are typically highest in the middle to late in the day when plants and algae are photosynthesizing, and lowest in the early morning, after plants and algae have been respiring throughout the night. The Los Angeles Regional Water Quality Control Plan (LARWQCB 1994 with 2011 updates) has a water quality objective of greater than 5 mg/l for any single determination in cold water, and greater than 7 mg/l for all waters, except where natural conditions cause lesser concentrations.

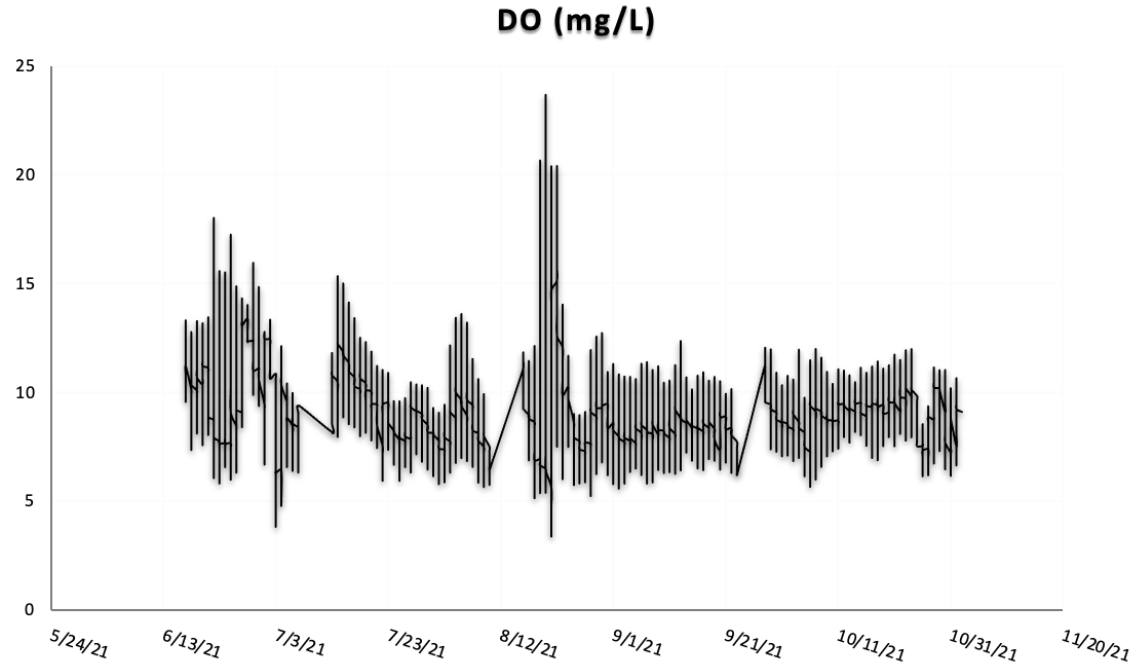

Figure 5. Dissolved Oxygen 6/17/2021 – 11/4/2021 from the data sonde in main lagoon.

Turbidity

Overall turbidity ranged between 0-25 NTU with spikes that could be a result of people, dogs or birds stirring up the sediments. Turbidity was recorded as 4,306.3 NTU on 10/31/2021 12:00, which exceeds the Hydrolab limit of 3,000 NTU. This observation was excluded from the dataset and marked as NA.

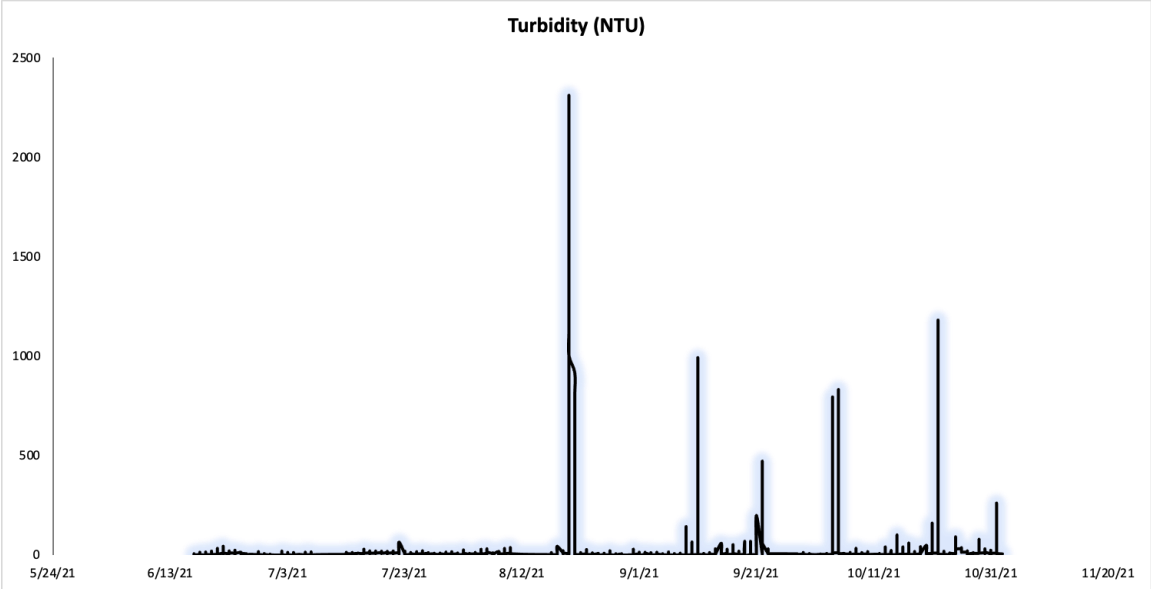

Figure 6. Turbidity in the main body of Topanga Lagoon July – November 2021

Electrical Conductivity (EC)

The ability to conduct an electrical current is based on the level of salts or other chemicals dissolved in water. This measurement is used to calculate the amount of total dissolved salts (TDS), which in turn provides insight into the electrical conductivity of the water. The standard EC for drinking water is less than 400 µS. Freshwater values range from 0-1500 µS and ocean water is typically 50,000 µS. During the deployment of the sonde values ranged from a low of 2 up to over 30 µS between July – November 2021.

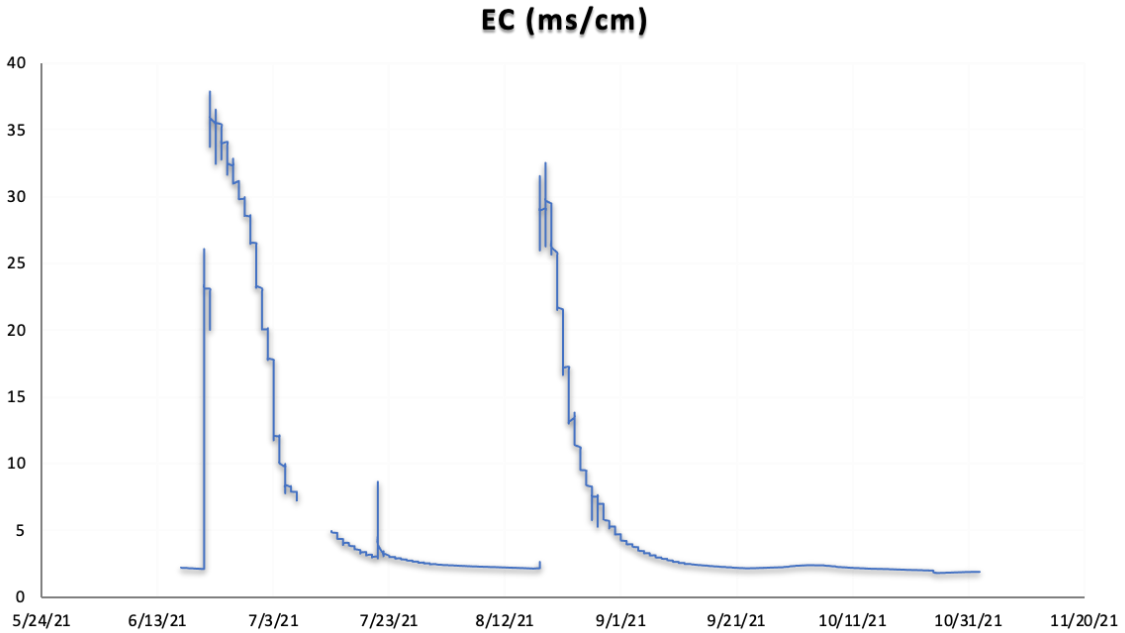

Figure 7. EC in the main body of Topanga Lagoon July – November 2021

Oxygen Reduction Potential (ORP)

ORP is considered to be an important indicator of pollution levels by measuring the oxidizing or reducing potential of water. The voltage between a platinum measuring electrode and a reference electrode can be either positive, which indicates an oxidizing environment or negative, which indicates a reducing environment and is measured in millivolts (mV). ORP is affected by temperature and drinking water is usually between+200-+600 mV. An ORP value of between +300-500 mV is considered healthy. The data from July – November 2021 falls within this range.

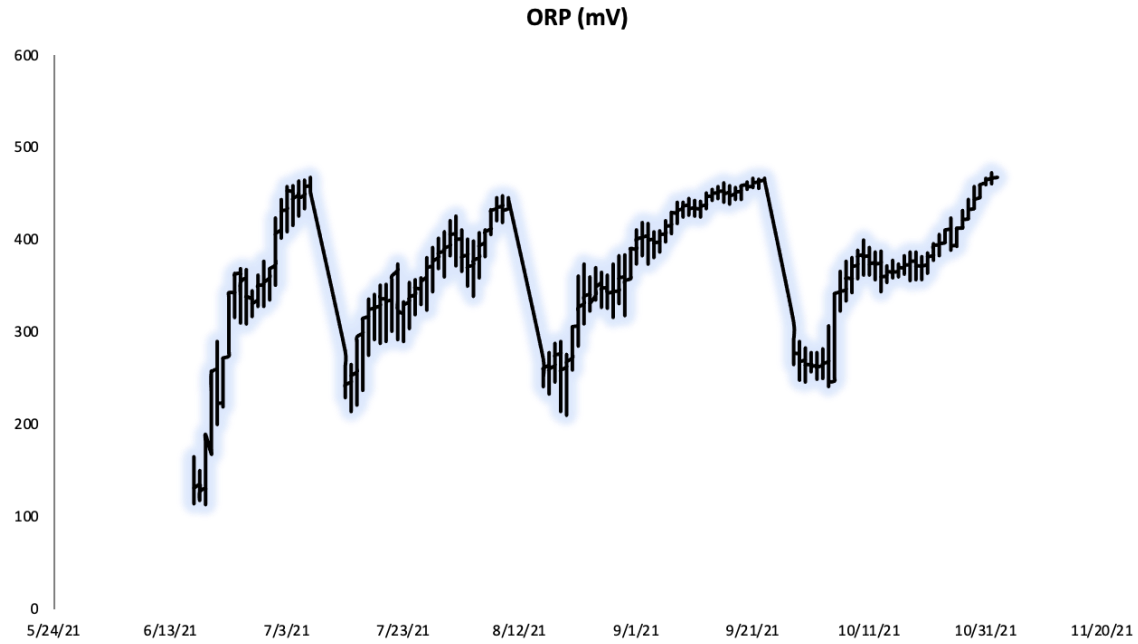

Figure 8. ORP in the main body of Topanga Lagoon July – November 2021

GRAB SAMPLE AND NUTRIENT MONITORING

Aquatic health of Topanga Lagoon and creek is influenced by numerous factors. Aquatic species typically tolerate levels of nutrient loading that are lower than drinking water standards used to evaluate water quality. For instance, the drinking water standard used by the Regional Water Quality Control Board to regulate discharge from sewage treatment facilities for nitrogen–N is 10 mg/L. By comparison, the EPA limit for freshwater aquatic systems for nitrogen-N is 1 mg/L (EPA 2012).

Eutrophication describes the excessive growth of algae and plant matter due to the increased input of factors needed to photosynthesize, such as nutrients. Eutrophication occurs naturally in freshwater ecosystems over time with sedimentation; however, the

process has been accelerated in many places due to nearby human activity. Input of nutrients can be from point (e.g., culverts) or non-point (e.g., runoff) sources.

Additionally, excessive nutrients typically lead to algae blooms, which can affect in-situ water quality parameters, such as pH and dissolved oxygen. For instance, when algae and plants are photosynthesizing during the day, dissolved oxygen levels will be high, however, when they respire at night, or die, oxygen is depleted. Aquatic organisms especially steelhead trout typically require a consistent level of 5 mg/L or above of dissolved oxygen to survive, and when levels drop below this, it can be detrimental to the aquatic wildlife (LARWQCB 1994 with 2011 updates).

METHODS

From 2012-2014, water samples were collected in the field monthly during the dry season (April – October) and bi-weekly during the wet season (November – March), and at the first flush rain event (> 0.75") in 500 mL bottles. Bottles were rinsed three times and filled and capped underwater. Nutrient testing (nitrate-N, nitrite-N, orthophosphates, ammonia-N) of grab samples was done within six hours of collection using a LaMotte SMART3 Colorimeter. Turbidity was tested using a LaMotte Turbidimeter 2020we.

In-situ parameters measured included water temperature, pH, salinity, conductivity, and dissolved oxygen. Water temperature (ºC) and dissolved oxygen (mg/L and % saturated) were tested using a handheld YSI 55 DO meter. Conductivity (µS/cm) and pH were tested using handheld Oakton probes (waterproof ECTestr11 and waterproof pHTestr 30, respectively). Salinity (ppm) was tested using a handheld refractometer (ATC 300011 SPER SCIENTIFIC salt refractometer). Air temperature was measured using a mercury thermometer.

Beginning in October 2021, monthly grab samples have been collected and tested for nitrate-N, nitrite-N, and orthophosphates, along with in-situ data using the same tools as listed above.

RESULTS

The raw data for these samples are detailed in Appendix A.

Salinity

Surface salinity levels in the main body of Topanga Lagoon were mostly low, with a few higher saline events observed when overwash or tidal exchange occurred. No stratification has been documented. Between 2012-2014, mean salinity was 1.5 ppt, with a maximum of 5 ppt and minimum of 0 ppt. This pattern continues to be observed with little to no stratification of salinity documented and is consistent with the data gathered by the HydroLab data sonde in 2021. Samples taken at the upper lagoon site (80m upstream of PCH bridge) occasionally are slightly brackish (7 ppt in December 2021 following a breach event) but generally under 1 ppt. Thus, Topanga Lagoon is primarily a

freshwater dominated system, with brackish conditions only occurring during and immediately following a breach event with tidal overwash.

pH

pH levels throughout the creek and lagoon remained fairly consistent in 2012-2014 and did not fluctuate significantly. Most aquatic species prefer a pH range between 6.5-9 in freshwater systems, which is also the range for the RWQCB Water Quality Objective. Although average pH (7.6-8.2) was slightly on the alkaline side, even maximum recorded levels (7.9-8.5) remained within the tolerance limit range for most aquatic species. Again, this pattern appears to be holding with both our 2020-2021 grab sample and sonde data.

Conductivity

At standard temperatures, conductivity is a measure of the number of dissolved ions in the water, and is recorded as µS/cm (microsiemens per centimeter). Ranges are usually from 0.5-3.0 µS/cm for distilled water, with potable water ranging from 30-1500 µS/cm and seawater up to 53,000 µS/cm. No specific water quality range is included in the Water Quality Control Plan Los Angeles Region. This measurement is an indirect way to evaluate the amount of dissolved salts in the water that are conductors. In conjunction with pH and salinity, conductivity is used to evaluate inputs from groundwater sources or sewage.

During the 2012-2014 study, the mean conductivity in the lagoon based on 30 samples was 3576 µS/cm, with a maximum of 10250 µS/cm and minimum of 2000 µS/cm Grab samples collected in 2020- 2021 ranged from 1324 µS/cm to a high of 1780 µS/cm. This is within the same range as EC data collected by the HydroLab data sonde.

Nitrate - N

The nitrate levels in Topanga Lagoon and creek were consistently well below the 1 ppm threshold for concern for aquatic species (EPA 2012) in 2012-2014, with a single maximum reading of 0.18 ppm in December 2013. The standard for drinking water is <10 ppm. Levels of nitrate greater than 3.5 ppm are thought to contribute to increased algal production and eutrophication in Southern California streams (Luce and Abramson 2005). Natural background readings vary depending on underlying geologic conditions, but can range from 0.0- 0.08 ppm (EPA 2012). The pending TMDL limit for Malibu Creek is <1 ppm (EPA 2012). Compared to both maximum and average levels documented at Topanga Lagoon (max=0.87, mean=0.14) in 2003-2004, levels in 2021 (max = 0.22, mean = 0.12 (n=3)) are even lower and consistent throughout the creek and lagoon.

Nitrite - N

Nitrite-N can have serious health effects for infants, and is the cause of the blue baby syndrome (EPA 2014). The tolerance levels for aquatic species are not well documented. The target for nitrite–N is 1 ppm (LARWQCB 1994 with 2011 updates). All sites within Topanga Lagoon and creek are consistently well below that threshold with a maximum of 0.05 ppm and mean of 0.01 ppm (n=30) recorded between 2012-2014. Although there are

only 3 samples from 2021, the maximum recorded was 0.04 ppm with a mean of 0.03 ppm in the main lagoon. Samples upstream were similarly low (maximum 0.04 ppm, mean of 0.03 ppm).

Between 2008-2009, discrete total nitrogen (TN) and total phosphorus (TP) samples were collected in Topanga Lagoon and analyzed via persulfate digest and colorimetrically using an auto analyzer during both wet and dry weather conditions. The calculated annual TN load was 187 kg, which was the lowest recorded of all 23 estuaries (range=187-348,018kg Tijuana River Estuary) sampled in southern California. The annual TP of 25 kg was also the lowest recorded and matched only by Bolsa Chica and the range was from 25-82,988 kg at the Tijuana River Estuary (McLaughlin et al. 2013).

Orthophosphate

Common sources of orthophosphate levels exceeding 0.65 ppm in freshwater include organic elements from septic systems, graywater systems and inorganic sources like fertilizers and soaps from detergents. Natural readings range from 0.0-0.65 ppm.

Maximum orthophosphate levels exceeded the target of 0.10 ppm for all locations throughout Topanga Lagoon and Creek at some point during the 2012-2014 study when the maximum level occurred during a first flush event (0.16 ppm 1/24/13) in Topanga Lagoon. The non- storm event maximum at the lagoon was 0.93 ppm (3/6/2014) with a mean of 0.07 ppm). Mean level of 0.11 ppm was documented in 2003-2004 at Topanga Lagoon with a maximum of 0.37 ppm (Dagit et al. 2004). Levels in 2021 range between 0.1 and 0.28 ppm.

Ammonia -N

Most aquatic species are quite sensitive to increased levels of ammonia, with toxicity occurring between 1-25 ppm. The Water Quality Control Plan Los Angeles Region utilizes the EPA pH adjusted range of 2.5 – 10.5 ppm with a target of <0.4 ppm. The most common sources of ammonia –N in freshwater systems are human effluent and animal wastes.

Between 2012-2014, the maximum level documented was 0.70 ppm (02/07/14) during non-first flush conditions. The mean of 0.06 ppm (n=30) and minimum of 0 ppm suggest that ammonia is not a significant issue in Topanga lagoon.

Turbidity

The amount of suspended particles, phytoplankton, pollutants, and other materials is measured as turbidity. Not only does turbidity affect water clarity, it can also increase heat absorption and impair breathing and foraging of aquatic animal species (Yamamoto 2010). The Los Angeles Region Basin Plan objective for turbidity is a mix of numeric and narrative: “The secondary drinking water standard for turbidity is 5 NTU. Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. Increases in natural turbidity attributable to controllable water quality factors shall not exceed the following: where natural turbidity is between 0 and 50 NTU, increases

shall not exceed 20%; where natural turbidity is greater than 50 NTU, increases shall not exceed 10%."

Other than a few incidents of high turbidity observed at Topanga Lagoon such as the maximum level documented on 3/24/2014 of 10.31 NTU, mean levels (2.86 NTU (n=30)) have been below the drinking water standard of 5 NTU. Turbidity levels in the main body of Topanga Lagoon associated with storm events (max = 44.7 NTU, mean = 2.53 NTU) were significantly higher in 2003-2004 than in 2012-2014. Following the storm event in December 2021 turbidity increased (max = 36.15 NTU, mean = 6.41 NTU) but was significantly lower (under 2 NTU) during the dry condition.

ALGAE MONITORING

In order to track the presence and abundance of algae in the lagoon, two types of algae data were taken. During each sampling event between 2008-2009, and again in 2012-2014, a visual estimate of percent cover and random point contact method data were collected.

METHODS

Algae cover was recorded in Topanga Lagoon during monthly snorkel surveys using a visual estimate of percent cover for the lagoon as a whole, with the observations generally made from the bank above or from the east bank, which provided a good view of the whole lagoon area south of the PCH bridge.

Additional more quantitative algae monitoring took place between October 2008-2009 as part of the SCCWRP Eutrophication Study (McLaughlin et al. 2013). Macroalgal biomass and cover were measured at three 30-50 m transects and percent cover at ten randomly selected points along each transect were taking using the point intercept method with 0.5 square meter quadrats. Biomass samples were cleaned and both wet and dry weights collected. Phytoplankton biomass was estimated using both fluorescent measurements from the YSI 6600 data sonde probe and via discrete grab samples taken every other month and then filtered to determine chlorophyll a concentration.

Documentation of algae species and relative abundance was also done as part of the tidewater goby surveys in June and November 2020 and April, June and November 2021.

RESULTS

Macrocystis was observed floating (unattached) in Topanga Lagoon, especially following high tide/overwash or breach events. *Cladophora* sp. and *Phyllospadix sp*. were observed in Topanga Lagoon occasionally as well. *Ruppia sp.* were observed seasonally, with peak abundance in summer and early fall when 100 % of the substrate could be covered.

Based on the 2008-2009 data, Topanga Lagoon was ranked 11 of 23 estuaries, which puts it in the mid-range of overall condition for southern California based on the metrics of peak season macroalgal abundance, annual mean phytoplankton biomass and 10 percentile dissolved oxygen (McLaughlin et al. 2013).

WATER TEMPERATURE MONITORING

Water temperature is a concern for fish because they typically maintain body temperatures that match that of their surrounding environment. To date, *O. mykiss* have been observed only rarely in Topanga Lagoon and only for short periods of time (<1 day) as they outmigrate. However, the lagoon is consistently important habitat for endangered tidewater gobies (*Eucyclogobius newberyii*). *E. newberyii* have a wider temperature and dissolved oxygen tolerance than *O. mykiss,* and, despite the higher average temperatures in the lagoon, thrive there and extend approximately 300 meters upstream (RCDSMM, *unpublished data*). Tidewater gobies have a wide tolerance of water temperature levels from 8 to 25ºC (Irwin and Soltz 1984, Swift et al. 1989, Spies and Steele 2016).

Optimal temperatures for *O. mykiss* to support spawning, rearing, growth and smolt migration range from 10-16ºC, but physical acclimation and/or genetic selection may extend that up to as high as 22ºC (McEwan and Jackson 1996; Farrell et al. 2015; Richter and Kolmes 2005). Although increased summer water temperature can be a limiting factor for salmonids, *O. mykiss* especially in southern California are distinct in their ability to withstand higher temperatures; a critical thermal maximum of 26.7ºC has been reported by multiple sources (CDWR 1988; Carter 2005). Sloat and Osterback (2013) observed a thermal threshold for *O. mykiss* persistence in Santa Paula Creek of 31.5ºC.

Critical thermal maximum is based on acclimatization over a relatively short time period and is considered higher than what a fish could tolerate for hours to days and still swim. The temperature at which limited growth, mortality, and other negative effects are induced can be influenced not only by acclimation temperature, but also covariate stressors such as low dissolved oxygen content, and food availability (Boughton et al. 2007; Farrell et al. 2015). Abundant food availability has been attributed to continued growth past in higher temperatures (Spina 2007; Krug et al. 2012). However, if food resources become limited, then tolerance of higher temperatures decreases (Sloat and Osterback 2013). Incipient lethal temperatures are identified as the temperature at which over 50% of fish exposed to that temperature die.

Most studies examine effects of increased maximum temperatures, but few studies have examined the effect of gradually increasing minimum temperatures, which could raise the lower limit of temperature ranges needed for recovery from either short-term or chronic sub-lethal exposure to high temperatures, as well as potentially alter the composition of BMI communities that provide important food resources, and increase habitat suitability for competitive invasive species. The effects of exposure to sub-lethal temperatures are not well studied, but a behavioral response to warm temperatures suggests that *O. mykiss* will move to refugia locations that have cooler temperatures if they are available (Sloat

and Osterback 2013). Increased levels of diseases are also associated with warmer water temperatures (Noga 2000). For instance, the common ectoparasitic protozoan *Ichthyophthirius multifiliis*, (usually referred to as Ich) is widespread in freshwater systems and associated with increased stress and impaired immunity (Noga 2000).

METHODS

Based on the recommendations of the Technical Advisory Committee, and in the interest of more comprehensively documenting temperature patterns in both the very exposed main lagoon body with limited shade provided only by the steep fill banks compared to the more riparian tree shaded portion of the lagoon upstream of the PCH bridge, a HOBO Tidbit v2 temperature logger was installed on the west side of the main lagoon in January 2020. Both this logger and the one located in upper Topanga Lagoon (80 m above PCH bridge) record at 30-minute intervals. Both water and air temperature at the upper lagoon location (80 m upstream of the PCH bridge) has been monitored since 2014. Data was uploaded monthly during snorkel surveys and data managed according to QAQC protocols.

RESULTS

Water temperatures collected between 2012-2014 were mostly comparable in the lower and upper lagoon except for during a period of time from April to June 2014 when temperatures were considerably higher in the lower lagoon. The first flush temperatures ranged between 12.6-14.2 ^{o}C, while the non-storm event mean was 16.3 ^{o}C with a maximum of 22.5 ^{o}C and minimum of 7.4 ^{o}C.

During July 2020, water temperature in the main lagoon exceeded 35 ^{o}C and continued to fluctuate from 20-35 ^{o}C into September (Figure x). This corresponded with a shallow depth and stagnant condition due to the drought. In general, the main lagoon area temperatures range between 7-25 ^{o}C. This is well within the tolerance range of tidewater gobies (ADD) but on the high end of the preferred temperature range for southern steelhead (ADD).

The duration of time when water temperatures are challenging for aquatic species is also important. Figure X. shows that temperatures between 21-25 ^{o}C were higher in summer/fall 2020, and substantially lower in 2021, although the lagoon experienced lengthy time periods in both years that are on the upper end of thermal tolerance for both tidewater gobies and southern steelhead.

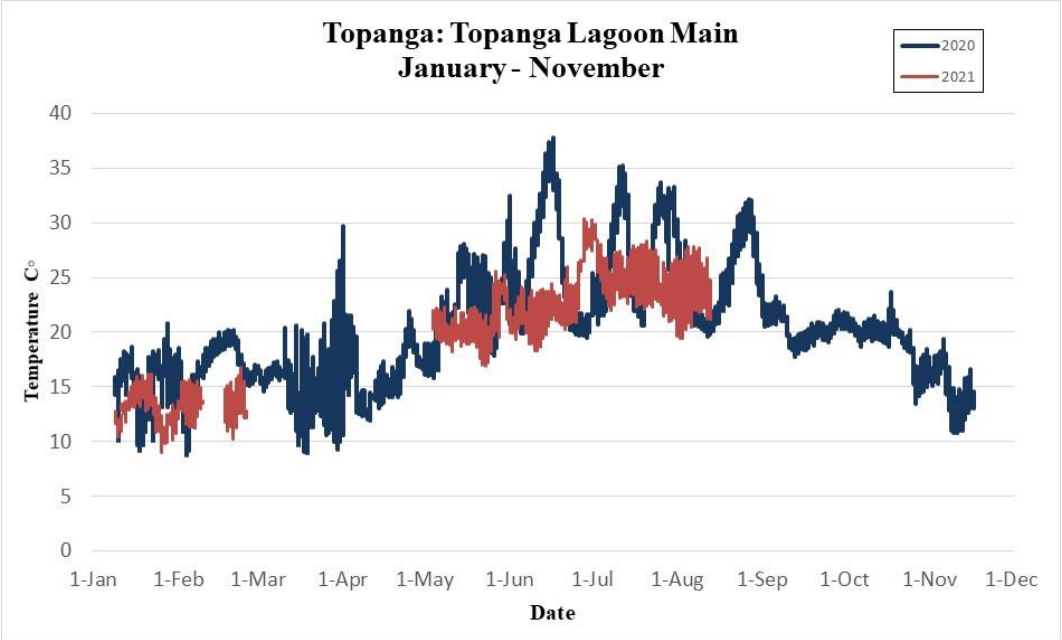

Figure 9. Water temperatures measured in Topanga Lagoon January 2020 – December 2021

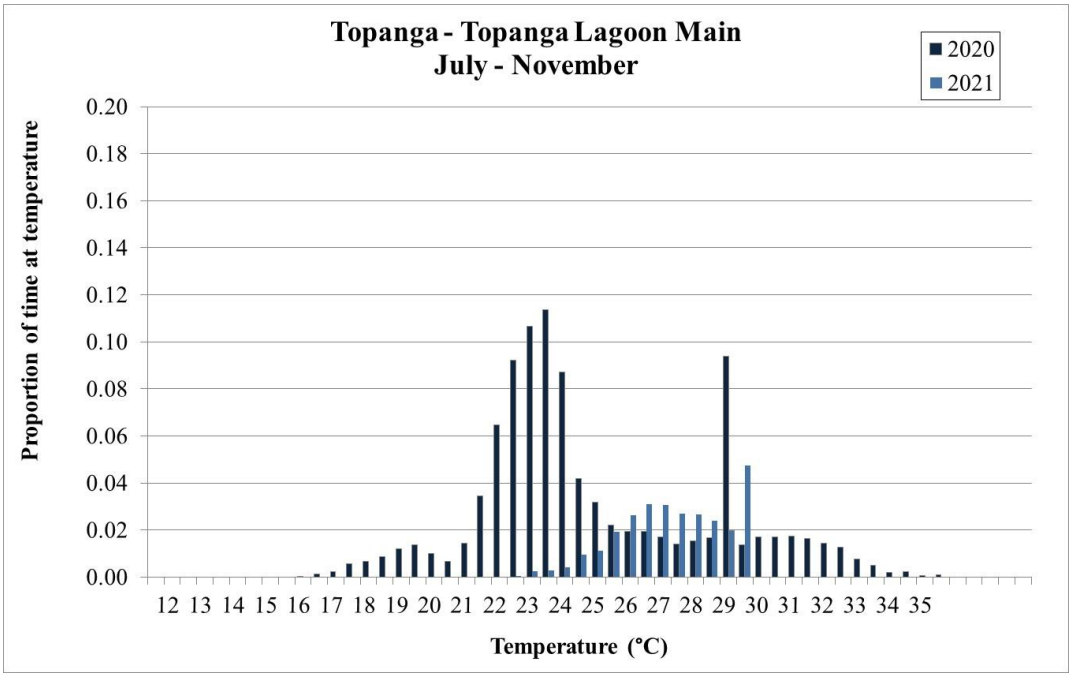

Figure 10. Percent time at each water temperature measured in Topanga Lagoon July 2020 – November 2021

The pattern of water temperatures in the upper lagoon site where the wetted channel has approximately 60% canopy cover tells a different story (Figure X). The water temperature rarely exceeded 25 ºC and the diurnal difference during spring through fall remains mostly within the preferred temperature range for tidewater gobies, and although slightly on the higher tolerance end for steelhead, definitely could support juvenile rearing.

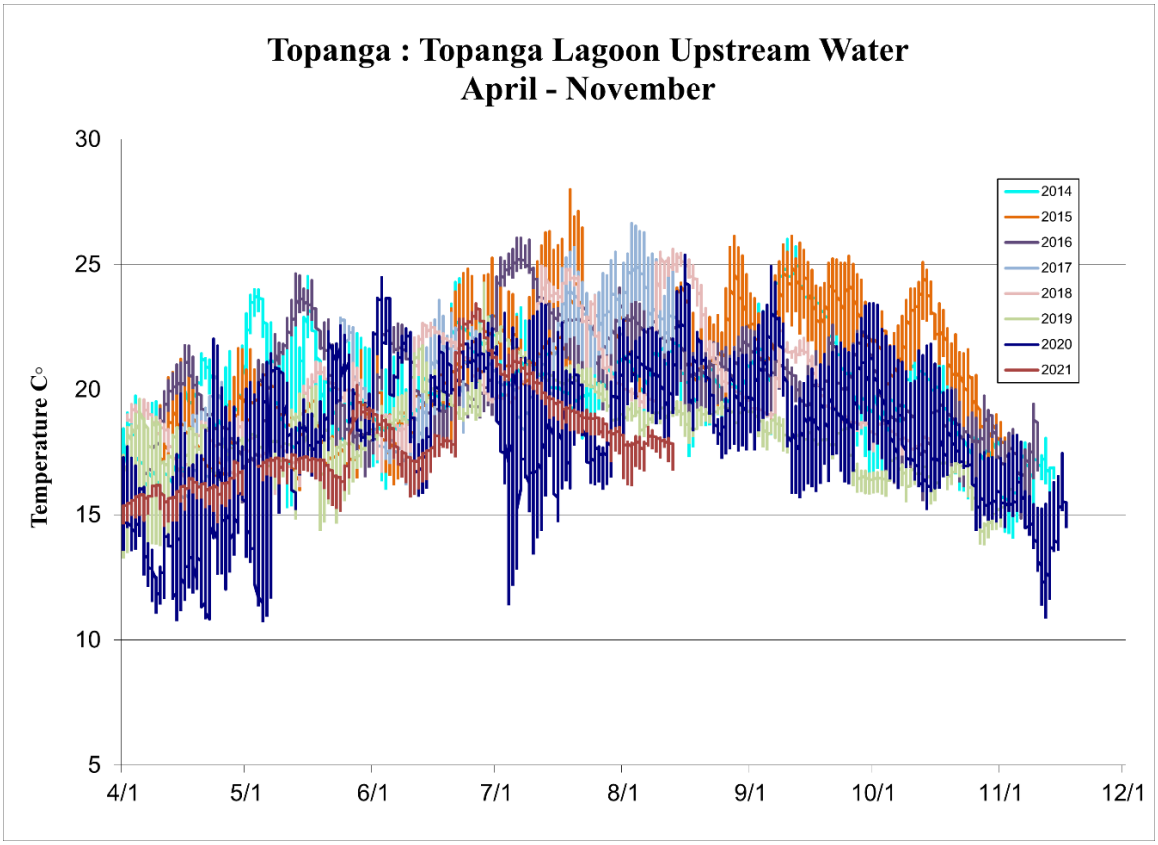

Figure 11. Water temperatures measured in Topanga Lagoon Upstream (80m) annually from April 2014 – December 2021

The proportion of time when temperatures exceeded 20 ºC was substantially less than that observed in the main body of the lagoon as shown in Figure .X. It is interesting to observe that the diurnal difference between daily high and low temperatures is contracting, which results in less cool recovery time overnight.

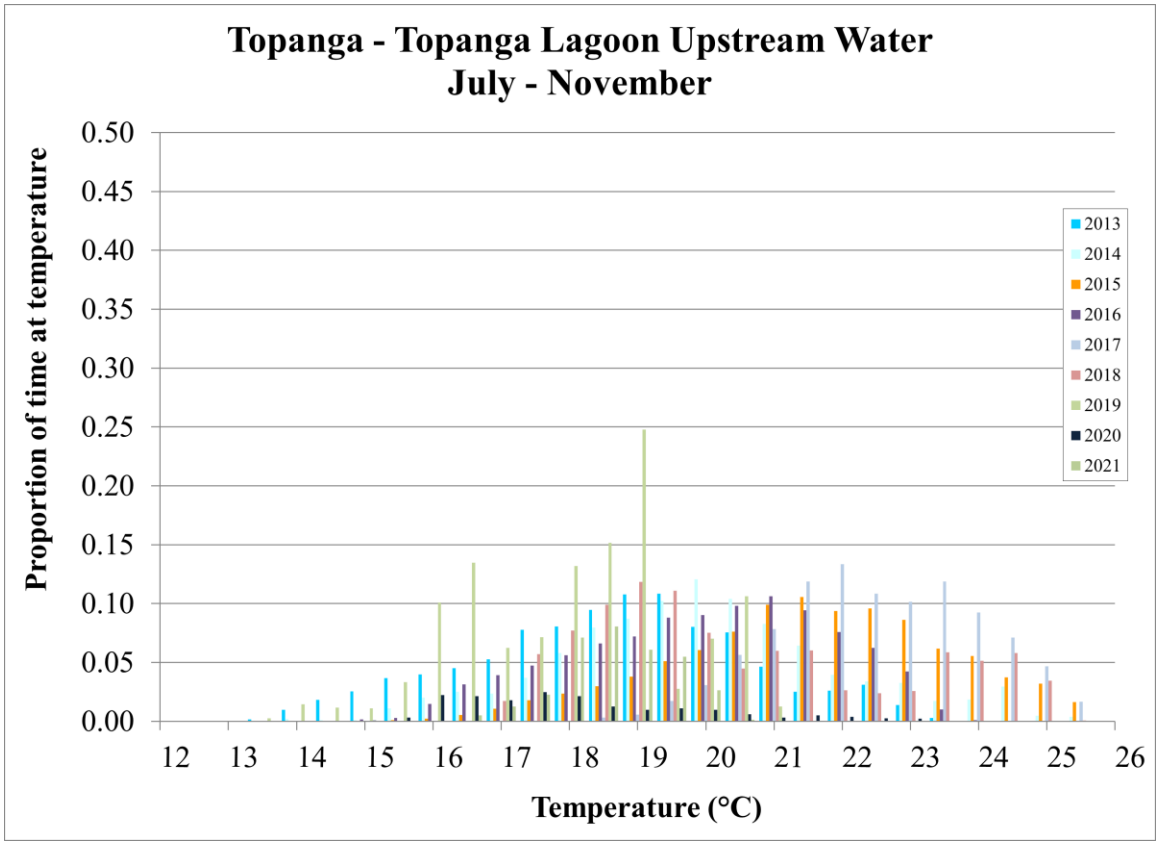

Figure 12. Percent time at each water temperature measured in Topanga Lagoon Upstream (80m) annually from July 2013 – November 2021

QA/QC PROTOCOLS

A variety of quality assurance/quality control measures were taken to assure quality data was collected and managed correctly. A complete Topanga Source ID Study Quality Assurance/Quality Control Plan (April 2013) provided all details and includes measures to ensure the accuracy, precision and completeness of all data collected. These standards of practice were implemented throughout the study in 2012-2014 and 2021- present.

All staff were trained how to use, calibrate and maintain the water quality testing equipment, as well as how to properly collect nutrient, bacteria samples, flow and algae data in the field. Additional training covered downloading and processing the HOBO temperature logger data. Sonde calibration, data upload and post-processing QAQC was done by SCCWRP (2013-2014) and The Bay Foundation (2021-present).

RECOMMENDATIONS

Alternative 2 provides the largest lagoon footprint, and therefore could provide the most wetland, emergent and riparian vegetation to assist in shading the water to moderate temperatures, and providing nutrient cycling. Alternatives 3 and 4 do not expand the

wetted areas and are not expected to provide as much potential water quality benefit. Bacteria levels are not expected to change substantively in any alternative as the primary bird source will remain and could possibly increase. Reduction of dog and human sources could be achieved with greater enforcement of the no dog or camping on the beach rules.

Vector Control issues and management have been problematic at some previous lagoon restoration sites. Refinement of the alternatives to incorporate state of the science and Best Management Practices into the final preferred alternative to prevent future problems.

Pre-Construction

- Continue baseline monthly, in-situ and grab samples for nutrients, seasonal sonde deployment and water temperature monitoring to document conditions prior to construction.

During Construction

Implement Best Management Practices required by all permits including but not limited to:

- Daily turbidity and dissolved oxygen sampling
- Deployment of water temperature loggers
- Oversight monitoring of construction activities and implementation of all Storm Water Protection and water diversion requirements.

Post-Construction

- Implement post-construction monthly in-situ and grab samples, seasonal sonde deployment and water temperature monitoring to document conditions for five years to document changes over time.

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APPENDIX A
MONTHLY GRAB SAMPLE DATA

Site 1: Main Lagoon									
DATE	10/26/2021	11/16/2021	12/16/2021	1/5/2022	2/7/2022	3/8/2022	4/5/2022	5/3/2022	6/8/2022
TIME	13:40	13:12	9:00	15:03	12:00	13:00	13:30	14:30	12:30
BERM CONDITION	closed	closed	open, not connected	open, connected	open, not passable	open	open, not connected	closed	closed
AIR TEMP	18	20	12	20	20	20	24	19	18
SALINITY	0	6	23	1	0	1	0	0	0
CONDUCTIVITY	1780	1160	#N/A	1720	1710	310	5.4	3.04	3.2
pH	7.2	8.66	7.34	8.73	8.44	8.23	8.17	8.65	8.3
WATER TEMPERATURE(degrees C)	20.9	19.2	11.1	13.7	17.5	19.1	20.1	21.6	21.7
DISSOLVED OXYGEN(mg/l)	1.45	4.39	#N/A	#N/A	#N/A	#N/A	5.13	6.05	3.43
WATER DEPTH cm		20	10	20	110/40	15	80	20	10
Site 2: Upstream of Bridge									
DATE	10/26/2021	11/16/2021	12/16/2021	1/5/2022	2/7/2022	3/8/2022	4/5/2022	5/3/2022	6/8/2022
TIME	14:10	13:43	9:27	15:21	12:00	13:18	13:58	14:40	12:45
BERM CONDITION	closed	closed	open, not connected	open, connected	open, not connected	open	open, not connected	closed	closed
AIR TEMP	19.7	20	12	19	20	19	22	18	18
SALINITY	0	6	23	0	0	1	0	0	0
CONDUCTIVITY	1790	11	#N/A	#N/A	#N/A	1910	2.2	2.9	3
pH	8.35	8.55	7.65	8.57	7.96	8.08	8.1	8.96	8.52
WATER TEMPERATURE(degrees C)	20.9	16.7	9.8	13.3	14.5	14.3	16.7	21	20.6
DISSOLVED OXYGEN(mg/l)	1.54	3	#N/A	#N/A	#N/A	#N/A	9.42	7.47	2.93
WATER DEPTH cm	30	20	25	25	90/40	15	60	40	30
Site 3: 80m									
DATE	10/26/2021	11/16/2021	12/16/2021	1/5/2022	2/7/2022	3/8/2022	4/5/2022	5/3/2022	6/8/2022
TIME	14:35	13:58	9:53	15:37	12:00	13:32	14:15	15:07	13:10
BERM CONDITION	closed	closed	open, not connected	open, connected	open, not connected	open	open, not connected	closed	closed
AIR TEMP	18	20	12	20	18	20	23	19	18
SALINITY	0	2	7	0	0	0	0	0	0
CONDUCTIVITY	1910	2.9	#N/A	#N/A	1680	1840	1.67	1710	2.3
pH	7.48	7.44	7.31	8.64	8.02	7.67	8.01	8.2	8.09
WATER TEMPERATURE(degrees C)	19.2	16.6	12.1	12.4	15.5	16.3	17.8	18.5	18.5
DISSOLVED OXYGEN(mg/l)	0.02	#N/A	#N/A	#N/A	#N/A	#N/A	6.7	9.66	3.51
WATER DEPTH cm	30	20	55	20	80/40	60	60	40	50

Nutrients table

		October	**November**	**December**	**January**	**February**	**March**	**April**	**May**	**June**
Lagoon Condition		Closed	Closed	Open	Open	Open	Open	Open	Closed	Closed
Nitrates										
Main Lagoon		0.22	0.02	0.13	3.87	0.17	0.03	0.14	0.11	0
Upstream of Bridge		0.26	0	0.15	3.66	0.31	0.03	0.07	0.05	0
80M		0.02	0.01	0.31	3.98	0.24	0.06	0.07	0.04	0.01
Nitrites										
Main Lagoon		0.04	0.02	0.03	0.05	0.03	0	0.02	0.04	0.03
Upstream of Bridge		0.04	0.01	0.02	0.07	0.01	0	0.03	0.07	0.03
80M		0.04	0.02	0.03	0.04	0.02	0.01	0	0.02	0
Phosphates										
Main Lagoon		0.1	0.08	0.12	0.12	0	0	0.08	0.1	0.11
Upstream of Bridge		0.28	0.02	0.16	0.03	0.06	0	0.08	0.08	0.07
80M		0.26	0.06	0.12	0.09	0.01	0.04	0.07	0.04	0.09
Turbidity										
Main Lagoon		1.6	0.71	4.9	1.53	2.06	4.3	3.45	0.75	6.07
Upstream of Bridge		0.46	0.81	36.15	5.22	0.79	4.01	3.08	0.4	4.19
80M		0.65	1.64	13.43	6.34	1.59	0.68	7.15	0.63	5.87

APPENDIX B
RESUMES

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Rosi Dagit, Sr. Conservation Biologist for the RCDSMM has coordinated a variety of research projects throughout the Santa Monica Mountains and Bay since 1987. As Principle Investigator for the Topanga Source Identification Study (2014), and several other watershed level water quality reports, she has trained staff and community volunteers to assist with collecting field data, implemented Quality Assurance/Quality Control Plans for managing data collection and analysis since 1998. She has numerous publications and technical reports summarizing this work.

Ms. Dagit has coordinated several habitat restoration efforts including the 2008 Rodeo Grounds Berm Removal, the Trancas Lagoon Restoration Feasibility Study (2015) and is currently Project Manager for the Topanga Lagoon Restoration Planning process in collaboration with State Parks.

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Chris Enyart is the Watershed Program Manager for The Bay Foundation (TBF) and has been with TBF over four years. Chris manages various habitat restoration projects throughout Santa Monica Bay, including TBF's Living Shoreline Projects as well as projects located at the LAX Dunes and Ballona Wetlands Ecological Reserve. Chris and his Program also support water quality monitoring in Malibu Lagoon and Topanga Lagoon. All these projects support the Santa Monica Bay National Estuary Program's strategic plan for the region. Prior to his work at TBF, Chris received his master's degree in Environmental Science from Loyola Marymount University (LMU). During his time at LMU, Chris conducted thesis research analyzing long-term recreational beach water quality at Santa Monica Bay beaches. Through his education and work, Chris has experience in restoration, scientific monitoring, reporting, research, contract management, permitting, public outreach, and administrative duties. He also supervises his department and staff at TBF as well as internship and research students through Loyola Marymount University's Coastal Research Institute.

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Before joining the RCDSMM, Mr. Ibekwe served with at the California Conservation Corps' Los Padres center where he worked in the native plant nursery, helped set up a long-term trail camp in Big Sur, and conducted instream surveys and participated in steelhead restoration projects with the Fisheries Habitat Restoration crew.

Since joining the RCDSMM he has participated in the RCD's educational programs and worked closely with Ms. Dagit monitoring the lagoons of the Santa Monica Mountains and conducting snorkel surveys and redd surveys in Topanga Creek.

Appendix Q

Santa Monica Mountains Land Use Plan and Topanga General Plan Consistency Table (Winecki 2022)

The Appendices herein contain supporting information. These Appendices contain highly detailed figures and other graphic information, which are difficult to translate for screen reading software; therefore, the Appendices have not been translated into an auditory format. If you have a disability and/or have difficulty accessing any material in this document, please contact us by mail, email, or telephone, and we will work with you to make all reasonable accommodations. Please indicate 1) the nature of the accessibility need; 2) your preferred format; 3) the material you are trying to access and its location within this document; and 4) how to reach you if questions arise while fulfilling your request. You can direct your requests to:

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Water Quality (Conservation and Open Space Element)	Preliminary Analysis/Comments
CO-2 Site, design, and manage new development and improvements, including – but not limited to – landscaping, to protect coastal waters from non-point source pollution by minimizing the introduction of pollutants in runoff and minimizing increases in runoff rate and volume. Review new development and improvements for potential degradation of water quality, and ensure that they meet the requirements of the NPDES Municipal Stormwater Permit's Low Impact Development (LID) Requirement, included as part of the Local Implementation Program.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. However, the No Project alternative would generally maintain existing site conditions and therefore would not serve to improve and enhance water quality and marine resources of the lagoon and nearshore environment consistent with Coastal Act Sections 30230 and 30231 which require that "*Marine resources shall be maintained, enhanced, and where feasible, restored"* and *"The biological productivity and the quality of coastal waters, streams, wetlands, estuaries, and lakes appropriate to maintain optimum populations of marine organisms and for the protection of human health shall be maintained and, where* *feasible, restored…".* **Alternative 2 – Max Lagoon Habitat/Partial or Full Relocation of Existing Amenities in Phase 2** ***Potentially Consistent*** – Maximum habitat restoration activities, increased habitat buffers, and lengthening of the PCH bridge would help restore water quality and tidal circulation of the lagoon, improve conveyance of stream flow and sediment transport from inland areas, improved passage of fish and other aquatic species, and help to restore natural shoreline processes, thereby improving water quality and enhancing the biological productivity of marine resources. In addition, it is anticipated that proposed site modifications to restore, remove and/or relocate existing amenities will include project design features, identified mitigation measures and/or conditions of approval will identify and require site design BMPs, source control BMPs, and treatment control BMPs to improve the treatment of stormwater runoff over existing conditions, resulting in improved water quality to ensure that water quality and marine resources are maintained, enhanced, and where feasible, restored. **Alternative 3 – Limited Lagoon Habitat/Retention & Restoration of Existing Amenities** ***Potentially Consistent*** – Same as Alternative 2; however, retention and restoration of existing amenities would involve less extensive habitat restoration and less new/extended habitat buffer areas. **Alternative 4 – Max Managed Retreat/Realign PCH Inland/Partial Retention & Modification of Existing Amenities** ***Potentially Consistent*** - Same as Alternative 3, but increased PCH bridge lengthening and realignment inland would serve to better restore natural shoreline processes and may further improve tidal circulation of the lagoon, conveyance of stream flow and sediment transport from inland areas, passage of fish and other aquatic species.
CO-3 To reduce runoff and erosion and provide long-term, post-construction water quality protection in all physical development, prioritize the use of Best Management Practices (BMPs) in the following order: 1) site design BMPs, 2) source control BMPs, 3) treatment control BMPs. When the combination of site design and source control BMPs is not sufficient to protect water quality, require treatment control BMPs, in addition to site design and source control measures. Design, construct, and maintain any required treatment control BMPs (or suites of BMPs) so that they treat, infiltrate, or filter the amount of storm water runoff produced by all storms up to and including the 85th percentile, 24-hour storm event for volume-based BMPs, and/or the 85th percentile, 1-hour storm event (with an appropriate safety factor of 2 or greater) for flow-based BMPs. Prioritize the use of Low Impact Development in project design to preserve the natural hydrologic cycle and minimize increases in storm water or dry weather flows.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. See consistency analysis for CO-2 **Alternatives 2-4** ***Potentially Consistent*** - It is anticipated that proposed site modifications for Alternatives 2-4 will include project design features, identified mitigation measures and/or conditions of approval will identify and require site design BMPs, source control BMPs, and treatment control BMPs to improve the treatment of stormwater runoff over existing conditions, resulting in improved water quality to ensure that water quality and marine resources are maintained, enhanced, and where feasible, restored. Specific site design/s, identified mitigation measures and/or conditions of approval, and findings of Water Quality report to confirm consistency determination.
CO-4 Minimize impervious surfaces in new development, especially directly-connected impervious areas. Require redevelopment projects to increase the area of pervious surfaces, where feasible.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. See consistency analysis for CO-2 **Alternative 2 – Max Lagoon Habitat/Partial or Full Relocation of Existing Amenities in Phase 2**

Water Quality (Conservation and Open Space Element)	Preliminary Analysis/Comments
	Potentially Consistent – Alternative 2 would maximize the extent of habitat restoration and habitat buffer areas, thereby minimizing impervious surfaces onsite and increasing pervious site areas to the maximum extent feasible, consistent with project goals to maintain and enhance onsite public access, recreation and visitor-serving activities. **Alternatives 3-4** ***Potentially Consistent*** - It is anticipated that proposed site modifications for Alternatives 3 and 4 will include project design features to minimize impervious surfaces and increase pervious surfaces. Specific site design/s and findings of Water Quality report to confirm consistency determination.
CO-5 Infiltrate development runoff on-site, where feasible, to preserve or restore the natural hydrologic cycle and minimize increases in stormwater or dry weather flows.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. See consistency analysis for CO-2 **Alternatives 2-4** ***Potentially Consistent*** – See consistency analysis for CO-2 - CO-4. Specific site design/s, identified mitigation measures and/or conditions of approval, and findings of Water Quality report to confirm consistency determination.
CO-6 Require development to protect the absorption, purification, and retention functions of natural drainage systems that exist on the site. Where feasible, site and design development, including drainage, to complement and utilize existing drainage patterns and systems, conveying drainage from the developed area of the site in a non-erosive manner. Disturbed or degraded natural drainage systems should be restored where feasible.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. See consistency analysis for CO-2 **Alternatives 2-4** ***Potentially Consistent*** – See consistency analysis for CO-2 - CO-4. Specific site design/s, identified mitigation measures and/or conditions of approval, and findings of Water Quality report to confirm consistency determination.
CO-8 Cooperate with local and State transportation agencies to implement BMPs that promote infiltration of runoff from roads and highways and minimize urban runoff flows into streams and creeks.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. See consistency analysis for CO-2 **Alternatives 2-4** ***TBD*** – Specific site design/s for bridge replacement and findings of Water Quality report to confirm consistency determination.
CO-10 Limit grading, soil compaction and removal of locally-indigenous vegetation to the minimum footprint needed to create a building site, allow access, and provide fire protection for the proposed development. Monitor grading projects to ensure that grading conforms to approved plans.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. See consistency analysis for CO-2 **Alternatives 2-4** ***Potentially Consistent*** – Grading for restoration activities would be limited to that necessary to remove historic fill and re-establish a more natural topography onsite. Where amenities are to be retained and/or relocated, clustering of amenities and relocation of amenities closer to adjacent roads and development sites would minimize the overall grading footprint and consolidate required fuel modification requirements thereby minimizing removal of locally-indigenous vegetation. Specific site design/s, identified mitigation measures and/or conditions of approval, and findings of Water Quality report to confirm consistency determination.
CO-11 Revegetate prior to the rainy season areas disturbed by development activity. Use locally-indigenous plant species outside of Fuel Modification Zone A and avoid non-native invasive species, balancing long-term slope stability and habitat restoration with reduced fuel loads for fire protection.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. See consistency analysis for CO-2 **Alternatives 2-4** ***Potentially Consistent*** – See consistency analysis for CO-2 - CO-4. Specific site design/s, identified mitigation measures and/or conditions of approval, and findings of Water Quality report to confirm consistency determination.

Water Quality (Conservation and Open Space Element)	Preliminary Analysis/Comments
CO-17 Prohibit non-emergency earthmoving operations during the rainy season (extending from October 15 to April 15). Approved grading shall not be commenced unless there is sufficient time to complete grading operations before the rainy season. If grading operations are not completed before the rainy season begins, grading shall be halted and temporary erosion control measures shall be put into place to minimize erosion until grading resumes after April 15, unless the County determines that completion of grading would be more protective of sensitive environmental resources and would minimize erosion and sedimentation. Erosion control measures shall be required for any ongoing grading project or any completed grading project that is still undeveloped.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. See consistency analysis for CO-2 **Alternatives 2-4** ***Potentially Consistent*** – See consistency analysis for CO-2 - CO-4. Specific site design/s, identified mitigation measures and/or conditions of approval, and findings of Water Quality report to confirm consistency determination.
CO-19 Minimize the land disturbance activities of construction (e.g., clearing, grading, and cut-and-fill), especially in erosive areas (including steep slopes, unstable areas, and erosive soils), to avoid detrimental water quality impacts caused by increased erosion or sedimentation. Use soil stabilization BMPs on disturbed areas.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. See consistency analysis for CO-2 **Alternatives 2-4** ***Potentially Consistent*** – See consistency analysis for CO-2 - CO-4. Specific site design/s, identified mitigation measures and/or conditions of approval, and findings of Water Quality report to confirm consistency determination.
CO-20 Require that public agencies use the most effective BMPs to protect natural resources at project sites and maintenance yards when the maintenance and modification of public infrastructure involves the removal of vegetation and/or earth.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. See consistency analysis for CO-2 **Alternatives 2-4** ***Potentially Consistent*** – See consistency analysis for CO-2 - CO-4. Specific site design/s, identified mitigation measures and/or conditions of approval, and findings of Water Quality report to confirm consistency determination.
CO-21 Natural vegetation buffer areas that protect riparian habitats shall be maintained. Buffers shall function as transitional habitat and provide a separation from developed areas to minimize adverse impacts. Buffers shall be of a sufficient size to ensure the biological integrity and preservation of the riparian habitat, but in no case shall the buffer be less than 100 feet, except when it is infeasible to provide the 100 foot buffer in one of the following circumstances: (1) to provide access to development approved in a coastal development permit on a legal parcel where no other alternative is feasible; (2) for public works projects required to repair or protect existing public roads when there is no feasible alternative; (3) for a development on a legal parcel that is the minimum development necessary to provide a reasonable economic use of the property and where there is no feasible alternative. Water quality BMPs required for new development shall be located outside the 100-foot buffer, except for non-structural BMPs (e.g. vegetated berms/swales, bioengineered velocity reducers). Water quality BMPs proposed to improve the water quality of runoff from existing development without adequate BMPs shall be located outside the 100-foot buffer to the maximum extent feasible. The County encourages the restoration of streams that had previously been channelized or otherwise significantly altered. Existing legally-established development within the required 100-foot buffer of such a restored stream shall be considered a lawfully non-conforming use subject to the non-conforming development provisions of the LCP.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. See consistency analysis for CO-2 **Alternative 2 - Max Lagoon Habitat/Partial or Full Relocation of Existing Amenities in Phase 2** ***Potentially Consistent*** – It is anticipated that maximum habitat restoration would involve establishing minimum 100-ft. buffers as required by Policy CO-21. See consistency analysis for CO-2 - CO-4. **Alternatives 3-4** ***TBD*** - It is anticipated that proposed site modifications for Alternatives 3 and 4 will retain existing legal non-conforming uses, and/or will relocate amenities to increase buffer areas to the 100 ft. minimum required. However, for retained amenities, any significant alteration of existing facilities exceeding 50%, including restoration of historic structures, may be considered redevelopment and therefore required to meet the minimum 100 ft. buffer requirement. Specific site design/s, identified mitigation measures and/or conditions of approval to confirm consistency determination.
CO-22 Minimize the spread of aquatic invasive species through education, outreach, and signage for recreational users, as well as residents, parks and business operators. Los Angeles County will work with organizations, homeowners, and park agencies on educational programs to reduce the spread of aquatic invasive species within the Coastal Zone.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. See consistency analysis for CO-2 **Alternatives 2-4** ***Potentially Consistent*** – It is anticipated that proposed project design features, identified mitigation measures and/or conditions of approval will identify appropriate education, outreach, and signage measures to inform recreational users of efforts and programs to reduce the spread of aquatic invasive species within the Coastal Zone Specific site design/s, identified mitigation measures and/or conditions of approval to confirm consistency determination.
CO-25 Participate in the development and implementation of solutions to problems associated with OWTS and their	**Alternative 1 – No Project/Managed Decline**

Water Quality (Conservation and Open Space Element)	Preliminary Analysis/Comments
impact on water quality.	***Consistent***. See consistency analysis for CO-2 since no system on site is functional and requires weekly pump and haul which is in violation of the LAMP why is this consistent? **Alternatives 2-4** ***Potentially Consistent*** – Various OWTS solutions for all restoration project alternatives are being evaluated for feasibility and consistency with LCP and other regulatory requirements. Consistency to be reviewed based on further assessment and site designs/specifications.
CO-26 Prohibit construction of new small "package" wastewater treatment plants, except in areas where this is the desired long-term wastewater management solution and only if the “package” plants can be sited in locations that will be safe from coastal erosion, flooding and inundation, initially or as a result of sea level rise.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. See consistency analysis for CO-2 **Alternatives 2-4** ***Potentially Consistent*** – Various OWTS solutions for all restoration project alternatives are being evaluated for feasibility and consistency with LCP and other regulatory requirements, including onsite wastewater systems. Consistency to be reviewed based on further assessment and site designs/specifications for potential onsite wastewater systems and potential impacts from coastal erosion, flooding and inundation, initially or as a result of sea level rise.
CO-28 In areas with constraints to OWTS, including but not limited to, substandard, Rural Villages and geologic hazard areas, the County Departments of Public Health and Public Works may permit innovative and alternative methods of wastewater treatment and disposal provided that installation, operation, and maintenance of such systems minimize impacts to public health, water quality and natural resources, and are acceptable to the County and to the Regional Water Quality Control Board.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. See consistency analysis for CO-2 since no system on site is functional and requires weekly pump and haul which is in violation of the LAMP why is this consistent? **Alternatives 2-4** ***Potentially Consistent*** – See analysis for Policy CO-25.
CO-30 Site new OWTS and require them to be designed so that impacts to sensitive environmental resources are minimized, including grading, site disturbance, and the introduction of increased amounts of water. Adequate setbacks and/or buffers shall be required to protect H1 habitat area and surface waters from lateral seepage from the sewage effluent dispersal systems and, on or adjacent to beaches, to preclude the need for bulkheads, seawalls or revetments to protect the OWTS from coastal erosion, flooding and inundation, initially or as a result of sea level rise.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. See consistency analysis for CO-2 since no system on site is functional and requires weekly pump and haul which is in violation of the LAMP why is this consistent? **Alternatives 2-4** ***Potentially Consistent*** – See analysis for Policy CO-25.
CO-31 Channelizations or other substantial alterations of streams shall be prohibited except for: (1) necessary water supply projects where no feasible alternative exists; (2) flood protection for existing development where there is no other feasible alternative, or (3) the improvement of fish and wildlife habitat. Any channelization or stream alteration permitted for one of these three purposes shall minimize impacts to coastal resources, including the depletion of groundwater, and shall include maximum feasible mitigation measures to mitigate unavoidable impacts. Bioengineering alternatives shall be preferred for flood protection over "hard" solutions such as concrete or riprap channels.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – Proposed replacement and lengthening of the PCH bridge may require shoreline protection at abutments; however, the bridge improvements are proposed solely for habitat restoration purposes (i.e. bridge improvements are not proposed for purposes of increasing transportation capacity of PCH), and therefore is a permitted use per policy CO-31. In addition, it is anticipated that proposed site improvements will include project design features, mitigation measures and/or conditions to ensure maximum feasible mitigation measures are implemented to mitigate unavoidable impacts. What about lagoon expansion improvements? Specific site design/s, identified mitigation measures and/or conditions of approval and Hydrology Report to assess feasibility of bioengineering options if shoreline protection is required and to confirm consistency determination.
CO-32 Alteration of natural streams for the purpose of creating stream road crossings shall be prohibited unless there is no other feasible alternative to provide access to public recreation areas or lawfully-established development on legal parcels, and the stream crossing is accomplished by bridging. Bridge columns shall be located outside streambeds and banks. Wherever possible, shared bridges shall be used for providing access to multiple home sites. Culverts may be utilized for the crossing of minor drainages lacking beds and banks and riparian vegetation and where the culvert is sized	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – Proposed replacement and lengthening of the PCH bridge would continue to support a

Water Quality (Conservation and Open Space Element)	Preliminary Analysis/Comments
and designed to not restrict movement of fish or other aquatic wildlife. An in-stream road crossing, such as an "Arizona crossing", shall be modified to a soft-bottom crossing or replaced by a bridge, consistent with Fire Department requirements, when major maintenance or repair activities on the crossing are undertaken.	critical transportation and public access corridor and is consistent with the permitted use provisions of policy CO-32. No culverts are proposed. What about lagoon expansion improvements?

Biological Resources	Preliminary Analysis/Comments
SERA and H3 Habitat Protection Policies	
CO-33 Sensitive Environmental Resource Areas (SERAs) are areas containing habitats of the highest biological significance, rarity, and sensitivity. SERAs are divided into two habitat categories – H1 habitat and H2 habitat – that are subject to strict land use protections and regulations. 1) H1 habitat consists of areas of highest biological significance, rarity, and sensitivity--alluvial scrub, coastal bluff scrub, dune, native grassland and scrub with a strong component of native grasses or forbs, riparian, native oak, sycamore, walnut and bay woodlands, and rock outcrop habitat types. Wetlands, including creeks, streams, marshes, seeps and springs, are also H1 habitat. Coast live and valley oak, sycamore, walnut, and bay woodlands are all included in H1 habitat. H1 habitat also includes populations of plant and animals species (1) listed by the State or Federal government as rare, threatened or endangered, listed by NatureServe as State or Global-ranked 1, 2, or 3, and identified as California Species of Special Concern, and/or (2) CNPS-listed 1B and 2 plant species normally associated with H1 habitats, where they are found within H2 or H3 habitat areas. 2) H2 habitat consists of areas of high biological significance, rarity, and sensitivity that are important for the ecological vitality and diversity of the Santa Monica Mountains Mediterranean Ecosystem. H2 habitat includes large, contiguous areas of coastal sage scrub and chaparral-dominated habitats. A subcategory of H2 habitat is H2 "High Scrutiny" habitat, which comprises sensitive H2 habitat species/habitats that should be given avoidance priority over other H2 habitat. This habitat contains (1) CNDDB-identified rare natural communities; (2) plant and animal species listed by the State or Federal government as rare, threatened, or endangered; listed by NatureServe as State or Global-ranked 1, 2, or 3, and identified as California Species of Special Concern; and/or (3) CNPS-listed 1B and 2 plant species, normally associated with H2 habitats. H2 "High Scrutiny" habitat also includes (1) plant and animals species listed by the State or Federal government as rare, threatened or endangered, listed by NatureServe as State or Global ranked 1, 2, or 3, and identified as California Species of Special Concern, and/or (2) CNPS-listed 1B and 2 plant species, normally associated with H1 habitats, where they are found as individuals (not a population) in H2 habitat.	**Alternatives 1-4** ***Consistent*** – The project site contains SERAs as defined in the LCP and have been identified and mapped pursuant to a site-specific assessment as required the LCP. The type and acreages of SERA land cover that exists on the site are enumerated in Table X and shown on Map X of the Biological Report. Cite to RCD Draft Biological Report findings.
CO-34 H3 habitat consists of areas that would otherwise be designated as H2 habitat, but the native vegetation communities have been significantly disturbed or removed as part of lawfully-established development. This category also includes areas of native vegetation that are not significantly disturbed and would otherwise be categorized as H2 habitat, but have been substantially fragmented or isolated by existing, legal development and are no longer connected to large, contiguous areas of coastal sage scrub and/or chaparral-dominated habitats. This category includes lawfully-developed areas and lawfully-disturbed areas dominated by non-native plants such as disturbed roadside slopes, stands of non-native trees and grasses, and fuel modification areas around existing development (unless established illegally in an H2 or H1 area). This category further includes isolated and/or disturbed stands of native tree species (oak, sycamore, walnut, and bay) that do not form a larger woodland or savannah habitat. While H3 habitat does not constitute a SERA, these habitats provide important biological functions that warrant specific development standards for the siting and design of new development.	**Alternatives 1-4** ***Consistent*** – The project site contains H3 as defined in the LCP and has been identified and mapped pursuant to a site-specific assessment as required the LCP. The acreages of H3 habitat and other non-SERA land cover that exists on the site are enumerated in Table X and shown on Map X of the Biological Report. Cite to RCD Draft Biological Report findings.
CO-35 The areas occupied by existing, legally-established structures, agricultural uses (including equestrian uses), access roads and driveways and confined animal facilities do not constitute H1 or H2 habitat areas. Additionally, the fuel modification areas required by the Los Angeles County Fire Department for existing, lawfully-established structures do not meet the criteria of the H1 or H2 habitat categories, with the exception of the areas subject to the minimal fuel	**Alternatives 1-4** ***Consistent*** – See consistency analysis for CO-34.

Biological Resources	Preliminary Analysis/Comments
modification measures that are required in riparian or woodland habitats (e.g., removal of deadwood). In areas subject to the minimal fuel modification measures that are required in riparian or woodland habitats, the habitat maintains its biological significance, rarity, and sensitivity and shall be accorded all the protection provided for the H1 habitat category in the LCP.	
CO-36 SERA habitat (H1 and H2) and H3 habitat categories are depicted on Map 2 Biological Resources of the Santa Monica Mountains LUP ("Biological Resources Map"). The precise boundaries of these habitat categories shall be determined on a site-specific basis, based on substantial evidence and a site-specific biological surveys inventory and/or assessment required by the LCP when a development proposal is submitted. This LCP contains a procedure, as enunciated in Policy CO-37, to both confirm the habitat types and locations depicted on the map and establish on the basis of substantial evidence the appropriate habitat category. Any area not designated as a habitat category on the Biological Resources Map that meets the criteria of a habitat category shall be accorded all the protection provided for that habitat category in the LCP.	**Alternatives 1-4** ***Consistent*** – See consistency analysis for CO-33 - CO-34.
CO-37 The habitat categories as depicted on the Biological Resources Map may be adjusted based upon substantial biological evidence and independent review by the County Biologist and ERB as set forth in this Element. Based on substantial evidence, a resource on any site may be classified or reclassified from one category to a higher or lower category. Where the County finds that the physical extent of habitats on a project site are different than those indicated on the Biological Resources Map, the County shall make findings as part of the CDP regarding the physical extent of the habitat categories and detailed justification for any classification or reclassification of habitat categories at the project site based on substantial evidence. Where the County finds that the physical extent of habitats on a project site are different than those indicated on the Biological Resources Map, the Biological Resources Map shall be modified accordingly, as part of a map update indicated below, and such a modification shall be considered an LCP amendment and subject to approval by the Coastal Commission as set forth in Policy CO-38. The County may take action on the CDP, applying the appropriate LCP policies and standards for protection of the habitat categories present, even if the Biological Resources Map of the LUP has not yet been amended.	**Alternatives 1-4** ***Consistent*** – See consistency analysis for CO-33 - CO-34. The review authority for confirming the type and physical extent of the SERAs on site to be determined based on permit path (i.e. County CDP or CCC consolidated CDP permit path).
CO-39 Fire is a natural and essential part of the life cycle of the plant communities of the Santa Monica Mountains. The plant communities are highly diverse as a result of the shifting mosaic of habitats created by repeated fires. For example, chaparral habitat impacted by fire is still present in the form of root crowns that will re-sprout and a fire-adapted seed bank (a number of chaparral species drop seeds that require fire for germination) that will generate new growth following the rainy season. Therefore, areas burned by wildfire, where there is evidence that the areas consisted of a habitat meeting the definition of H1, H2, H2 High Scrutiny, or H3 habitat before the fire, shall be afforded the protections of the applicable habitat category.	**Alternatives 1-4** ***Consistent*** – See consistency analysis for CO-33 - CO-34.
CO-40 Any area mapped as, or meeting the definition of, H1, H2, H2 High Scrutiny, or H3 habitat shall not be deprived of protection as that habitat category, as required by the policies and provisions of the LCP, on the basis that habitat has been damaged or eliminated by natural disaster (e.g. landslide, flooding, etc.), or impacted by illegal development or other illegal means, including removal, degradation, or elimination of species that are rare or especially valuable because of their nature or role in an ecosystem.	**Alternatives 1-4** ***Consistent*** – See consistency analysis for CO-33 - CO-34.
CO-41 New non-resource-dependent development shall be prohibited in H1 habitat areas to protect these most sensitive environmental resource areas from disruption of habitat values. The only exception is that two uses may be approved in H1 habitat other than wetlands in very limited circumstances, as follows: (1) public works projects required to repair or protect existing public roads when there is no feasible alternative, as long as impacts to H1 habitat are avoided to the maximum extent feasible, and unavoidable impacts are minimized and mitigated; and (2) an access road to a lawfully-permitted use outside H1 habitat when there is no other feasible alternative to provide access to public recreation areas or development on a legal parcel, as long as impacts to H1 habitat are avoided to the maximum extent feasible, and unavoidable impacts are minimized and mitigated. Any new development approved for one of these two uses within woodland or savannah habitat shall protect native trees in accordance with Policy CO-99.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than permitted, minor resource-dependent habitat restoration is proposed. **Alternative 2 - Max Lagoon Habitat/Partial or Full Relocation of Existing Amenities in Phase 2** ***Consistent*** – It is anticipated that only permitted, resource-dependent habitat restoration and passive public access and recreational activities will occur within H1 habitat areas. **Alternatives 3-4** ***TBD*** – It is anticipated that only permitted, resource-dependent habitat restoration and passive public access and

Biological Resources	Preliminary Analysis/Comments
The County shall not approve the development of any non-resource dependent use other than these two uses within H1 habitat, unless such use has first been considered in an LCP amendment that is certified by the Coastal Commission.	recreational activities will occur within H1 habitat areas; however, specific site designs will confirm that retention and/or relocation of amenities will not result in new structure, grading or fuel modification impacts beyond what currently exists onsite.
CO-42 Resource-dependent uses are only allowed in H1 and H2 habitats where sited and designed to avoid significant disruption of habitat values, consistent with the policies of the LUP. Low-impact campgrounds, public accessways, and trails are considered resource-dependent uses. Resource-dependent uses shall be sited to avoid or minimize impacts to H1 and H2 habitat to the maximum extent feasible. Measures, including but not limited to, signage, placement of boardwalks, utilizing established trail corridors, following natural contours to minimize grading, and limited fencing shall be implemented as necessary to protect H1 and H2 habitat. Accessways to and along the shoreline shall be sited, designed, and managed to avoid and/or protect marine mammal hauling grounds, seabird nesting and roosting sites, sensitive rocky points and intertidal areas, and coastal dunes.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than permitted, minor resource-dependent habitat restoration is proposed. **Alternative 2 - Max Lagoon Habitat/Partial or Full Relocation of Existing Amenities in Phase 2** ***Consistent*** – It is anticipated that only permitted, resource-dependent habitat restoration and passive public access and recreational activities will occur within H1 and H2 habitat areas. In addition, it is anticipated that proposed site improvements will include project design features, mitigation measures and/or conditions of approval to ensure improvements are located and measures are implemented to avoid or minimize impacts to H1 and H2 habitat to the maximum extent feasible. **Alternatives 3-4 Would use as a hotel require variance?** ***TBD*** – It is anticipated that only permitted, resource-dependent habitat restoration and passive public access and recreational activities will occur within H1 and H2 habitat areas; however, specific site designs will confirm that retention and/or relocation of amenities will not result in new structure, grading or fuel modification impacts beyond what currently exists onsite. In addition, it is anticipated that proposed site improvements will include project design features, mitigation measures and/or conditions of approval to ensure improvements are located and measures are implemented to avoid or minimize impacts to H1 and H2 habitat to the maximum extent feasible.
CO-43 New development shall avoid H2 Habitat (including H2 High Scrutiny Habitat), where feasible, to protect these sensitive environmental resource areas from disruption of habitat values. H2 High Scrutiny Habitat is considered a rare and sensitive H2 Habitat subcategory that should be given protection priority over other H2 habitat and should be avoided to the maximum extent feasible. Where it is infeasible to avoid H2 habitat, new development shall be sited and designed to minimize impacts to H2 habitat. If there is no feasible alternative that can eliminate all impacts to H2 habitat, then the alternative that would result in the fewest or least significant impacts to H2 habitat shall be selected. Impacts to H2 habitat that cannot be avoided through the implementation of siting and design alternatives shall be fully mitigated.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than permitted, minor resource-dependent habitat restoration is proposed. **Alternative 2 - Max Lagoon Habitat/Partial or Full Relocation of Existing Amenities in Phase 2** ***Consistent*** – See consistency analysis for CO-42. **Alternatives 3-4** ***TBD*** – See consistency analysis for CO-42. **Would use as a hotel require variance?**
CO-44 New development shall be sited in a manner that avoids the most biologically-sensitive habitat onsite where feasible, while not conflicting with other LCP policies, in the following order of priority: H1, H2 High Scrutiny, H2, H3. Priority shall be given to siting development in H3 habitat, but outside of areas that contain undisturbed native vegetation that is not part of a larger contiguous habitat area. If infeasible, priority shall be given to siting new development in such H3 habitat. If it is infeasible to site development in H3 habitat areas, development may be sited in H2 habitat if it is consistent with the specific limitations and standards for development in H2 habitat and all other provisions of the LCP. New development is prohibited in H1 habitat unless otherwise provided in Policy CO-41.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than permitted, minor resource-dependent habitat restoration is proposed. **Alternative 2 - Max Lagoon Habitat/Partial or Full Relocation of Existing Amenities in Phase 2** ***Consistent*** – See consistency analysis for CO-42. **Alternatives 3-4** ***TBD*** – See consistency analysis for CO-42.
CO-45 Emphasize the protection of habitat: a) Preserve, protect, and enhance habitat linkages through limitations in the type and intensity of development and preservation of riparian corridors. b) Place primary emphasis on preserving large, unbroken blocks of undisturbed natural open space and wildlife habitat areas. As part of this emphasis, all feasible strategies shall be explored to protect these areas from disturbance. Such strategies include, but are not limited to, purchasing open space lands, retiring development rights, clustering development to increase the amount of preserved open space, requiring the dedication of open space conservation	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than permitted, minor resource-dependent habitat restoration is proposed. However, the No Project alternative would generally maintain existing site conditions and therefore would not serve to enhance the habitat linkage supported by the natural habitat area onsite. **Alternative 2 - Max Lagoon Habitat/Partial or Full Relocation of Existing Amenities in Phase 2** ***Consistent*** – Maximum habitat restoration activities and increased habitat buffers would serve to preserve, protect, and enhance the habitat linkage supported by the natural habitat area onsite.

Biological Resources	Preliminary Analysis/Comments
easements in all CDPs that include approval of structures within H2 habitat, and minimizing grading and the removal of native vegetation.	**Alternatives 3-4** ***Potentially Consistent*** – Same as Alternative 2; however, retention and restoration of existing amenities would involve less extensive habitat restoration and less new/extended habitat buffer areas; where feasible, clustering of retained and/or relocated amenities would consolidate development and fuel modification areas and minimize edge effects to further maximize protection of contiguous restored habitat areas and better ensure consistency with Policy CO-45.
CO-46 Encourage the permanent preservation of steep lands (lands over 50 percent slope, as defined in this LCP) as open space, preferably through open space dedications to a public agency or a public land conservation agency which has the authority to manage, preserve, or enhance park and open space lands, or, secondarily, through effective easements.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than permitted, minor resource-dependent habitat restoration is proposed. **Alternatives 2-4** ***Potentially Consistent*** – It is anticipated that modification of onsite amenities would not involve new development on slopes exceeding 50 percent ensuring that steep slopes onsite are protected as open space.
CO-48 New and replacement infrastructure may be permitted provided that it complies with applicable provisions of this plan and is designed to avoid and, if infeasible, minimize adverse impacts to environmental and scenic resources. New roads shall only be constructed to provide access to lawfully-approved proposed new development, and shall comply with the road standards found in the LIP. New and replacement utilities shall only be developed to serve legally-established uses.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – Proposed replacement and lengthening of the PCH bridge would continue to support a critical transportation and public access corridor and is consistent with the permitted use provisions of the LCP. New and replacement utilities would only be developed to serve legally-established, high-priority coastal recreation and visitor-serving uses. In addition, it is anticipated that proposed site improvements will include project design features, mitigation measures and/or conditions of approval to ensure improvements are located and measures are implemented to minimize adverse impacts to environmental and scenic resources.
CO-49 Require development to be sited and designed to protect and preserve important, viable habitat areas and habitat linkages in their natural condition.	**Alternatives 1-4** ***Consistent*** – See consistency analysis for CO-41, CO-42 and CO-45.
CO-50 New development shall be prohibited in wetlands with the exception of the following where it has been demonstrated that there is no feasible less-environmentally-damaging alternative, and where feasible mitigation measures have been provided to minimize adverse environmental effects: (1) wetlands-related scientific research and wetlands-related educational uses, (2) incidental public service purposes, including but not limited to, burying cables and pipes or inspection of piers and maintenance of existing intake and outfall lines, and (3) wetland restoration projects where the primary purpose is restoration of the habitat.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than permitted, minor resource-dependent habitat restoration is proposed. **Alternatives 2-4** ***Consistent*** – It is anticipated that only permitted, resource-dependent habitat restoration will occur within wetland areas. Proposed replacement and lengthening of the PCH bridge are proposed solely for habitat restoration purposes (i.e. bridge improvements are not proposed for purposes of increasing transportation capacity of PCH), and therefore is a permitted use per policy CO-50.
CO-54 Use primarily locally-indigenous plant species in landscape areas within Fuel Modification Zones A and B of structure(s) requiring fuel modification. Non-locally-indigenous plants and gardens that are not invasive may be allowed within the building site area and in Fuel Modification Zones A and B, with associated irrigation, provided that the species are consistent with Fire Department requirements and all efforts are made to conserve water. Invasive plants are strictly prohibited. The removal or trimming, thinning or other reduction of natural vegetation, including locally-indigenous vegetation, is prohibited except when required for construction of an approved development and/or for compliance with fuel modification requirements for approved or lawfully-existing development. Los Angeles County will work with organizations, homeowners, and park agencies on educational programs to reduce the spread of invasive plant species within the Coastal Zone.	**Alternatives 1-4** ***Consistent –*** All restoration and landscape/fuel modification maintenance activities would utilize primarily locally-indigenous plant species. It is anticipated that identified mitigation measures and/or conditions of approval would ensure project activities comply with Policy CO-54.
CO-55 New development adjacent to H1 habitat shall provide native vegetation buffer areas to serve as transitional habitat and provide distance and physical barriers to human intrusion. Buffers shall be of a sufficient size to ensure the	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed.

Biological Resources	Preliminary Analysis/Comments
biological integrity and preservation of the H1 habitat areas they are designed to protect. New development shall provide a buffer of no less than 100 feet from H1 habitat. Variances or modifications to the required H1 habitat buffer width shall not be granted, except for a permitted use included in Policy CO-56. For streams and riparian habitat, the buffer shall be measured from the outer edge of the canopy of riparian vegetation. Where riparian vegetation is not present, the buffer shall be measured from the outer edge of the bank of the subject stream. For woodland habitat, the buffer shall be measured from the outer edge of the woodland tree canopy. For coastal bluff habitat, the buffer shall be measured from the bluff edge. For wetlands, the buffer shall be measured from the upland limit of the wetland. For all other H1 habitat, the buffer shall be measured from the outer extent of the vegetation that makes up the habitat.	**Alternative 2 - Max Lagoon Habitat/Partial or Full Relocation of Existing Amenities in Phase 2** ***Potentially Consistent*** – It is anticipated that maximum habitat restoration would involve establishing minimum 100-ft. buffers as required by Policy CO-55. **Alternatives 3-4** ***TBD*** - It is anticipated that proposed site modifications for Alternatives 3 and 4 will retain existing legal non-conforming uses that may not meet minimum buffer requirements, and/or will relocate amenities to increase buffer areas to the 100 ft. minimum required. However, for retained amenities, any significant alteration of existing facilities exceeding 50%, including restoration of historic structures, may be considered redevelopment and therefore would be required to meet the minimum 100 ft. buffer requirement. Specific site design/s, identified mitigation measures and/or conditions of approval, and findings of Biological Report to confirm consistency determination.
CO-56 New development, including but not limited to vegetation removal, vegetation thinning, or planting of non-native or invasive vegetation, shall not be permitted within the H1 habitat buffer with the exception of resource-dependent uses and the following uses in very limited circumstances: (1) public works projects required to repair or protect existing public roads when there is no feasible alternative, as long as impacts to H1 habitat are avoided to the maximum extent feasible, and unavoidable impacts are minimized and mitigated; (2) an access road to a proposed use which could be found consistent with the LCP when there is no other feasible alternative to provide access to public recreation areas or development on a legal parcel, as long as impacts to H1 habitat are avoided to the maximum extent feasible, and unavoidable impacts are minimized and mitigated; (3) a development on a lawfully-created parcel that is the minimum development necessary to provide a reasonable economic use of the property and where there is no feasible alternative, as long as impacts to H1 habitat are avoided to the maximum extent feasible, and unavoidable impacts are minimized and mitigated, and (4) continued use and maintenance of an existing, lawfully-established road or driveway to an existing, lawfully-established use.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternative 2 - Max Lagoon Habitat/Partial or Full Relocation of Existing Amenities in Phase 2** ***Potentially Consistent*** – See consistency analysis for CO-55. In addition, it is anticipated that only permitted, restoration and resource-dependent passive recreational and educational uses would occur in required buffers. **Alternatives 3-4** ***TBD*** - See consistency analysis for CO-55. Specific site design/s, identified mitigation measures and/or conditions of approval, and findings of Biological Report to confirm consistency determination.
CO-57 New non-resource-dependent development shall also provide an additional 100-foot "Quiet Zone" from H1 habitat where feasible (measured from the outer edge of the 100-foot H1 habitat buffer required above). New development is not permitted in the H1 habitat Quiet Zone except resource-dependent uses, non-irrigated fuel modification required by the Fire Department for lawfully-established structures, and the following other uses in very limited circumstances: (1) public works projects required to protect existing public roads when there is no feasible alternative, as long as impacts to H1 habitat and the H1 buffer are avoided to the maximum extent feasible, and unavoidable impacts are minimized and mitigated; (2) an access road to a lawfully-permitted use when there is no other feasible alternative to provide access to public recreation areas or development on a legal parcel, as long as impacts to H1 habitat and H1 buffer are avoided to the maximum extent feasible, and unavoidable impacts are minimized and mitigated; (3) a development on a lawfully-created parcel that is the minimum development necessary to provide a reasonable economic use of the property and where there is no feasible alternative, as long as impacts to H1 habitat and H1 buffer are avoided to the maximum extent feasible, and unavoidable impacts are minimized and mitigated; (4) equestrian pasture outside of the fuel modification zone, consistent with the requirements of the LCP, where the development is sited and designed to ensure that no required fuel modification extends into H1 habitat or H1 buffer, it will not significantly degrade H1 habitat, and will not adversely affect wildlife usage, including movement patterns, of the local area or region. Additionally, if existing fuel modification for the principal use is located within the Quiet Zone, confined animal facilities may be established within the Quiet Zone on slopes of 3:1 or less only if the facilities will not require fuel modification to extend into H1 habitat or the H1 habitat buffer, and subject to ERB review. Furthermore, public recreational facilities may also be located within this quiet zone, if it is developed and/or disturbed by historic use (e.g., recreational).	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternative 2 - Max Lagoon Habitat/Partial or Full Relocation of Existing Amenities in Phase 2** ***Potentially Consistent*** – See consistency analysis for CO-55. In addition, it is anticipated that only permitted, restoration and resource-dependent passive recreational and educational uses would occur in required buffers. **Alternatives 3-4** ***TBD*** - See consistency analysis for CO-55. Specific site design/s, identified mitigation measures and/or conditions of approval, and findings of Biological Report to confirm consistency determination.
CO-58 The use of insecticides, herbicides, anti-coagulant rodenticides or any toxic chemical substance which has the potential to significantly degrade biological resources in the Santa Monica Mountains, shall be prohibited, except where	**Alternatives 1-4** ***Potentially Consistent*** – It is anticipated that proposed restoration and site improvements would not include the

Biological Resources	Preliminary Analysis/Comments
necessary to protect or enhance the habitat itself, such as for eradication of invasive plant species or habitat restoration, and where there are no feasible alternatives that would result in fewer adverse effects to the habitat value of the site. Application of such chemical substances shall not take place during the winter season or when rain is predicted within a week of application. Herbicide application necessary to prevent regrowth of highly-invasive exotic vegetation such as giant reed/cane (Arundo donax) shall be restricted to the best available and least-toxic product and method in order to minimize adverse impacts to wildlife and the potential for introduction of herbicide into the aquatic environment or onto adjacent non-targeted vegetation. In no instance shall herbicide application occur if wind speeds on site are greater than five miles per hour or 48 hours prior to predicted rain. In the event that rain does occur, herbicide application shall not resume again until 72 hours after rain.	use of insecticides, herbicides, anti-coagulant rodenticides or toxic chemicals. Identified mitigation measures and/or conditions of approval, and findings of Biological Report to confirm consistency determination.
CO-59 Work toward a poison free Santa Monica Mountains by exploring the feasibility of eliminating the use of all rodenticides at the soonest practicable date, and identify and promote rodent control methods that do not involve the use of poisons.	**Alternatives 1-4** ***Potentially Consistent*** – See consistency analysis for CO-58.
CO-60 Mosquito abatement within or adjoining H1 habitat shall be limited to the implementation of the minimum measures necessary to protect human health, and shall minimize adverse impacts to H1 habitat. Larvacides shall be used that are specific to mosquito larvae and will not have any adverse impacts to non-target species, including fish, frogs, turtles, birds, or other insects or invertebrates. The use of mosquitofish shall be prohibited throughout the Coastal Zone.	**Alternatives 1-4** ***Potentially Consistent*** – Identified mitigation measures and/or conditions of approval, and findings of Biological Report to confirm consistency determination.
CO-62 Interpretive signage may be used in H1 or H2 habitat accessible to the public to provide information about the value and need to protect sensitive resources.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Consistent*** – It is anticipated that restoration and resource-dependent passive recreational and educational uses with appropriate signage would occur in H1 and H2 habitats and required buffers to inform the public of the value and need to protect sensitive resources.
Policies Protecting Areas Adjoining H1 Habitat and Parkland	
CO-64 Where multiple SERA protection policies and permitted uses are applicable, the policy that is most restrictive and protective of the habitat resource shall regulate development.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Consistent*** – Specific site design/s, identified mitigation measures and/or conditions of approval will ensure that the most restrictive SERA protection policies will govern approved project activities.
CO-65 Variances or modifications to required development standards that are not related to H1 and H2 protection (street setbacks, height limits, etc.) shall be permitted where necessary to avoid impacts to H1 habitat and to avoid or minimize impacts to H2 habitat.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternative 2** ***Consistent*** – It is anticipated that maximum restoration plans would avoid impacts to H1 and H2 habitat without the need for variances or modifications. **Alternatives 3-4** ***TBD*** – Specific site design/s will determine if variances or modifications area necessary to retain high-priority coastal recreation and visitor-serving uses while avoiding impacts to H1 and H2 habitat areas.
CO-66 Protection of H1 and H2 habitat and public access shall take priority over other development standards, and where there is any conflict between general/other development standards and the biological resource and/or public access protection provisions, the standards that are most protective of H1 and H2 habitat and public access shall have precedence.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***TBD*** – Specific site design/s, identified mitigation measures and/or conditions of approval will ensure that LCP

Biological Resources	Preliminary Analysis/Comments
	standards that are most protective of H1 and H2 habitat and public access shall have precedence over other development standards of the LCP.
CO-67 Coastal development permits for the development of uses allowed within or adjoining H1 and H2 habitat shall include an open space conservation easement over the remaining H1 habitat, H1 habitat buffer, or H2 habitat, in order to avoid and minimize impacts to biological resources.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Consistent*** – The primary purpose of the proposed project is to implement restoration activities to protect and enhance a variety of sensitive habitats and special status species in perpetuity, consistent with the intent of Policy CO-67.
Stream Protection	
CO-68 Channelizations or other substantial alterations of streams shall be prohibited except for: (1) necessary water supply projects where no feasible alternative exists; (2) flood protection for existing development where there is no other feasible alternative; or (3) the improvement of fish and wildlife habitat. Any channelization or stream alteration permitted for one of these three purposes shall minimize impacts to coastal resources, including the depletion of groundwater, and shall include maximum feasible mitigation measures to mitigate unavoidable impacts. Bioengineering alternatives shall be preferred for flood protection over "hard" solutions such as concrete or riprap channels.	Duplicate policy requirement. See consistency analysis for CO-31.
CO-69 Alteration of natural streams for the purpose of stream road crossings shall be prohibited, except where there is no other feasible alternative to provide access to public recreation areas or lawfully-established development on legal parcels and the stream crossing is accomplished by bridging. Bridge columns shall be located outside streambeds and banks. Wherever possible, shared bridges shall be used for providing access to multiple home sites. Culverts may be utilized for the crossing of minor drainages lacking beds and banks and riparian vegetation, and where the culvert is sized and designed to not restrict movement of fish or other aquatic wildlife.	Duplicate policy requirement. See consistency analysis for CO-32.
Environmental Review Policies	
CO-70 A site-specific Biological Inventory shall accompany each application for all new development. A detailed Biological Assessment report shall be required in applications for new development located in, or within 200 feet of, H1, H2, or H2 “High Scrutiny” habitat, as mapped on the Biological Resources Map, or where an initial Biological Inventory indicates the presence or potential for sensitive species or habitat. The County Biologist shall conduct preliminary review of all development, regardless of whether the proposal must be considered by the Environmental Review Board (ERB).	**Alternatives 1-4** ***Consistent*** – See consistency analysis for CO-33 - CO-34. The review authority for confirming the type and physical extent of the SERAs on site to be determine based on permit path (i.e. County CDP or CCC consolidated CDP permit path).
CO-71 The ERB shall be comprised of qualified professionals with technical expertise in resource management and serve as an advisory body to the Director, Regional Planning Commission and the Board of Supervisors in the review of development proposals in the Santa Monica Mountains Coastal Zone and their effects on biological resources. The ERB shall provide recommendations to the decision-making body on the conformance or lack of conformance of the project to the policies of the LUP, and shall consider the individual and cumulative impact of each development proposal. Any recommendation of approval shall include mitigation measures designed to minimize adverse impacts to coastal resources.	**Alternatives 1-4** ***Consistent*** – See consistency analysis for CO-33 - CO-34. The review authority for confirming the type and physical extent of the SERAs on site to be determine based on permit path (i.e. County CDP or CCC consolidated CDP permit path).
CO-72 The ERB shall review and analyze all proposals for development in the following areas unless exempted: a. H1 habitat; b. Within 200 feet of designated H1 habitat; c. H2 habitat including H2 “High Scrutiny”; d. Within 200 feet of designated H2 habitat including H2 “High Scrutiny”; or e. Any development within the Las Flores Heights, Malibu Mar Vista, Malibu Vista, and Vera Canyon Rural Villages.	**Alternatives 1-4** ***Consistent*** – See consistency analysis for CO-33 - CO-34. The review authority for confirming the type and physical extent of the SERAs on site to be determine based on permit path (i.e. County CDP or CCC consolidated CDP permit path).

Biological Resources	Preliminary Analysis/Comments
CO-73 The County staff biologist shall review and analyze all proposals for development in the following areas unless exempted: a. Proposed actions that would impact only habitat category H3, and which would not encroach within 200 feet of designated H1, H2 "High Scrutiny", or H2 habitat, unless the Director determines that review by the ERB is warranted. b. Developments within the Rural Villages of El Nido, Fernwood, Malibu Bowl, Malibou Lake, Monte Nido, Old Post Office, Old Topanga, Topanga Canyon, Topanga Oaks, Topanga Woods, and Upper Latigo, unless the Director determines that review by the ERB is warranted. c. Demolition of an existing structure and construction of a new structure within the existing building pad area where the building pad is not within 200 feet of H1 habitat and no additional fuel modification is required. d. New structures and landscaping proposed within the permitted graded pad or permitted building site area if there is no graded pad, authorized in a previously approved coastal development permit or lawfully established prior to the effective date of the Coastal Act, where the pad or building site area is not within 200 feet of H1 habitat and no additional fuel modification is required.	**Alternatives 1-4** ***Consistent*** – See consistency analysis for CO-33 - CO-34. The review authority for confirming the type and physical extent of the SERAs on site to be determine based on permit path (i.e. County CDP or CCC consolidated CDP permit path).
Policies Regarding New Development	
CO-74 New development shall be clustered to the maximum extent feasible and located as close as possible to existing roadways, services and other developments to minimize impacts to biological resources. New development shall be sited and designed to minimize impacts to H2 and H3 habitat by: Limiting the maximum number of structures to one main residence, one second residential structure, and accessory structures such as stable, corral, pasture, workshop, gym, studio, pool cabana, office, or tennis court. Such accessory structures are to be located within the approved building site area except as set forth in Policies CO-103 to CO-105, and structures shall be clustered to minimize required fuel modification. The Director or Regional Planning Commission may determine that fewer structures are appropriate for a given site.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than permitted, minor resource-dependent habitat restoration is proposed. **Alternative 2 - Max Lagoon Habitat/Partial or Full Relocation of Existing Amenities in Phase 2** ***Consistent*** – Maximum habitat restoration plans would remove existing structures and reduce fuel modification activities from SERA buffers and therefore eliminate existing biological resource impacts and provide for expanded habitat restoration in these existing disturbed areas. **Alternatives 3-4** ***Potentially Consistent*** – Same as Alternative 2; however, retention and restoration of existing amenities would involve less extensive habitat restoration and fewer new/extended habitat buffer areas. Where feasible, clustering of retained and/or relocated amenities and relocation of amenities closer to adjacent roads and development sites would consolidate development and fuel modification areas and thereby minimize impacts to biological resources.
CO-76 All new development shall be sited and designed so as to minimize grading, alteration of physical features, and vegetation clearance in order to prevent soil erosion, stream siltation, reduced water percolation, increased runoff, and adverse impacts on plant and animal life and prevent net increases in baseline flows for any receiving water body.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than permitted, minor resource-dependent habitat restoration is proposed. **Alternative 2 - Max Lagoon Habitat/Partial or Full Relocation of Existing Amenities in Phase 2** ***Consistent*** – Grading for restoration activities would be limited to that necessary to remove historic fill and re-establish a more natural topography onsite. In addition, maximum habitat restoration plans would remove existing structures and reduce fuel modification activities from SERA buffers and thereby reduce vegetation clearance and alteration of physical site features, and would reduce runoff, soil erosion, stream siltation, etc. that may otherwise adversely impact plant and animal life. **Alternatives 3-4** ***Potentially Consistent*** – Grading for restoration activities would be limited to that necessary to remove historic fill and re-establish a more natural topography onsite. Where amenities are to be retained and/or relocated, clustering of amenities and relocation of amenities closer to adjacent roads and development sites would minimize the overall grading footprint onsite and consolidate development and fuel modification areas, thereby reduce vegetation clearance and alteration of physical site features, and would reduce runoff, soil erosion, stream siltation, etc. that may otherwise adversely impact plant and animal life.

Biological Resources	Preliminary Analysis/Comments
CO-77 New development in H2 and H3 habitat areas shall be sited and designed to minimize removal of native vegetation and required fuel modification and brushing to the maximum extent feasible in order to minimize habitat disturbance or destruction, removal or modification of natural vegetation, and irrigation of natural areas, while providing for fire safety. Where clearance to mineral soil is not required by the Fire Department, fuel load shall be reduced through thinning or mowing, rather than complete removal of vegetation. All vegetation removal, thinning and mowing required for new development must avoid disturbance of wildlife and special-status species, including nesting birds.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than permitted, minor resource-dependent habitat restoration is proposed. **Alternative 2 - Max Lagoon Habitat/Partial or Full Relocation of Existing Amenities in Phase 2** ***Consistent*** – Maximum habitat restoration plans would remove existing structures and reduce fuel modification activities to restore H1 and H2 habitat areas and buffers, which would no longer be subject to fuel modification impacts currently required for existing amenities. **Alternatives 3-4** ***Potentially Consistent*** – Where existing amenities are to be retained/relocated, clustering and relocation of amenities closer to adjacent roads and existing development sites would consolidate development and fuel modification areas, thereby minimizing vegetation clearance activities within existing and restored habitat buffers. Specific site design/s, identified mitigation measures and/or conditions of approval would ensure that any authorized fuel modifications activities be implemented to avoid disturbance of wildlife and special-status species, including nesting birds
CO-78 Disturbed areas adjoining H1 habitats shall not be further degraded, and if feasible, restored.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. However, the No Project alternative would generally maintain existing site conditions and therefore would not serve to significantly restore H1 habitats, if feasible, as directed by Policy CO-78. **Alternative 2 – Max Lagoon Habitat/Partial or Full Relocation of Existing Amenities in Phase 2** ***Potentially Consistent*** – Maximum habitat restoration activities, increased habitat buffers, lengthening of the PCH bridge and removal of existing amenities within H1 buffers would help to significantly restore H1 habitats and thereby prevent further degradation of the habitats. **Alternatives 3-4** ***Potentially Consistent*** – Same as Alternative 2; however, where existing amenities are to be retained/relocated, clustering and relocation of amenities closer to adjacent roads and existing development sites would consolidate development and fuel modification areas, thereby minimizing site disturbance and vegetation clearance activities that may otherwise further degrade the habitats.
CO-79 Access roads that are wholly new, incorporate any portion of an existing access road, or require the widening, improvement or modification of an existing, lawfully-constructed road in order to comply with County Fire Department access development standards shall comply with the following: a. No more than one access road or driveway with one hammerhead-type turnaround area providing access to the one approved building site area may be permitted as part of a development permitted in H2 habitat or H2 High Scrutiny habitat, unless a secondary means of access is specifically required by the Fire Department to protect public safety. b. An access road or driveway shall only be permitted concurrently with the use it is intended to serve, except for the approval of geologic testing roads. c. Grading, landform alteration, and vegetation removal for access roads and driveways shall be minimized to the greatest extent feasible. The length of the one access road or driveway shall be the minimum necessary to provide access to the one approved building site area on a legal parcel. The alignment and design of the access road or driveway shall avoid impacts to H1 and H2 habitat, or if avoidance is not feasible, shall minimize such impacts. In no case shall new on-site or off-site access roads, or driveways as measured from the nearest public road, exceed a maximum of 300 feet or one-third the parcel depth, whichever is less, unless the County finds, based on substantial evidence, that a variance of this standard is warranted. d. The width and grade of an access road or driveway and the size of the hammerhead turnaround approved shall be the	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-3** ***TBD*** – Policy applicability and consistency to be reviewed based on further site designs/specifications to be developed per Fire Department requirements.

Biological Resources	Preliminary Analysis/Comments
minimum required by the Fire Department for that development project.	
CO-80 New development shall be sited and designed to minimize the amount of grading, consistent with the grading requirements of the LCP. Cut and fill slopes shall be minimized by the use of retaining walls, where consistent with all other provisions of the LCP.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** - See consistency analysis for CO-76. Consistency to be reviewed based on preliminary grading plans and further site designs/specifications associated with proposed cut/fill grading quantities and retaining walls.
CO-81 Fencing or walls shall be prohibited within riparian, bluff, or dune habitat, except where necessary for public safety or habitat protection or restoration.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – Specific site design/s, identified mitigation measures and/or conditions of approval will ensure that any fencing associated with proposed restoration and recreational activities comply with LCP requirements.
CO-82 Fencing within H1 habitat, or within 100 feet of H1 habitat, is prohibited, except where necessary for public safety or habitat protection or restoration. Permitted fencing shall be wildlife-permeable, except where temporary fencing is required to keep wildlife from habitat restoration areas. Development permitted within H2 or H3 habitat may include fencing, if necessary for safety, limited to the immediate building site area, and extending no further than the outer extent of Fuel Modification Zone B (100 feet from structures that require fuel modification). Fencing shall be wildlife-permeable. Perimeter fencing of a parcel, or barbed-wire or chainlink fencing, is prohibited.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – Specific site design/s, identified mitigation measures and/or conditions of approval will ensure that any fencing associated with proposed restoration and recreational activities comply with LCP requirements.
CO-84 Wells, test pits, and other excavations and pipes must be covered during construction and permanently capped to prevent adverse impacts to wildlife.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – Specific site design/s, identified mitigation measures and/or conditions of approval will ensure that any wells, test pits, or other excavations and pipes will be covered during construction and permanently capped to prevent adverse impacts to wildlife.
CO-85 The County shall coordinate with the California Department of Fish and Wildlife, U. S. Fish and Wildlife Service, National Marine Fisheries Service, and other resource management agencies, as applicable, in the review of development applications to ensure that impacts to SERAs, including rare, threatened, or endangered species, are avoided and minimized.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Consistent*** – All resource agencies will have an opportunity to ensure that impacts to SERAs, including rare, threatened, or endangered species, are avoided and minimized.
Policies CO-86a, CO-86b and CO-87 require certain mitigation measures/compensation for unavoidable impacts to H1 and H2 habitat and from the provision of less than a 100-foot H1 habitat.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Consistent*** – The primary purpose of the proposed project is to implement restoration activities to protect and enhance a variety of sensitive habitats and special status species; therefore, Policies CO-86a, CO-86b and CO-87 are not directly applicable to proposed project activities. However, Alternatives 2-4 would further the intent of Policies CO-86a, CO-86b and CO-87 to protect, maintain and enhance H1 and H2 resources in perpetuity.
CO-90 New recreational facilities or structures on beaches shall be designed and located to avoid impacts to H1 habitat and marine resources.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4**

Biological Resources	Preliminary Analysis/Comments
	TBD – Project improvements include demolishing the existing lifeguard headquarters, beach restroom and helipad currently threatened by coastal erosion and reconstructing these facilities at a higher elevation and closer to the realigned access road. Specific site design/s, identified mitigation measures and/or conditions of approval, and findings of the Biological report to confirm avoidance of H1 habitat and marine resources.
CO-92 Leachfields shall be located at least 100 feet and seepage pits shall be located at least 150 feet from any stream, as measured from the outer edge of riparian canopy, or from the stream bank where no riparian vegetation is present, and at least 50 feet outside the dripline of existing oak, sycamore, walnut, bay, and other native trees. The County shall ensure that new leachfields and seepage pits permitted by the County comply with all applicable Water Resources Control Board requirements. The LCP may be updated, pursuant to an LCP amendment that is certified by the Coastal Commission, to reflect new Water Resources Control Board requirements.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. See consistency analysis for CO-2 **Alternatives 2-4** ***Potentially Consistent*** – Various OWTS solutions for all restoration project alternatives are being evaluated for feasibility and consistency with LCP and other regulatory requirements. Consistency to be reviewed based on further assessment and site designs/specifications.
CO-93 Public accessways, trails, and low-impact campgrounds shall be an allowed use in H1 and H2 habitat areas. Accessways to and along the shoreline shall be sited, designed, and managed to avoid and/or protect marine mammal hauling grounds, seabird nesting and roosting sites, sensitive rocky points and intertidal areas, and coastal dunes. Inland public trails and low-impact campgrounds shall be located, designed, and maintained to avoid or minimize impacts to H1 or H2 habitat areas and other coastal resources by utilizing established trail corridors, following natural contours to minimize grading, and avoiding naturally-vegetated areas with significant native plant species to the maximum extent feasible. Trails shall be constructed in a manner that minimizes grading and runoff.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than permitted, minor resource-dependent habitat restoration is proposed. **Alternatives 2-4** ***Potentially Consistent*** – It is anticipated that only permitted, resource-dependent habitat restoration and passive public access and recreational activities will occur within H1 and H2 habitat areas Specific site designs, identified mitigation measures and/or conditions of approval will ensure that public accessway and trail improvements are sited, designed, and managed to avoid and/or protect marine mammal hauling grounds, seabird nesting and roosting sites, sensitive rocky points and intertidal areas, and coastal dunes where these resources may occur in the project area. Specific site designs, identified mitigation measures and/or conditions of approval will also ensure that inland public trails are located, designed, and maintained to avoid or minimize impacts to H1 or H2 habitat areas and other coastal resources by utilizing established trail corridors, following natural contours to minimize grading, and avoiding naturally-vegetated areas with significant native plant species to the maximum extent feasible.
CO-94 Exterior lighting (except traffic lights, navigational lights, and other similar safety lighting) shall be minimized, restricted to low-intensity features, shielded, and cause no light to trespass into native habitat to minimize impacts on wildlife. Night lighting for development allowed in H2 or H3 habitat may be permitted when subject to the following standards. a. The minimum lighting necessary shall be used to light walkways used for entry and exit to the structures, including parking areas, on the site. This lighting shall be limited to fixtures that do not exceed two feet in height, that are directed downward, and use bulbs that do not exceed 60 watts, or the equivalent. All other lighting of driveways or access roads is prohibited. b. Security lighting shall be attached to the residence or permitted accessory structures that is controlled by motion detectors, and is limited to 60 watts, or the equivalent. c. Night lighting for sports courts or other private recreational facilities shall be prohibited except for minimal lighting for equestrian facilities as provided for in CO-103. d. Lighting is prohibited around the perimeter of the parcel or for aesthetic purposes. e. Prior to issuance of a CDP, the applicant shall be required to execute and record a deed restriction reflecting the above restrictions. Public agencies shall not be required to record a deed restriction, but may be required to submit a written statement agreeing to any applicable restrictions contained in this subsection.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than permitted, minor resource-dependent habitat restoration is proposed. **Alternatives 2-4** ***Potentially Consistent*** – Specific site design/s, identified mitigation measures and/or conditions of approval will ensure that any lighting associated with proposed restoration, recreational and/or visitor-serving uses and amenities will comply with LCP requirements addressing exterior lighting.
Fuel Modification Policies	

Biological Resources	Preliminary Analysis/Comments
CO-96 All new development shall be sited and designed to minimize required fuel modification and brushing to the maximum extent feasible in order to minimize habitat disturbance or destruction, removal or modification of natural vegetation, and irrigation of natural areas, while providing for fire safety. Development shall utilize fire-resistant materials. Alternative fuel modification measures, including but not limited to landscaping techniques to preserve and protect habitat areas, buffers, designated open space, or public parkland areas, may be approved by the Fire Department only where such measures are necessary to protect public safety. All development shall be subject to applicable federal, State and County fire protection requirements.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than permitted, minor resource-dependent habitat restoration is proposed. **Alternative 2 – Max Lagoon Habitat/Partial or Full Relocation of Existing Amenities in Phase 2** ***Consistent*** – No new habitable structures requiring fuel modification would be proposed and removal of existing amenities would reduce fuel modification requirements on the site. Specific site design/s, identified mitigation measures and/or conditions of approval will ensure that any remaining required fuel modification activities will comply with applicable LCP requirements addressing fire-resistant materials and alternative fuel modification measures, including but not limited to landscaping techniques to preserve and protect habitat areas, buffers, designated open space, or public parkland areas. **Alternatives 3-4** ***Potentially Consistent*** – See consistency analysis for CO-77. In addition, specific site design/s, identified mitigation measures and/or conditions of approval will ensure that any required fuel modification activities will comply with applicable LCP requirements addressing fire-resistant materials and alternative fuel modification measures, including but not limited to landscaping techniques to preserve and protect habitat areas, buffers, designated open space, or public parkland areas.
CO-97 As required by Policy SN-35, applications for new development shall include a fuel modification plan for the project site, approved by the County Fire Department. Additionally, applications shall include a site plan depicting the brush clearance, if any, that would be required on adjacent properties to provide fire safety for the proposed structures.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than permitted, minor resource-dependent habitat restoration is proposed. **Alternatives 2-4** ***Potentially Consistent*** – Specific site design/s, identified mitigation measures and/or conditions of approval will ensure that any required fuel modification activities are implemented pursuant to an approved fuel modification plan.
CO-98 Applications for new development shall include the total acreage of natural vegetation that would be removed or made subject to thinning, irrigation, or other modification by the proposed project, including building pad and road/driveway areas, as well as required fuel modification on the project site and brush clearance on adjoining properties.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than permitted, minor resource-dependent habitat restoration is proposed. **Alternatives 2-4** ***Potentially Consistent*** –Specific site design/s, identified mitigation measures and/or conditions of approval will ensure that any required fuel modification activities are identified and the total acreage of natural vegetation that would be removed or made subject to thinning, irrigation or other modification identified on the fuel modification plan or Biological Report findings.
Tree Protection Policies	
CO-99 New development shall be sited and designed to preserve oak, walnut, sycamore, bay, or other native trees to the maximum extent feasible that are not otherwise protected as H1 or H2 habitat and that have at least one trunk measuring six inches or more in diameter, or a combination of any two trunks measuring a total of eight inches or more in diameter, measured at four and one-half feet above natural grade. Removal of native trees shall be prohibited except where no other feasible alternative exists. Development shall be sited to prevent any encroachment into the protected zone of individual native trees to the maximum extent feasible, as set forth below. Protected Zone means that area within the dripline of the tree and extending at least five feet beyond the dripline, or 15 feet from the trunk of the tree, whichever is greater. Removal of native trees or encroachment in the protected zone shall be prohibited for accessory uses or structures. If there is no feasible alternative that can prevent tree removal or encroachment, then the alternative that would result in the fewest or least-significant impacts shall be selected. Adverse impacts to native trees shall be fully mitigated, with priority given to on-site mitigation. Mitigation shall not substitute for implementation of the feasible	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than permitted, minor resource-dependent habitat restoration is proposed. **Alternatives 2-4** ***Potentially Consistent*** – Detailed tree survey information has been developed to identify all trees onsite protected by LCP policy requirements and to assess potential project impacts of each alternative. Specific site design/s, identified mitigation measures and/or conditions of approval will ensure that impacts to protected trees are avoided to the maximum extent feasible, and that all unavoidable impacts to protected tree species will be identified and mitigation implemented consistent with the requirements of the LCP.

Biological Resources	Preliminary Analysis/Comments
project alternative that would avoid impacts to native trees and/or woodland habitat. When unavoidable adverse impacts to native trees will result from permitted development, the impacts must be mitigated in accordance with the following standards and subject to a condition of approval requiring a native tree replacement planting program: Table 1. Native Tree Mitigation Impact Mitigation Ratio (no. of replacement trees required for every 1 tree impacted/removed) Removal - 10:1 > 30% encroachment into protected zone - 10:1 Encroachment that extends within 3 ft. of tree trunk - 10:1 Trimming branch with over 11 in. diameter without encroachment within 3 ft. of tree trunk - 5:1 10-30% encroachment into protected zone without encroachment within 3 ft. of tree trunk - 5:1 < 10% encroachment into protected zone and without encroachment within 3 ft. of tree trunk - None. Monitoring required. Where development encroaches into less than 30 percent of the protected zone of native trees, each affected tree shall be monitored annually for a period of not less than 10 years. An annual monitoring report shall be submitted for review by the County for each of the 10 years. Should any of these trees be lost or suffer worsened health or vigor as a result of the proposed development, the applicant shall mitigate the impacts at a 10:1 ratio with seedling-sized trees.	
CO-100 New development on sites containing oak, walnut, sycamore, bay, or other native trees shall incorporate the following native tree protection measures: a. Protective fencing shall be used around the outermost limits of the protected zones of the native trees within or adjacent to the construction area that may be disturbed during construction or grading activities. Before the commencement of any clearing, grading, or other construction activities, protective fencing shall be placed around each applicable tree. Fencing shall be maintained in place for the duration of all construction. No construction, grading, staging, or materials storage shall be allowed within the fenced exclusion areas, or within the protected zones of any onsite native trees. b. Any approved development, including grading or excavation, that encroaches into the protected zone of a native tree shall be undertaken using only hand-held tools. c. The applicants shall retain the services of a qualified independent biological consultant or arborist, approved by the Director, to monitor native trees that are within or adjacent to the construction area. Public agencies may utilize their own staff who have the appropriate classification. If any breach in the protective fencing occurs, all work shall be suspended until the fence is repaired or replaced.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than permitted, minor resource-dependent habitat restoration is proposed. **Alternatives 2-4** ***Potentially Consistent*** –Specific site design/s, identified mitigation measures and/or conditions of approval will ensure that LCP-required tree protection measures, including protective fencing, hand excavation and monitoring, are implemented for all activities potentially impacting protected trees.
Restoration	
CO-101 Any CDP for development that includes impacts to H1, H2 "High Scrutiny" or H2 habitat that are required to be reduced or mitigated through habitat restoration and/or enhancement shall include a condition requiring the preparation and implementation of a detailed habitat restoration/enhancement plan that, at a minimum, includes all of the following: a. A detailed restoration or enhancement plan. The habitat restoration area shall be delineated on a detailed site plan, to scale, that illustrates the parcel boundaries, topography, existing habitat types, species, size, and location of all native plant materials to be planted. The habitat restoration plan shall be prepared by a qualified resource specialist or biologist familiar with the ecology of the Santa Monica Mountains and shall be designed to restore the area in question for habitat function, species diversity and vegetation cover appropriate for the type of habitat impacted. The restoration plan shall include an evaluation of existing habitat quality, statement of goals and performance standards, revegetation and restoration methodology, and maintenance and monitoring provisions; and	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Consistent*** – The primary purpose of the proposed project is to implement restoration activities to protect and enhance a variety of sensitive habitats and special status species; therefore, Policy CO-101 is not directly applicable to proposed project activities. However, Alternatives 2-4 would further the intent of Policies CO-101 to protect, restore and maintain H1 and H2 resources in perpetuity.

Biological Resources	Preliminary Analysis/Comments
b. The habitat restoration/enhancement plan shall specify that habitat restoration and/or enhancement shall be monitored for a period of no less than five years following completion. Specific restoration objectives and performance standards shall be designed to measure the success of the restoration and/or enhancement. Mid-course corrections shall be implemented if necessary. Monitoring reports shall be provided to the County annually and at the conclusion of the five-year monitoring period that document the success or failure of the restoration. If performance standards are not met by the end of five years, the monitoring period shall be extended until the standards are met. The restoration will be considered successful after the success criteria have been met for a period of at least two years without any maintenance or remedial activities other than exotic species control. At the County's discretion, final performance monitoring will be conducted by an independent monitor or County staff with the appropriate classification, supervised by the staff biologist and paid for by the applicant. If success criteria are not met within 10 years, the applicant shall submit an amendment proposing alternative restoration.	

Hillside Management (Conservation and Open Space Element)	Preliminary Analysis/Comments
CO-108 Site and design new development to minimize the amount of grading and the alteration of natural landforms	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – Grading for restoration activities would be limited to that necessary to remove historic fill and re-establish a more natural topography onsite. Where amenities are to be retained and/or relocated, clustering of amenities and relocation of amenities closer to adjacent roads and development sites would minimize the overall grading footprint alteration of natural landforms.
CO-109 Site and design new development to protect natural features, and minimize removal of natural vegetation.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See consistency analysis for CO-108. In addition, where amenities are to be retained and/or relocated, clustering of amenities and relocation of amenities closer to adjacent roads and development sites would minimize the overall grading footprint and consolidate required fuel modification requirements thereby minimizing removal of natural vegetation.
CO-110 The height of structures shall be limited to minimize impacts to scenic resources.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – Specific site design/s, identified mitigation measures and/or conditions of approval will ensure that any relocated structures will be sited and designed to minimize impacts to scenic resources.
CO-111 Cut and fill grading may be balanced on-site where the grading does not substantially alter the existing topography and blends with the surrounding area. Exporting of excess soil may be required to preserve biotic, scenic, or other significant resources. Topsoil from graded areas shall be utilized for site landscaping where it does not substantially alter the existing topography and blends with the surrounding area.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – Specific site design/s, identified mitigation measures and/or conditions of approval will ensure that any excess soil will be disposed of at a permitted disposal site outside of the coastal zone.

Hillside Management (Conservation and Open Space Element)	Preliminary Analysis/Comments
CO-112 Ensure that development conforms to the natural landform and blends with the natural landscape in site, design, shape, materials, and colors. Building pads on sloping sites shall utilize split-level or stepped-pad designs.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – Specific site design/s, identified mitigation measures and/or conditions of approval will ensure that any relocated structures will be sited and designed to avoid landform alteration and impacts to native habitat, and to blend with the surrounding environmental through use of appropriate shape, materials, and colors.
CO-113 Restrict development on slopes of 50 percent or greater.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – A Slope Exhibit will be developed consistent with LCP requirements to identify slope areas on the project site. Specific site design/s, identified mitigation measures and/or conditions of approval will ensure that any relocated structures will be sited and designed to avoid steep slopes.
CO-114 New development shall be sited and designed to minimize the height and length of manufactured cut and fill slopes, and minimize the height and length of retaining walls. Graded slopes shall blend with the natural contours of the land and shall utilize landform grading.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** **-** Grading for restoration activities would be limited to that necessary to remove historic fill and re-establish a more natural topography onsite. Where amenities are to be retained and/or relocated for Alternatives 3 and 4, clustering of amenities and relocation of amenities closer to adjacent roads and development sites would minimize the overall grading footprint alteration of natural landforms. Further consistency to be reviewed based on preliminary grading plans and further site designs/specifications associated with proposed cut/fill grading quantities and retaining walls details.
CO-115 All structures on lots in hillside areas shall be clustered if clustering is shown to minimize site disturbance and grading. Development within a subdivision shall be clustered and utilize shared driveways.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** **–** See consistency analysis for CO-113 and CO-114.
CO-116 Require all cut and fill slopes and other disturbed areas to be landscaped and revegetated prior to the beginning of the rainy season utilizing native, drought-tolerant plant species that blend with existing natural vegetation and natural habitats of the surrounding area.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – Specific site design/s, identified mitigation measures and/or conditions of approval will ensure that any cut and fill slopes and other disturbed areas are landscaped and revegetated prior to the beginning of the rainy season utilizing native, drought-tolerant plant species that blend with existing natural vegetation and natural habitats of the surrounding area.

Open Space	Preliminary Analysis/Comments
CO-117 Require open space easements or deed restrictions as part of development projects on sites containing SERAs in order to ensure that approved building site areas are limited and impacts to coastal habitat are minimized.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Consistent*** – The primary purpose of the proposed project is to implement restoration activities to protect, restore

Open Space	Preliminary Analysis/Comments
	expand a variety of sensitive habitats and special status species within permanently protected open space in around Topanga Canyon Lagoon; therefore, Alternatives 2-4 would achieve the intent of Policy CO-117 to ensure that approved building site areas are limited and impacts to coastal habitat are minimized.
CO-120 Require that any new development or improvement is sited and designed so required fuel modification or brush clearance does not encroach into dedicated open space or parkland where feasible.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Consistent*** – See consistency analysis for CO-96-CO-98.
CO-122 Implement legal protections, such as deed restrictions and dedication of open space easements, to ensure designated open space lands are preserved in perpetuity.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Consistent*** – See consistency analysis for CO-117.

Scenic Resources	Preliminary Analysis/Comments
CO-124 The Santa Monica Mountains contain scenic resources of regional and national importance. The scenic and visual qualities of these resources shall be protected and, where feasible, enhanced.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – Proposed lagoon and upland restoration activities would enhance the scenic and visual qualities of the project area with expanded and restored open space on the project site. Lengthening and elevating the PCH Bridge could increase the visual mass of structure as viewed from surrounding areas, and could impact views to the shoreline from inland areas. However, potential view impacts could be offset by a new bridge design with less support structure and more open span across the lagoon. Removal, relocation and clustering of amenities would reduce visual impacts of the built environment. In addition, specific site design/s, identified mitigation measures and/or conditions of approval will ensure the location and design of improvements achieves overall compatibility with the visual resources in the area and therefore protects coastal visual resources to the greatest extent feasible.
CO-125 Protect public views within Scenic Areas and throughout the Coastal Zone. Places on, along, within, or visible from Scenic Routes, public parklands, public trails, beaches, and state waters that offer scenic vistas of the mountains, canyons, coastline, beaches, and other unique natural features are considered Scenic Resource Areas. Scenic Resource Areas do not include areas that are largely developed such as existing, predominantly built-out residential subdivisions. Scenic Resource Areas also include the scenic resources identified on Map 3 and consist of Scenic Elements, Significant Ridgelines, and Scenic Routes. In addition to the resources identified on Map 3, the public parkland and recreation areas identified on Map 4 are also considered Scenic Resource Areas.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See consistency analysis for CO-124.
CO-126 Maintain and enhance the quality of vistas along identified Scenic Routes. The following roadways are considered Scenic Routes: • Mulholland Scenic Corridor and County Scenic Highway; • Pacific Coast Highway (SR-1); • Malibu Canyon/Las Virgenes Road County Scenic Highway; • Kanan Dume Road; • Topanga Canyon Boulevard (SR-27);	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See consistency analysis for CO-124.

Scenic Resources	Preliminary Analysis/Comments
• Old Topanga Canyon Road; • Saddle Peak Road/Schueren Road; • Piuma Road; • Encinal Canyon Road; • Tuna Canyon Road; • Rambla Pacifico Road; • Las Flores Canyon Road; • Corral Canyon Road; • Latigo Canyon Road; • Little Sycamore Canyon Road; and • Decker Road	
CO-127 Protect public views of designated Scenic Elements and Significant Ridgelines, the ocean, and beaches. The viewshed and line-of-sight to these scenic resources shall also be preserved and protected.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See consistency analysis for CO-124.
CO-128 New development shall be subordinate to the character of its setting.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See consistency analysis for CO-108-116 (Hillside Management policies), CO-120 andCO-124.
CO-130 Preserve large areas of natural open space of high scenic value by siting development in existing developed areas.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See consistency analysis for CO-108-116 (Hillside Management policies), CO-120 andCO-124.
CO-131 Site and design new development to minimize adverse impacts on scenic resources to the maximum extent feasible. If there is no feasible building site location on the proposed project site where development would not be visible, then the development shall be sited and designed to minimize impacts on scenic areas through measures that may include, but not be limited to, siting development in the least visible portion of the site, breaking up the mass of new structures, designing structures to blend into the natural hillside setting, restricting the building maximum size, reducing maximum height, clustering development, minimizing grading, incorporating landscape and building material screening elements, and where appropriate, berming.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See consistency analysis for CO-114 and CO-124.
CO-132 Avoidance of impacts to scenic resources through site selection and design alternatives is the preferred method over landscape or building material screening. Landscape or building material screening shall not substitute for project alternatives including re-siting or reducing the height or bulk of structures.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See consistency analysis for CO-124.
CO-133 New development shall be sited and designed to minimize alteration of natural landforms by:	**Alternative 1 – No Project/Managed Decline**

Scenic Resources	Preliminary Analysis/Comments
a. Conforming to the natural topography. b. Preventing substantial grading or reconfiguration of the project site. c. Eliminating flat building pads on slopes. Building pads on sloping sites shall utilize split-level or stepped-pad designs. d. Requiring that manufactured contours mimic the natural contours. e. Ensuring that graded slopes blend with the existing terrain of the site and surrounding area. f. Minimizing grading permitted outside of the building footprint. g. Clustering structures to minimize site disturbance and to minimize development area. h. Minimizing height and length of cut and fill slopes. i. Minimizing the height and length of retaining walls. j. Cut and fill operations may be balanced on site, where the grading does not substantially alter the existing topography and blends with the surrounding area. Export of cut material may be required to preserve the natural topography.	***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See consistency analysis for CO-108, CO-109, CO-111, CO-114 and CO-124.
CO-134 The length of roads or driveways shall be minimized, except where a longer road or driveway would allow for an alternative building site location that would be more protective of scenic resources, H1 and H2 habitat areas, or other coastal resources. Driveway slopes shall be designed to follow the natural topography, unless otherwise required by the Fire Department. Driveways that are within or visible from a scenic resource shall be a neutral color that blends with the surrounding landforms and vegetation.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-3** ***TBD*** – Policy applicability and consistency to be reviewed based on further site designs/specifications to be developed per Fire Department requirements.
CO-135 Preserve topographic features of high scenic value in their natural state, including canyon walls, geological formations, creeks, ridgelines, and waterfalls.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – Proposed restoration activities would restore the natural creek corridor and lagoon topography to the extent feasible. In addition, specific site design/s, identified mitigation measures and/or conditions of approval will ensure that any additional topographic features of high scenic value will be preserved.
CO-137 Preserve and, where feasible, restore and enhance individual native trees and native tree communities in areas containing suitable native tree habitat – especially oak, walnut, and sycamore woodlands and savannas – as important elements of the area's scenic character.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See consistency analysis for CO-99 and CO-100.
CO-138 New development shall minimize removal of native vegetation.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See consistency analysis for See consistency analysis for CO-108-116 (Hillside Management policies) and CO-120.
CO-139 Cut and fill slopes and other areas disturbed by construction activities shall be landscaped or revegetated prior to the beginning of the rainy season, unless the County Biologist determines that another time would be more advantageous for the long-term success of the vegetation included in the landscaping/revegetation project. All such landscaping/vegetation shall include only native, drought-tolerant plant species that blend with the existing natural vegetation.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See consistency analysis for See consistency analysis for CO-108-116 (Hillside Management policies), CO-120 and CO-124.
CO-140 Prohibit placing new and phase out any existing offsite advertising signs and onsite pole signs upon change of use, along designated scenic routes. Prohibit the placement of signs (except traffic control signs), utilities, and accessory equipment that would adversely impact public views to the ocean, parks, and scenic resources wherever feasible.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-3**

Scenic Resources	Preliminary Analysis/Comments
	TBD – Policy applicability and consistency to be reviewed based on further site designs/specifications.
CO-141 Limit and design exterior lighting to preserve the visibility of the natural night sky and stars, to the extent feasible and consistent with public safety. Los Angeles County will periodically update the LIP's Dark Skies requirements, to ensure that they are consistent with the most current Dark Skies science, technology, and best practices in the field, beginning five years after the LCP's certification date.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See consistency analysis for CO-94.
CO-142 Maintain dark skies in the Coastal Zone by reducing light pollution and requiring best available Dark Skies technology in all permitted lighting and compliance with Dark Skies principals and best practices to the maximum extent feasible. Only very limited night lighting for equestrian facilities shall allowed and must be consistent with Policy CO-103. Night lighting for sport courts or other private recreational facilities shall be prohibited.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See consistency analysis for CO-94.
CO-143 All new structures shall avoid large cantilevers or understories. Cantilevers and understories shall be minimized and covered with materials that blend with the surrounding landscape.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-3** ***TBD*** – Policy applicability and consistency to be reviewed based on further site designs/specifications.
CO-144 New development shall incorporate colors and exterior materials that are compatible with the surrounding landscape. The use of highly-reflective materials shall be prohibited, with the exception of solar panels.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See consistency analysis for CO-112.
CO-145 Solar energy devices/panels shall be sited on the rooftops of permitted structures, where feasible to minimize site disturbance and the removal of native vegetation. If roof-mounted systems are infeasible, ground-mounted systems may be allowed only if sited within the building site area of permitted development. Wind energy systems are prohibited.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-3** ***TBD*** – Policy applicability and consistency to be reviewed based on further site designs/specifications.
CO-146 Encourage the undergrounding of all existing and future utilities as funding is available.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-3** ***TBD*** – Policy applicability and consistency to be reviewed based on further site designs/specifications.
CO-147 Limit the height of structures above existing grade to minimize impacts to visual resources. Within scenic areas, the maximum allowable height shall be 18 feet above existing or finished grade, whichever is lower. Chimneys, rooftop solar equipment and non-visually-obstructing rooftop antennas may be permitted to extend above the allowable height of the structure, but shall not extend more than six feet above the maximum allowable height.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – Specific site design/s, identified mitigation measures and/or conditions of approval will ensure that any relocated structures will be sited and designed to minimize impacts to scenic resources.
CO-148 Design and locate signs to minimize impacts to visual resources. Signs approved as part of commercial development shall be part of a coordinated sign program incorporated into the design of the project and shall be subject to bulk, height, and width limitations.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-3** ***TBD*** – Policy applicability and consistency to be reviewed based on further site designs/specifications.
CO-149 Fences, gates, and walls shall be designed to incorporate veneers, texturing, and/or colors that blend in with the surrounding natural landscape, and shall not present the appearance of a bare wall.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4**

Scenic Resources	Preliminary Analysis/Comments
	Potentially Consistent – Specific site design/s, identified mitigation measures and/or conditions of approval will ensure that any fencing, gates and walls associated with proposed restoration and recreational activities comply with LCP policies addressing impacts to public views and visual compatibility.
CO-150 Fences, gates, walls, and landscaping shall minimize impacts to public views of scenic areas, and shall be compatible with the character of the area.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See consistency analysis for CO-149.
CO-151 Limit height of retaining walls by using stepped or terraced retaining walls, with plantings in-between. Where feasible, long continuous walls shall be broken into sections or shall include undulations to provide visual relief.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternative 2 – Max Lagoon Habitat/Partial or Full Relocation of Existing Amenities in Phase 2** ***Consistent*.** No new retaining walls proposed. **Alternatives 3-4** ***TBD –*** Consistency to be reviewed based on preliminary grading plans and further site designs/specifications associated with retaining walls details.
CO-153 Public works projects along scenic routes that include hardscape elements such as retaining walls, cut-off walls, abutments, bridges, and culverts shall incorporate veneers, texturing, and colors that blend with the surrounding landscape. The design of new bridges on scenic routes shall be compatible with the rural character of the Santa Monica Mountains and designed to protect scenic views.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***TBD –*** Consistency to be reviewed based on preliminary bridge replacement plans and further site designs/specifications associated with bridge structure details.

Recreation and Trails	Preliminary Analysis/Comments
CO-155 The beaches, parklands and trails located within the Coastal Zone provide a wide range of recreational opportunities in natural settings which include hiking, equestrian activities, bicycling, camping, educational study, picnicking, and coastal access. These recreational opportunities shall be protected, and where feasible, expanded or enhanced as a resource of regional, State and national importance, and allowed to migrate when feasible with rising sea level.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. However, the No Project alternative would generally maintain existing site conditions and therefore would not serve to expand or enhance public access recreational opportunities onsite. **Alternatives 2-4** ***Consistent*** – Proposed restoration project alternatives would include a variety of expanded and improved passive shoreline access and inland recreational opportunities.
CO-156 Encourage a full range of recreational experiences to serve local, regional and national visitors with diverse backgrounds, interests, ages, and abilities, including the transit-dependent and the physically challenged.	**Alternatives 1-4** ***Consistent*** - See policy analysis for CO-155.
CO-157 In carrying out the requirements of Section 4 of Article X of the California Constitution, maximum access, which shall be conspicuously posted, and recreational opportunities shall be provided for all the people consistent with public safety needs and the need to protect public rights, rights of private property owners, and natural resource areas from overuse.	**Alternatives 1-4** ***Consistent*** - See policy analysis for CO-155.
CO-158 Wherever appropriate and feasible, public facilities, including parking areas or facilities, shall be distributed throughout an area so as to mitigate against the impacts, social and otherwise, of overcrowding or overuse by the public of any single area.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. However, the No Project alternative would generally maintain existing site conditions and therefore would not serve to expand or enhance public access recreational opportunities onsite. **Alternatives 2-4**

Recreation and Trails	Preliminary Analysis/Comments
	Potentially Inconsistent – Proposed restoration project alternatives would include a variety of expanded and improved passive shoreline access and inland recreational support facilities which would vary depending on alternative. However, project alternatives would result in an overall reduction of public parking resources within the project area, which could adverse effect public access to the shoreline and inland park resources and contribute to overburdening other resources near the project area. Specific site design/s, identified mitigation measures and/or conditions of approval may address alternative parking options and/or access opportunities (transit, etc.) to offset the loss of parking and findings of a parking demand and capacity analysis to confirm consistency determination.
CO-159 Lower-cost visitor-serving and recreational facilities, including overnight accommodations, shall be protected, encouraged, and, where feasible, provided. Developments providing public recreational opportunities are preferred. Priority shall be given to the development of visitor-serving commercial and/or recreational uses that complement public recreation areas or supply recreational opportunities not currently available in public parks or beaches. Visitor-serving commercial and/or recreational uses may be located near public park and recreation areas only if the scale and intensity of the visitor-serving commercial recreational uses is compatible with the character of the nearby parkland and all applicable provisions of the LCP.	**Alternative 1 – No Project/Managed Decline** ***Potentially Inconsistent***. No new development other than minimal habitat restoration proposed. However, the No Project alternative would generally maintain existing site conditions allowing for continued degradation of historically available low-cost overnight accommodations (LCOAs) and visitor-serving uses and therefore would not serve to protect and provided these high priority uses. **Alternative 2 Max Lagoon Habitat/Partial or Full Relocation of Existing Amenities in Phase 2** ***Potentially Inconsistent***. Maximum habitat restoration activities would involve removal of public parking spaces, the Topanga Ranch Motel and existing visitor-serving uses, which could be relocated to the west side of Topanga Canyon Boulevard in a future design phase. However, removal of these amenities would result in at a least a temporal impact to coastal public access, LCOAs and visitor-serving uses. **Alternatives 3-4** ***Potentially Consistent*** – Proposed restoration project alternatives would include a range of recreational, LCOAs and visitor-serving uses depending on alternative. Specific site design/s, identified mitigation measures and/or conditions of approval would ensure the scale and intensity of the recreational, low-cost overnight accommodations and visitor-serving uses are compatible with the character of the project area.
CO-160 These public access policies shall be implemented in a manner that takes into account the need to regulate the time, place, and manner of public access depending on the facts and circumstances in each case including, but not limited to, the following: a. Topographic and geologic site characteristics. b. The capacity of the site to sustain use and at what level of intensity. c. The appropriateness of limiting public access to the right to pass and repass depending on such factors as the fragility of the natural resources in the area and the proximity of the access area to adjacent residential uses. d. The need to provide for the management of access areas so as to protect the privacy of adjacent property owners and to protect the aesthetic value of the area by providing for the collection of litter. In carrying out the public access policies of this LUP, the County shall consider and encourage the utilization of innovative access management techniques, including, but not limited to, agreements with private organizations which would minimize management costs and encourage the use of volunteer programs.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – Proposed restoration project alternatives would include a variety of expanded and improved passive shoreline access and inland recreational opportunities and specific site design/s, identified mitigation measures and/or conditions of approval would ensure the location, intensity and timing of public access are consistent with all applicable natural resource and operational constraints, and adjacent land uses.
CO-161 Oceanfront land suitable for recreational use shall be protected for recreational use and development unless present and future foreseeable demand for public or commercial recreational activities that could be accommodated on the property is already adequately provided for in the area.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Consistent*** – Proposed restoration project alternatives would protect and maximize the beach area for recreational use by varying degrees depending on the project alternative, by relocating and clustering the existing lifeguard headquarters, beach restroom and helipad currently threatened by coastal erosion at a higher more inland location and closer to the realigned access road, and by realigning the PCH bridge access to a more inland location, as

Recreation and Trails	Preliminary Analysis/Comments
	applicable.
CO-162 The California Coastal Trail (CCT) shall be identified and defined as a continuous trail system traversing the length of the State's coastline and designed and sited as a continuous lateral trail traversing the length of the coastal zone and connecting with contiguous trail links in adjacent coastal jurisdictions.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***TBD –*** Consistency to be reviewed based on further site designs/specifications for existing and proposed trail improvements.
CO-163 The CCT shall be designed and implemented to achieve the following objectives: a. Provide a continuous walking and hiking trail as close to the ocean as possible; b. Provide maximum access for a variety of non-motorized uses by utilizing alternative trail segments where feasible; c. Maximize connections to existing and proposed local trail systems; d. Ensure that all segments of the trail have vertical access connections at reasonable intervals; e. Maximize ocean views and scenic coastal vistas; f. Plan to relocate or replace trail segments so that the CCT can adapt to rising sea level; g. Provide an educational experience where feasible through interpretive facilities.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***TBD –*** Consistency to be reviewed based on further site designs/specifications for existing and proposed trail improvements.
CO-164 Encourage opportunities for recreation throughout the Plan area when consistent with environmental values and protection of natural resources. a. Park and recreation uses shall be consistent with the visitor carrying capacity of specific areas, taking into consideration available support facilities, opportunities to develop new support facilities, accessibility, protection of natural resources, public safety issues, and neighborhood compatibility. b. Regulate use to preserve resource values within natural areas intended for the protection of vegetative, habitat, and scenic resources. c. Establish the facilities necessary for information, first aid, orientation, recreation, interpretation, education, and recreation area maintenance and operations, where appropriate. Site and design these facilities to minimize impacts to coastal resources in harmony with the surrounding natural landscape. d. At the periphery of areas devoted to recreation, provide sufficient staging and parking areas at trail access points, including space to accommodate horse trailers where needed and appropriate; to ensure adequate access to the trails system, campgrounds, roadside rest, and picnic areas where suitable; to provide visitor information; and to establish day-use facilities, where the facilities are developed and operated in a manner consistent with the policies of the LUP and compatible with surrounding land uses. e. Overnight campgrounds, including "low-impact" campgrounds, are permitted uses in parklands and are encouraged within park boundaries for public use to provide a wider range of recreational opportunities and low-cost visitor-serving opportunities for visitors of diverse abilities, where impacts to coastal resources are minimized and where such sites can be designed within site constraints and to adequately address public safety issues. These campgrounds help provide recreational opportunities and low-cost visitor-serving opportunities for visitors. Low-impact campgrounds constitute a resource-dependent use. Access to low-impact campgrounds shall be supported by parking areas and designated ADA drop-offs that may be located in H2 or H3 habitat areas, where it is infeasible to site such facilities in non-habitat areas. f. In selected areas where physical constraints of natural park areas limit access opportunities for people with disabilities, park support facilities and amenities shall be developed and maintained, where consistent with public safety needs and resource protection policies to provide access opportunities for people with disabilities, and thematically link nature study, education and recreation via specialized public programs and events.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***TBD***– See policy analysis for CO-158, CO-159, and CO-160. Consistency to be reviewed based on further site designs/specifications for existing and proposed trail, parking and LCOAs.
CO-165 Public land, including rights of way, easements, and dedications, shall be utilized for public recreation or access purposes, where appropriate and consistent with public safety and the protection of SERAs.	**Alternatives 1-4**

Recreation and Trails	Preliminary Analysis/Comments
	Consistent - See policy analysis for CO-155.
CO-167 Upland areas necessary to support coastal recreational uses shall be reserved for such uses, where feasible.	**Alternatives 1-4** ***Consistent*** - See policy analysis for CO-155.
CO-170 Locate development of visitor-serving commercial recreational facilities at sites which provide convenient public access, adequate infrastructure, sufficient and safe parking, and that are designed to enhance public opportunities for recreation.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***TBD***– See policy analysis for CO-158, CO-159, and CO-160. Consistency to be reviewed based on further site designs/specifications for existing and proposed trail, parking and LCOAs.
CO-171 Allow visitor-serving commercial recreational uses near public parklands and recreation areas only if the development does not overload nearby recreation areas. This shall be determined by the scale and intensity of the proposed use and the compatibility with the character of the nearby parkland and recreation area.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See policy analysis for CO-160.
CO-172 Provide adequate parking to serve recreation uses. Existing parking areas serving recreational uses shall not be displaced unless a comparable replacement area is provided.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Inconsistent*** – Proposed restoration project alternatives would result in an overall reduction of public parking resources within the project area, which could adverse effect public access to the shoreline and inland park resources and contribute to overburdening other resources near the project area. Specific site design/s, identified mitigation measures and/or conditions of approval may address alternative parking options and/or access opportunities (transit, etc.) to offset the loss of parking and findings of a parking demand and capacity analysis to confirm consistency determination.
CO-173 New development shall provide off-street parking sufficient to serve the approved use to minimize impacts to public street parking available for coastal access and recreation. Off-street parking for private use shall be adequate for the use, but may be reasonably restricted to protect existing uses or public safety where it is demonstrated that the proximity to a public area with a parking fee is causing the private area to be used for parking instead of the public parking area.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Inconsistent*** – See policy analysis for CO-172.
CO-174 The implementation of restrictions on public parking, which would impede or restrict public access to beaches, trails or parklands, (including, but not limited to, the posting of “no parking” signs, red curbing, physical barriers, imposition of maximum parking time periods, and preferential parking programs) shall be prohibited except where such restrictions are needed to protect public safety and where no other feasible alternative exists to provide public safety. Where feasible, an equivalent number of public parking spaces shall be provided nearby as mitigation for impacts to coastal access and recreation.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Inconsistent*** – See policy analysis for CO-172.
CO-176 Provide safe and accessible bikeways on existing roadways (see Map 4 Recreation) and support related facilities, where feasible, through the implementation of the adopted Bikeways Plan in the County General Plan.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***TBD*** – Consistency to be reviewed based on further site designs/specifications for existing and proposed bike facilities.
CO-178 Coordinate with the National Park Service, the California Department of Parks and Recreation, the State Coastal Conservancy, Caltrans, the City of Malibu, the Mountains Recreation and Conservation Authority, and the Santa Monica Mountains Conservancy to provide a comprehensive signage program to identify public parks, trails and accessways. Said signage program should be designed to minimize conflicts between public and private property uses.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***TBD*** – Consistency to be reviewed based on further site designs/specifications for existing and proposed bike sign

Recreation and Trails	Preliminary Analysis/Comments
	improvements.
CO-179 Protect and, where possible, enhance recreation and access opportunities at existing public beaches and parks as an important coastal resource. Public beaches and parks shall maintain lower-cost user fees and parking fees and maximize affordable public access and recreation opportunities to the extent possible. Limitations on time of use or increases in use fees or parking fees, which affect the intensity of use, shall be subject to a coastal development permit.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***TBD*** – Consistency to be reviewed based on further site designs/specifications for existing and proposed parking facilities and use fees.
CO-180 The extension of public transit facilities and services, including shuttle programs, to maximize public access and recreation opportunities shall be encouraged, where feasible.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***TBD*** – Consistency to be reviewed based on further site designs/specifications for existing and proposed public transit opportunities.
CO-181 Protect and enhance the County's existing and proposed trails as shown on Map 4 Recreation. An extensive public trail system has been developed across the Santa Monica Mountains that provides public coastal access and recreation opportunities. This system includes trails located within public parklands as well as those which cross private property. a. New development shall be reviewed to determine the most appropriate means to protect trails. Depending on the size, location, impacts, and intensity of the proposed development, one of the following may be imposed: a setback from the trail, a trail easement, or a trail dedication. If an easement or dedication is required, it shall preferably be made to a qualified public agency or land conservation organization operating outdoor recreation facilities in the Santa Monica Mountains. b. New development shall minimize and avoid whenever possible impacts to the use of or views from existing trails. c. As funding becomes available, and consistent with constitutional principles regarding property rights, develop the proposed trails as shown on Map 4 Recreation. d. Design a trail system to provide linkages between major regional trails and area recreational facilities. Proposed trail locations are not intended to be precise, and the best and most feasible route would be determined as a result of further study during any review of a coastal development permit (see Map 4 Recreation). e. Locate trails and trail facilities, including parking areas, in a manner that preserves natural resources, including scenic values, wildlife habitats and corridors, and water quality and that ensures maximum adaptive capacity to address sea level rise. f. Prohibit motorized off-road vehicle use on the area trails system; restrict mountain bike use to designated multi-use trails specifically designed and identified for bicycles and where conflict with equestrian and hiking uses would not occur. g. Preserve public rights when development is proposed, by obtaining trail easements where the public has acquired these rights through use, or where the trail is depicted on Map 4 Recreation to the maximum extent allowed by constitutional principles. Conduct a review of each development proposal to determine whether there is a nexus between the development's impacts and obtaining a trail easement, and to determine whether obtaining a trail easement is proportional mitigation for the impacts of the proposed development. Trail easements shall be dedicated to a public agency or land conservation organization operating outdoor recreation facilities in the Santa Monica Mountains. h. Public accessways and trails are resource-dependent and shall be an allowed use in all habitat categories. Where necessary (determined by consideration of supporting evidence), limited or controlled methods of access and/or mitigation designed to eliminate or minimize impacts to H1 and H2 habitat areas shall be utilized. Accessways to and along the shoreline shall be sited, designed, and managed to avoid and/or protect marine mammal hauling grounds, seabird nesting and roosting sites, sensitive rocky points and intertidal areas, and coastal dunes. i. Public accessways and trails to the shoreline and public parklands shall be a permitted use in all land use and zoning designations. Where there is an existing, but unaccepted and/or unopened public access offer-to-dedicate (OTD), easement, or deed restriction for lateral, vertical or trail access or related support facilities (e.g., parking) construction of	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***TBD***– See policy analysis for CO-160. Consistency to be reviewed based on further site designs/specifications for existing and proposed trails.

Recreation and Trails	Preliminary Analysis/Comments
necessary access improvements shall be permitted to be constructed, opened and operated for its intended public use where it is consistent with all other provisions of the LCP.	
CO-182 Development shall not interfere with the public's right of access to the sea where acquired through use or legislative authorization, including, but not limited to, the use of dry sand and rocky coastal beaches to the first line of terrestrial vegetation.	**Alternatives 1-4** ***Consistent*** - See policy analysis for CO-155.
CO-183 Public access from the nearest public roadway to the shoreline and along the coast shall be provided in new development projects except where: (1) it is inconsistent with public safety, military security needs, or the protection of fragile coastal resources, (2) adequate access exists nearby, or (3) agriculture would be adversely affected. Dedicated accessways shall not be required to be opened to public use until a public agency or private association agrees to accept responsibility for maintenance and liability of the accessway.	**Alternatives 1-4** ***Consistent*** - See policy analysis for CO-160.
CO-184 Coastal areas suited for water-oriented recreational activities that cannot readily be provided at inland water areas shall be protected for such uses.	**Alternatives 1-4** ***Consistent*** - See policy analysis for CO-155 and CO-161.

Shoreline and Beaches	Preliminary Analysis/Comments
CO-187 Development in areas adjacent to sensitive marine and beach habitats shall be sited and designed to prevent impacts that could significantly degrade the environmentally sensitive habitats. All proposed uses shall be compatible with maintaining the biological productivity and integrity of such habitats.	**Alternative 1** – No Project/Managed Decline ***Consistent.*** No new development other than permitted, minor resource-dependent habitat restoration is proposed. **Alternatives 2-4** **TBD** – It is anticipated that only permitted, resource-dependent habitat restoration and passive public access and recreational activities will occur within sensitive marine and beach habitats areas; however, specific site designs will confirm that relocation of facilities on the beach will not result in new structure, grading or fuel modification impacts beyond what currently exists onsite. In addition, it is anticipated that proposed site improvements will include project design features, mitigation measures and/or conditions of approval to ensure improvements are located and measures are implemented to avoid or minimize impacts to sensitive marine and beach habitats areas to the maximum extent feasible.
CO-188 Protect marsh-wetland habitats, restore biological productivity where possible, and ensure adaptive capacity to address rising sea level.	**Alternative 1 – No Project/Managed Decline** ***Inconsistent***. No new development other than minimal habitat restoration proposed. However, the No Project alternative would generally maintain existing site conditions and therefore would not serve to restore biological productivity of the lagoon habitat, where possible, and would not ensure adaptive capacity of the lagoon to address rising sea level. **Alternative 2 – Max Lagoon Habitat/Partial or Full Relocation of Existing Amenities in Phase 2** ***Potentially Consistent*** – Maximum habitat restoration activities, increased habitat buffers, and lengthening of the PCH bridge would help restore water quality and tidal circulation of the lagoon, improve conveyance of stream flow and sediment transport from inland areas, improve passage of fish and other aquatic species, and help to restore natural shoreline processes, thereby improving water quality and enhancing the biological productivity of marine resources in the lagoon. In addition, it is anticipated that proposed site modifications to restore, remove and/or relocate existing amenities will include project design features, identified mitigation measures and/or conditions of approval will identify and require site design BMPs, source control BMPs, and treatment control BMPs to improve the treatment of stormwater runoff over existing conditions, resulting in improved water quality to ensure that water quality and marine resources are maintained, enhanced, and where feasible, restored. **Alternative 3 – Limited Lagoon Habitat/Retention & Restoration of Existing Amenities** ***Potentially Consistent*** – Same as Alternative 2; however, retention and restoration of existing amenities would

Shoreline and Beaches	Preliminary Analysis/Comments
	involve less extensive habitat restoration and less new/extended habitat buffer areas. **Alternative 4 – Max Managed Retreat/Realign PCH Inland/Partial Retention & Modification of Existing Amenities** ***Potentially Consistent*** - Same as Alternative 3, but increased PCH bridge lengthening and realignment inland may serve to better restore natural shoreline processes and may further improve tidal circulation of the lagoon, conveyance of stream flow and sediment transport from inland areas, passage of fish and other aquatic species.
CO-189 Prohibit the alteration or disturbance of marine mammal habitats and other sensitive resources, including haul-out areas, by recreational or any other new land uses.	**Alternative 1 – No Project/Managed Decline** ***Consistent.*** No new development other than minimal habitat restoration proposed. **Alternatives 2-4** **Potentially Consistent** – It is anticipated that only permitted, resource-dependent habitat restoration and passive public access and recreational activities will occur within sensitive marine and beach habitats areas. In addition, it is anticipated that proposed site improvements will include project design features, mitigation measures and/or conditions of approval to ensure no alteration or disturbance of marine mammal habitats and other sensitive resources, including haul-out areas, would occur for recreational or any other new land uses.
CO-190 Protect and enhance dune H1 habitat areas and other beach habitats. With the exception of vehicles utilized for emergency or official purposes, traffic through dunes and on the beach shall be prohibited. Such vehicular uses shall avoid sensitive habitat areas. Pedestrian traffic through dunes, where specifically permitted, shall use well-defined footpaths or other directed means of circulation. Nesting and roosting areas for sensitive birds shall be protected by measures including, but not limited to, fencing, signage, or seasonal access restrictions.	**Alternative 1 – No Project/Managed Decline** ***Consistent.*** No new development other than minimal habitat restoration proposed. **Alternatives 2-4** **Potentially Consistent** – It is anticipated that only permitted, resource-dependent habitat restoration and passive public access and recreational activities will occur within H1 dune habitat areas. In addition, it is anticipated that proposed site improvements will include project design features, mitigation measures and/or conditions of approval to ensure pedestrian traffic through dunes is controlled to minimize impacts to sensitive dune habitat and nesting and roosting areas for sensitive birds.
CO-191 Preserve and, where feasible, enhance nearshore shallow water fish habitats.	**Alternative 1 – No Project/Managed Decline** ***Consistent.*** No new development other than minimal habitat restoration proposed. **Alternatives 2-4** **Potentially Consistent** – Proposed restoration activities would help restore water quality and tidal circulation of the lagoon, improve conveyance of stream flow and sediment transport from inland areas, improve passage of fish and other aquatic species, and help to restore natural shoreline processes, thereby potentially improving water quality and enhancing the biological productivity of nearshore marine habitats.
CO-192 Lagoon breaching or water level modification shall not be permitted, unless it can be demonstrated that there is a health or safety emergency, there is no feasible less-environmentally- damaging alternative, and all feasible mitigation measures will be implemented to minimize adverse environmental effects.	**Alternative 1 – No Project/Managed Decline** ***Consistent.*** No new development other than minimal habitat restoration proposed. **Alternatives 2-4** **Potentially Consistent** – Proposed restoration activities would protect the natural breaching pattern of the lagoon by grading outside the footprint of the existing wetted lagoon and the beach berm at its mouth.
CO-193 Allow the diking, filling, or dredging of open coastal waters, wetlands, and estuaries only where there is no feasible less-environmentally-damaging alternative, and where mitigation measures have been provided to minimize adverse environmental effects. Uses of open coastal waters, wetlands, and estuaries shall be limited to the following: • Incidental public service purposes including, but not limited to, burying cables and pipes; • Restoration purposes; and • Nature study, aquaculture, or similar resource-dependent activities.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than permitted, minor resource-dependent habitat restoration is proposed. **Alternatives 2-4** ***Consistent*** – It is anticipated that only permitted, resource-dependent habitat restoration will occur within wetland areas. Proposed replacement and lengthening of the PCH bridge are proposed solely for habitat restoration purposes (i.e. bridge improvements are not proposed for purposes of increasing transportation capacity of PCH), and therefore is a permitted use per policy CO-50.

Shoreline and Beaches	Preliminary Analysis/Comments
CO-194 Limit the construction of seawalls, revetments, breakwaters, or other hard protection devices for coastal erosion control to emergency cases. Any such permitted structures shall be sited to avoid impacting sensitive resources.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – Proposed replacement and lengthening of the PCH bridge may require shoreline protection at abutments; however, the bridge improvements are proposed solely for habitat restoration purposes (i.e. bridge improvements are not proposed for purposes of increasing transportation capacity of PCH), and therefore is a permitted use per policy CO-31 and policy CO-193. In addition, it is anticipated that proposed site improvements will include project design features, mitigation measures and/or conditions to ensure any necessary shoreline protection structures avoid impacting sensitive resources to the extent feasible. Specific site design/s, identified mitigation measures and/or conditions of approval, Hydrology Report and Coastal Hazards Assessment to evaluate feasibility of bioengineering options if shoreline protection is required and to confirm consistency determination.
CO-195 Where feasible, require the use of soft structures and living shorelines if shore protection is needed. Prohibit shoreline structures, including piers, groins, revetments, breakwaters, drainages, seawalls, pipelines, and other such construction that alters natural shoreline processes, except where there is no less-environmentally-damaging alternative for the protection of coastal-dependent uses, existing development, or public beaches in danger from erosion. Any such structures shall be sited to avoid sensitive resources and designed to eliminate or mitigate adverse impacts on local shoreline sand supply. Existing marine structures causing water stagnation or contributing to pollution problems and fish kills should be phased out or upgraded where technically feasible.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See policy analysis for CO-194.
CO-196 Coordinate with the Department of Beaches and Harbors and Caltrans on beach nourishment efforts and future strategies to protect against beach erosion and to protect Pacific Coast Highway.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***TBD*** – Consistency to be reviewed based on further site designs/specifications for proposed dredging, if any.
CO-197 Support regional sediment management and allow the placement of sediments removed through erosion or flood control facilities, at appropriate points on the shoreline for the purpose of beach sand replenishment. Design such a program to minimize adverse impacts to beach, inter-tidal, and offshore resources, and to incorporate appropriate mitigation measures.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***TBD*** – Consistency to be reviewed based on further site designs/specifications for proposed dredging, if any.
CO-198 Support Department of Fish and Wildlife and Regional Water Quality Control Board efforts to increase monitoring to assess the conditions of the Coastal Zone near-shore species, water quality, and kelp beds, and support rehabilitation or enhancement of deficient areas.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***TBD*** – Consistency to be reviewed based on further site designs/specifications for proposed dredging, if any.
CO-199 New development that is in proximity to the shoreline and beaches shall be sited and designed in ways that minimize: • Risks to life and property; • Impacts to public access and recreation; • Impacts to scenic resources; • Impacts to the quality or quantity of the natural supply of sediment to the coastline; and • Accounts for sea level rise and coastal storm surge projections.	**Alternative 1 – No Project/Managed Decline** ***Inconsistent***. No new development other than minimal habitat restoration proposed; however, the No Project alternative would generally maintain existing site conditions and therefore would not serve to relocate existing development currently threatened by shoreline erosion and future sea level rise. **Alternatives 2-4** ***Potentially Consistent*** – Restoration project alternatives would restore to varying degrees the lagoon area and adjacent wetland habitats, increasing the resources' ability to adapt to future sea level rise and storm surge, improving tidal circulation of the lagoon, and improving conveyance of stream flow and sediment transport from inland areas. In addition, restoration project alternatives would relocate existing beach structures and amenities currently threatened by erosion to a more elevated, inland location, and project Alternative 4 would realign a

Shoreline and Beaches	Preliminary Analysis/Comments
	portion of PCH to accommodate managed retreat from future sea level rise and associated coastal hazards. Specific site design/s, identified mitigation measures and/or conditions of approval would ensure project improvements on the shoreline are sited and designed to minimize impacts to public access, recreation and scenic resources.
CO-200 Minimize human-induced erosion by reducing concentrated surface runoff from use areas and elevated groundwater levels from urbanization and irrigation.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See policy analysis for CO-3 – CO-6.

Archaeological, Paleontological and Historic Cultural Resources	Preliminary Analysis/Comments
CO-204 Protect and preserve archaeological, historical, and paleontological resources from destruction, and avoid impacts to such resources where feasible. Where avoidance is not feasible, minimize impacts to resources to the maximum extent feasible.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed; however, the No Project alternative would generally maintain existing site conditions and therefore would not serve to preserve and restore degrading historic structures onsite. **Alternative 2 – Max Lagoon Habitat/Partial or Full Relocation of Existing Amenities in Phase 2** ***Potentially Inconsistent* –** Maximum habitat restoration activities would involve removal of the Topanga Ranch Motel and existing visitor-serving uses, resulting in an impact to historic structures onsite. Specific site design/s, identified mitigation measures and/or conditions of approval may serve to adequately mitigate impacts to archaeological, historical, and paleontological resources if avoidance is determined to be infeasible. **Alternatives 3-4** ***Potentially Consistent*** – Restoration project alternatives would retain and restore to varying degrees the historic structures onsite, where feasible. Specific site design/s, identified mitigation measures and/or conditions of approval may serve to adequately mitigate impacts to archaeological, historical, and paleontological resources if avoidance is determined to be infeasible. Findings of the Cultural Report and GeoArchaeological Report to confirm consistency determination.
CO-205 Where development would adversely impact archaeological or paleontological resources as identified by the State Historic Preservation Officer, reasonable mitigation measures shall be required. Mitigation shall be designed to accord with guidelines of the State Office of Historic Preservation and the State of California Native American Heritage Commission.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – Specific site design/s, identified mitigation measures and/or conditions of approval may serve to adequately mitigate impacts to archaeological and paleontological resources if avoidance is determined to be infeasible. Findings of the Cultural Report and GeoArchaeological Report to confirm consistency determination.
CO-206 Regulate landform alteration to ensure minimal disturbance of known archaeological and historic cultural sites. New development on sites identified as archaeologically sensitive shall include onsite monitoring of all grading, excavation, and site preparation that involve earthmoving operations by a qualified archaeologist(s) and appropriate Native American consultant(s).	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See policy analysis for CO-205.
CO-208 New development within archaeologically-sensitive areas shall implement appropriate mitigation measures, designed in accord with guidelines of the State Office of Historic Preservation and the State of California Native American Heritage Commission.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See policy analysis for CO-205.

Archaeological, Paleontological and Historic Cultural Resources	Preliminary Analysis/Comments
CO-209 Preserve and protect cultural resources and traditions that are of importance to Native Americans, including the Chumash and Gabrieliño/Tongva peoples.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See policy analysis for CO-205.
CO-210 Prohibit the unauthorized collection of paleontological and historic cultural artifacts.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See policy analysis for CO-205.
CO-211 Notify all appropriate agencies, including Native American tribes, and the Department of Regional Planning of archaeological or paleontological resources discovered during any phase of development construction to ensure proper surface and site recordation and treatment.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See policy analysis for CO-205.
CO-213 New development shall, where feasible, protect significant historical buildings, landmarks, and districts because of their unique characteristics and contribution to the cultural heritage of the area.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. See policy analysis for CO-204. **Alternative 2 – Max Lagoon Habitat/Partial or Full Relocation of Existing Amenities in Phase 2** ***Potentially Inconsistent –*** See policy analysis for CO-204. **Alternatives 3-4** ***Potentially Consistent*** – See policy analysis for CO-204.
CO-214 Support the development of resource-dependent uses designed to educate the public on the history and cultural heritage of the Santa Monica Mountains, where appropriate.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternative 2 – Max Lagoon Habitat/Partial or Full Relocation of Existing Amenities in Phase 2** **Alternatives 2-4** ***Potentially Consistent*** – Restoration project alternatives would include development of resource-dependent uses, including habitat restoration and passive public recreational uses, which may serve to educate the public on the history and cultural heritage of the Santa Monica Mountains, where appropriate.

Geologic Hazards (Safety and Noise Element)	Preliminary Analysis/Comments
SN-1 All new development shall be sized, designed and sited to minimize risks to life and property from geologic hazard.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – Specific site design/s, identified mitigation measures and/or conditions of approval, and Geologic Hazards assessment, to ensure that all new development would be sized, designed and sited to minimize risks to life and property from geologic hazard.
SN-2 On ancient landslides, unstable slopes and other geologic hazard areas, new development shall only be permitted where there is substantial evidence, provided by the applicant and confirmed by the Los Angeles County Department of Public Works, that the project provides an adequate factor of safety.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See analysis for policy SN-1.
SN-3 Prohibit new development in areas where it presents an extraordinary risk to life and property due to an existing or	**Alternative 1 – No Project/Managed Decline**

Geologic Hazards (Safety and Noise Element)	Preliminary Analysis/Comments
demonstrated potential public health and safety hazard.	***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See analysis for policy SN-1.
SN-4 In the placement of new development, emphasize avoiding areas susceptible to seismic and non-seismic geologic hazards, even when engineering solutions are available.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See analysis for policy SN-1.
SN-5 Prohibit grading and brushing in areas that have a slope of 50 percent or greater and limit grading in areas with a slope of over 25 percent.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See analysis for policy CO-46 and CO-113.
SN-6 Prohibit the construction of new structures for human occupation in unstable geologic areas.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See analysis for policy SN-1.
SN-9 Allow the remediation or stabilization of landslides or other slope instability that affect existing structures or that threaten public health or safety. Analyze alternative remediation or stabilization techniques to determine the least-environmentally-damaging alternative. Maximum feasible mitigation shall be incorporated into the project to minimize adverse impacts to natural resources.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See analysis for policy SN-1.
SN-11 New development shall assure stability and structural integrity, and neither create nor contribute significantly to erosion, geologic instability, or destruction of the site or surrounding area or in any way require the construction of protective devices that would substantially alter natural landforms along bluffs and cliffs.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See analysis for policy SN-1.

Flood Hazards (Safety and Noise Element)	Preliminary Analysis/Comments
SN-12 Site, design and size all new development to minimize risks to life and property from flood hazard, considering changes to inundation and flood zones caused by rising sea level.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – Specific site design/s, identified mitigation measures and/or conditions of approval, and Flood Hazards assessment, to ensure that all new development would be sized, designed and sited to minimize risks to life and property from flood hazard.
SN-13 Prohibit construction that could impede storm flows within floodways or floodplains.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – Specific site design/s, identified mitigation measures and/or conditions of approval, and Flood Hazards assessment, to ensure that all new development would be sited and designed so as not to storm flows within floodways or floodplains.
SN-14 Prohibit development within flood hazard areas, in consideration of rising sea level, unless no alternative building site exists on the property and proper mitigation measures are provided to minimize or eliminate risks to life and property	**Alternative 1 – No Project/Managed Decline**

Flood Hazards (Safety and Noise Element)	Preliminary Analysis/Comments
from flood hazard.	***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – Specific site design/s, identified mitigation measures and/or conditions of approval, and Flood Hazards assessment, to ensure that all new development would be sized, designed and sited to minimize risks to life and property from flood hazard. See also consistency analysis for Policy CO-199.
SN-15 Require protection of drainage courses in their natural state, and development designs that maintain natural flow.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See policy analysis for CO-3 – CO-6.
SN-16 New development shall provide adequate drainage and erosion control facilities that convey site drainage in a non-erosive manner in order to minimize hazards resulting from increased runoff, erosion and other hydrologic impacts to streams.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See policy analysis for CO-3 – CO-6.
SN-17 New development shall not increase peak stormwater flows.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See policy analysis for CO-3 – CO-6.

Fire Hazards (Safety and Noise Element)	Preliminary Analysis/Comments
SN-20 Ensure that all new development is sized, designed and sited to minimize risks to life and property from fire hazard.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – Restoration plans would involve removal, relocation and clustering of retained site structures/uses which would consolidate site uses for improved fire protection, and all structures would be subject to the requirements of approved fuel modification plans. Additional specific site design/s, identified mitigation measures and/or conditions of approval would ensure that all new development would be sized, designed and sited to minimize risks to life and property from fire hazard.
SN-21 Design and site new development in a manner that minimizes the threat of loss from wildland fires while avoiding the need for excessive vegetation clearance.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See analysis for Policy SN-20. In addition, restoration plans would involve removal, relocation and clustering of retained site structures/uses to minimize the threat of loss from wildland fires while avoiding the need for excessive vegetation clearance.
SN-22 Landscaping shall not extend into utility lines or block access to roads, water supplies or other emergency facilities.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***TBD*** – Consistency to be reviewed based on further site designs/specifications for existing and proposed utilities

Fire Hazards (Safety and Noise Element)	Preliminary Analysis/Comments
	and landscaping.
SN-23 Require that development sites and structures: be located off ridgelines and other dangerous topographic features such as chimneys, steep draws, and saddles; be adjacent to existing development perimeters; be located close to public roads; and, avoid over-long driveways.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See analysis for Policy SN-20. In addition, proposed structures to be relocated onsite would not be located on a ridgeline and other dangerous topographic features.
SN-24 Structures shall be constructed with appropriate features and building materials, including but not limited to: fire-resistant exterior materials, windows and roofing; and eaves and vents that resist the intrusion of flame and burning embers.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See analysis for Policy SN-20.
SN-25 Structures that require fuel modification shall be set back 200 feet from adjoining vacant lands, where feasible. If it is not feasible to provide a 200 foot setback, then structures shall be set back to the maximum extent possible. However, a lesser setback may be approved where it will serve to cluster development, minimize fire hazards, or minimize impacts to coastal resources.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***TBD*** – Consistency to be reviewed based on further site designs/specifications for existing and proposed structures.
SN-26 New development adjacent to public parkland shall be sited at least 200 feet from all parkland, where feasible, and designed to ensure that all required fuel modification is located within the project site boundaries and no brush clearance is required within the public parkland. New development that requires unavoidable brush clearance in parklands shall only be approved to allow a reasonable economic use, brush clearance shall be minimized to the maximum extent feasible, and all resource impacts shall be fully mitigated.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See analysis for policies CO-77 and CO-96 – CO-98.
SN-27 Prohibit vegetation clearance where fuel modification or brush clearance has not been required by the County to minimize the risk of fire hazard on (1) existing development, or (2) new development with an approved coastal development permit and all other applicable permits. Vegetation shall not be removed or thinned for required fuel modification until all permits have been obtained and construction commences.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See analysis for policies CO-77 and CO-96 – CO-98.
SN-28 Avoid development where fuel modification or brush clearance requirements would affect SERA.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See analysis for policies CO-77 and CO-96 – CO-98.
SN-29 Limit fuel modification to the minimum area necessary and utilize those programs that are most appropriate to the development site, including such strategies as preserving fire-resistant locally-indigenous species instead of completely removing vegetation.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See analysis for policies CO-77 and CO-96 – CO-98.
SN-31 Prohibit development in areas with insufficient access, water pressure, fire flows, or other accepted means for adequate fire protection.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Consistent*** – Restoration plan improvements will occur in a developed area and with appropriate site design to ensure sufficient access, water pressure, fire flows, or other accepted means for adequate fire protection.
SN-32 Maintain onsite, where feasible, alternative water resources for fire-fighting purposes. Water tanks shall be sized consistent with County minimum requirements, clustered with approved structures, and sited to minimize impacts to	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed.

Fire Hazards (Safety and Noise Element)	Preliminary Analysis/Comments
coastal resources.	**Alternatives 2-4** ***TBD*** – Consistency to be reviewed based on further site designs/specifications for onsite water resources for fire protection.
SN-33 Locate structures along a certified all-weather accessible road, which in some cases may consist of permeable surfaces, in a manner that provides firefighters adequate vehicle turnaround space on private properties. Where feasible, require that new development be accessed from existing roads.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***TBD*** – Consistency to be reviewed based on further site designs/specifications for onsite access requirements.
SN-34 Should the County of Los Angeles Fire Department policies regarding fuel management and fire protection conflict with the policies and provisions of the LUP, personnel from the Fire and Regional Planning Departments shall meet and agree on measures to balance the need for fire protection for structures with the need to protect environmental resources. If resolution of issues cannot be achieved and there are no feasible solutions that would permit meeting the provisions of the LCP, the Los Angeles County Fire Guidelines, and the State Fire Code, shall take precedence. Any such modification of LCP policies or provisions must be approved by the Coastal Commission through an LCP amendment.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***TBD*** – Consistency to be reviewed based on further site designs/specifications for Fire Department requirements.

Hazardous and Toxic Materials (Safety and Noise Element)	Preliminary Analysis/Comments
SN-37 Prohibit new facilities that handle large amounts of hazardous and toxic materials.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Consistent*** – Proposed restoration plans do not involve uses that handle large amounts of hazardous and toxic materials.
SN-38 Monitor through conditional approvals businesses handling, using, or storing more than threshold amounts of hazardous or toxic materials. Hazardous or toxic wastes may only be stored on a commercial site temporarily and must be disposed of as soon as possible.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – It is anticipated that specific site design/s, identified mitigation measures and/or conditions of approval would ensure that any storing and handling of hazardous or toxic materials onsite would be implemented consistent with County and State standards.
SN-40 Protect the area's residents, workers, and visitors from the risks inherent in the transport, distribution, use, and storage of hazardous materials and hazardous wastes, recognizing that the use of these materials is necessary in many parts of society.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See analysis for Policy SN-38.

Noise Hazards (Safety and Noise Element)	Preliminary Analysis/Comments
SN-42 Require development projects to demonstrate that: 1) no adverse noise effects on adjacent uses will occur from the project, 2) no adverse effects on the project will occur from adjacent influences, and 3) that provisions of the County Noise Ordinance can be met by the project.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – It is anticipated that specific site design/s, identified mitigation measures and/or conditions of approval would ensure that potential noise effects onsite and/or on adjacent uses are addressed and mitigated consistent with the County's Noise Ordinance and LCP.
SN-44 Prohibit, wherever feasible, new development or land uses within any natural area or sensitive land use from increasing the ambient noise levels by more than 3 dBA CNEL. If infeasible, noise impacts shall be mitigated.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed.

Noise Hazards (Safety and Noise Element)	Preliminary Analysis/Comments
	Alternatives 2-4 ***Potentially Consistent*** – See analysis for Policy SN-42.
SN-48 Locate noise-tolerant uses within developed areas. Encourage sensitive building orientation, placing the most noise-tolerant portions of a project between sensitive portions and the noise source, and architectural design as the noise management strategies preferred over constructing noise barriers.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See analysis for Policy SN-42. Consistency to be reviewed based on further site designs/specifications for structures to be retained and/or relocated onsite.

Development and Environmental Resources & Pattern and Character of Development (Land Use and Housing Element)	Preliminary Analysis/Comments
LU-1 New residential, commercial, or industrial development shall be located within, contiguous with, or in close proximity to, existing developed areas able to accommodate it, or where such areas are not able to accommodate it, in other areas with adequate public services and where it will not have significant adverse effects, either individually or cumulatively, on coastal resources. In addition, land divisions, other than leases for agricultural uses, outside existing developed areas shall be permitted only where 50 percent of the usable parcels in the area have been developed and the created parcels would be no smaller than the average size of surrounding parcels.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Consistent*** – Restoration plan improvements will occur in a developed area and with sufficient access, water pressure, fire flows, or other accepted means for adequate fire protection.
LU-2 Retain the area's natural setting, rural and semi-rural character, and scenic features.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Consistent*** – Restoration plan improvements will preserve and expand natural habitat and open space in the project area.
LU-4 Maintain areas of diverse natural topography which provide, through the preservation of large undeveloped areas, long-range vistas of open ridgelines and mountain slopes.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Consistent*** – See analysis for Policy LU-2.
LU-6 Preserve the physical connections between open space areas, natural habitats, public parklands, and activity centers.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Consistent*** – Restoration plan improvements will preserve and expand natural habitat and open space in the project area, providing for a physical connection between the restored lagoon area, adjacent inland park and recreation areas, the shoreline, and nearby visitor-serving uses.
LU-7 Preserve ridgelines and open space areas that define and maintain the rural character of developed areas.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Consistent*** – See analysis for Policy LU-2.
LU-8 Mitigate the impacts of permitted development on neighboring jurisdictions; impacts shall not be exported to other jurisdictions.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed.

Development and Environmental Resources & Pattern and Character of Development (Land Use and Housing Element)	Preliminary Analysis/Comments
	Alternatives 2-4 ***Potentially Consistent*** – It is anticipated that specific site design/s, identified mitigation measures and/or conditions of approval would ensure that restoration plan improvements would not impact neighboring jurisdictions.
LU-12 Require that the extension of water, sewer, or utility infrastructure to serve development be located within legally existing roadways and road rights-of-way in a manner that avoids adverse impacts to coastal resources to the maximum extent feasible. Such infrastructure shall be sized and otherwise designed to provide only for the approved development to avoid growth-inducing impacts.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***TBD*** – Consistency to be reviewed based on further site designs/specifications for existing and proposed utility improvements.
LU-25 Notwithstanding any inconsistencies of existing development with the LCP, lawfully-established uses or structures established prior to the effective date of the Coastal Act or pursuant to a validly issued coastal development permit that conform to the conditions on which they were legally established are considered by the County to be legal conforming uses or structures that may be maintained and/or repaired. Additions and improvements to such structures, including reconstruction, may be permitted provided that (1) the additions and improvements comply with current LCP policies and standards and do not increase any existing inconsistencies; and (2) any inconsistencies of the existing legal structure with the LCP are rectified when (a) additions increase the square footage of the existing structure by 50 percent or more, or (b) any demolition, removal, replacement and/or reconstruction results in the demolition of more than 50 percent of either the total existing exterior wall area or the existing foundation system, or where the sum of the percentages of each that is demolished exceeds 50 percent. Reconstruction of existing lawfully-established structures following a natural disaster is exempt from this policy and may be permitted.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternative 2 - Max Lagoon Habitat/Partial or Full Relocation of Existing Amenities in Phase 2** ***Potentially Consistent*** – It is anticipated that no existing non-conforming structures/uses would be retained onsite. **Alternatives 3-4** ***TBD*** - It is anticipated that proposed site modifications for Alternatives 3 and 4 will retain existing legal non-conforming uses, and/or will relocate amenities to increase buffer areas to the 100 ft. minimum required. However, for retained amenities, any significant alteration of existing facilities exceeding 50%, including restoration of historic structures, may be considered redevelopment and therefore required to meet current LCP policies. Specific site design/s, identified mitigation measures and/or conditions of approval to confirm consistency determination.
LU-30 Prohibit development of non-resource-dependent uses and development that significantly disrupts habitat values within the H1 habitat areas, except for the two permitted uses pursuant to Policy CO-41.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See analysis for Policy CO-41.
LU-33 Require that new development be compatible with the rural character of the area and the surrounding natural environment.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See analysis for Policies CO-139 – CO-153 addressing scenic resources.
LU-34 Require that new development preserve views from public parks, trails, and designated Scenic Routes. This includes preserving and enhancing views from public roadways which are oriented toward existing or proposed natural community amenities such as parks, open space, or natural features.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See analysis for Policies CO-139 – CO-153 addressing scenic resources.
LU-35 Require that new development preserve views of the ocean or Scenic Elements from public parkland, trails, Scenic Routes, and the principal permitted use on adjoining parcels. If there is a conflict between protecting views from public view areas and from private view areas, the protection of public views shall take precedence.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See analysis for Policies CO-139 – CO-153 addressing scenic resources.
LU-36 Development on parcels must be clustered and concentrated in one building site area, particularly within lands	**Alternative 1 – No Project/Managed Decline**

Development and Environmental Resources & Pattern and Character of Development (Land Use and Housing Element)	Preliminary Analysis/Comments
designated either Rural Lands or Rural Residential, to facilitate fire protection and to preserve and minimize impacts to coastal resources and the area of disturbance. Areas surrounding the approved building site area shall be required to be dedicated as open space in perpetuity.	***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** –Where amenities are to be retained and/or relocated, clustering of amenities and relocation of amenities closer to adjacent roads and development sites would consolidate required fuel modification requirements, facilitate fire protection and minimize disturbance areas to protect coastal resources.
LU-38 Limit structure heights to ensure protection of scenic resources and compatibility with surrounding settings.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See analysis for Policies CO-139 – CO-153 addressing scenic resources.
LU-39 Limit the length of private access roads to the minimum necessary to provide access to the approved building site of a legal parcel. Temporary roads approved for preliminary hydrologic or geologic testing shall be restored and not be considered an existing access road for subsequent development proposals.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – Consistency to be reviewed based on further site designs/specifications and Fire Department requirements.
LU-40 Site and design development so as to: protect life and property; protect public lands, H1 and H2 habitat areas, dedicated open space, streams, scenic resources, public views, and other natural features and resources; maximize open space areas; and, minimize the overall vegetation clearance needed for fire protection.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See consistency analysis above for corresponding sections.
LU-42 Require open space areas in individual developments to connect trails, open space, and wildlife corridors wherever possible.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See consistency analysis above for Open Space and Recreation policies above.
LU-43 Limit exterior lighting, except when needed for safety. Require that new exterior lighting installations use best available Dark Skies technology to minimize sky glow and light trespass thereby preserving the visibility of a natural night sky and stars and minimizing disruption of wild animal behavior, to the extent consistent with public safety.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See analysis for Policies CO-139 – CO-153 addressing scenic resources.
LU-44 Require the use of low-volume irrigation and locally-indigenous and drought-tolerant plant species in all development projects. Require the use of smart irrigation systems, and require the rapid repair of broken sprinkler systems. Prohibit the use of invasive species in all landscaping projects.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – It is anticipated that specific site design/s, identified mitigation measures and/or conditions of approval would ensure that native landscaping with local species indigenous to the Santa Monica Mountains and low-volume smart irrigation systems will be used. would be incorporated into all landscape/fuel modification plans.
LU-45 Concentrate commercial, office, and other higher-intensity uses along major streets and ensure that each project has adequate access, can accommodate the traffic, is accessible to essential services, and contains appropriate site design features to enhance community character.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – Where amenities are to be retained and/or relocated, clustering of amenities and relocation of amenities closer to adjacent roads and development sites.

Development and Environmental Resources & Pattern and Character of Development (Land Use and Housing Element)	Preliminary Analysis/Comments
LU-46 Require that commercial uses be designed to be compatible in scale and appearance with the existing community and surrounding natural environment.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See analysis for Policies CO-139 – CO-153 addressing scenic resources.
LU-47 Require that all development incorporate low impact development (LID) strategies to the maximum extent feasible, which emphasize an integrated system of decentralized, small-scale control measures to minimize alteration of the site's natural hydrologic conditions through infiltration, evapotranspiration, filtration, detention, and retention of runoff close to its source, as contained in the LCP.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See analysis for Policies CO-1 – CO-3 addressing water quality.
LU-49 Require all new commercial and institutional development to be compatible with the rural character of the area and the surrounding natural environment to the maximum extent feasible.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See analysis for Policies CO-139 – CO-153 addressing scenic resources.
LU-50 Require all new commercial and institutional development to minimize adverse impacts on adjacent properties though careful use of arrangement of buildings, architectural design, and types of uses proposed. These impacts include, but are not limited to: noise, odors, fuel modification, maintenance of community character, and views.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See analysis for policies in corresponding sections. Consistency to be reviewed based on further site designs/specifications for structures to be retained and/or relocated onsite.
LU-51 Solar energy devices/panels shall be sited on the rooftops of permitted structures, where feasible. If roof-mounted systems are infeasible, ground-mounted systems may be allowed only if sited within the building site area of permitted development. Wind energy systems are prohibited.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-3** ***TBD*** – Policy applicability and consistency to be reviewed based on further site designs/specifications.

Circulation Element	Preliminary Analysis/Comments
CI-7 Emphasize other transportation system management solutions, including improved public transit and non-motorized transportation, such as bicycles.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** –Consistency to be reviewed based on further site designs/specifications and identified mitigation measures and/or conditions of approval which may address transportation system management solutions for proposed uses.
CI-8 Ensure that all recreational easements and other recreational resources are protected during and after roadway construction, maintenance, and repair.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – Consistency to be reviewed based on further site designs/specifications. It is anticipated that specific site design/s, identified mitigation measures and/or conditions of approval would ensure that recreational resources are protected during and after roadway construction, maintenance, and repair activities.

Circulation Element	Preliminary Analysis/Comments
CI-11 Analyze and require mitigation of the traffic impacts from projects that generate substantial amounts of "off-peak" traffic, in addition to the traditional roadway capacity analysis.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – Consistency to be reviewed based on further site designs/specifications. It is anticipated that specific site design/s, identified mitigation measures and/or conditions of approval would ensure that potential traffic impacts are adequately mitigated.
CI-13 Allow road and driveway improvements only where they provide legal access to: 1) existing, lawfully-developed parcels; or 2) legal parcels with an approved coastal development permit and all other required permits.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – All road and driveway improvements would serve existing, lawfully-developed parcels.
CI-18 Improve roadways as appropriate to accommodate planned development and anticipated increases in recreational activities. Curbs, gutters, and sidewalks should only be used where deemed necessary for the safety of pedestrian and vehicular traffic by the Department of Public Works, and shall only be the default standard within the Sunset Mesa neighborhood, as defined in Policy CI-12.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – Consistency to be reviewed based on further site designs/specifications. It is anticipated that specific site design/s, identified mitigation measures and/or conditions of approval would ensure that roadways are improved to facilitate safe pedestrian, bike and vehicular traffic.
CI-20 Analyze the traffic impacts of a proposed development by considering the project's system-wide effects, including effects on transportation alternatives and the potential for bottlenecks in the area's roadway system.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – Consistency to be reviewed based on further site designs/specifications. It is anticipated that specific site design/s, identified mitigation measures and/or conditions of approval would ensure that potential traffic impacts are adequately mitigated.
CI-21 Require each new development causing cumulative circulation impacts to construct or fund its fair share of any necessary circulation system improvements or additions.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** – See consistency analysis for Policy CI-21.
CI-23 Encourage transportation alternatives, including public transit service, staging areas, and park-and-ride lots, both within the region and from metropolitan Los Angeles to the area's major parks and recreation areas.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** –Consistency to be reviewed based on further site designs/specifications and identified mitigation measures and/or conditions of approval which may address transportation system management solutions for proposed uses.
CI-24 The extension of public transit facilities and services, including shuttle programs, to maximize public access and recreation opportunities shall be encouraged, where feasible.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** –Consistency to be reviewed based on further site designs/specifications and identified mitigation measures and/or conditions of approval which may address extension of public transit facilities to maximize public access and recreation opportunities.
CI-30 Incorporate bike lanes and/or bike use signage into local road designs wherever feasible and safe.	**Alternative 1 – No Project/Managed Decline**

Circulation Element	Preliminary Analysis/Comments
	Consistent. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***TBD*** – Consistency to be reviewed based on further site designs/specifications for existing and proposed bike facilities.
CI-31 Ensure that improvements to any roadway or trail containing a bikeway and/or trail do not adversely affect the provision of bicycle or trail use.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***TBD*** – Consistency to be reviewed based on further site designs/specifications for existing and proposed road bike facilities.
CI-32 Support the region-wide expansion of alternative transportation methods, including rail lines, transitways, bike paths, and rapid bus systems, where consistent with the policies of this LUP.	**Alternative 1 – No Project/Managed Decline** ***Consistent***. No new development other than minimal habitat restoration proposed. **Alternatives 2-4** ***Potentially Consistent*** –Consistency to be reviewed based on further site designs/specifications and identified mitigation measures and/or conditions of approval which may address extension of alternative transportation methods to the project area.

Appendix R

Topanga Lagoon Final Transportation Assessment (LLG 2023)

The Appendices herein contain supporting information. These Appendices contain highly detailed figures and other graphic information, which are difficult to translate for screen reading software; therefore, the Appendices have not been translated into an auditory format. If you have a disability and/or have difficulty accessing any material in this document, please contact us by mail, email, or telephone, and we will work with you to make all reasonable accommodations. Please indicate 1) the nature of the accessibility need; 2) your preferred format; 3) the material you are trying to access and its location within this document; and 4) how to reach you if questions arise while fulfilling your request. You can direct your requests to:

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MEMORANDUM

To:	Rosi Dagit Resource Conservation District of the Santa Monica Mountains	Date:	February 3, 2023
From:	David S. Shender, P.E. Alfred C. Ying, P.E., PTP Linscott, Law & Greenspan, Engineers	EA: LLG Ref:	23930 1-22-4487-1
Subject:	Topanga Lagoon Restoration Project – Transportation Assessment		

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Linscott, Law & Greenspan, Engineers (LLG) has prepared this transportation assessment for the Topanga Lagoon Restoration project (the "Project"). This memorandum includes a summary of the existing conditions, a description of the proposed Project, a vehicle miles traveled (VMT) assessment related to the Project, a forecast of vehicular trip generation associated with components of the Project, as well as an assessment of the potential transportation effects associated with the Project.

Existing Conditions

The Topanga Lagoon Restoration Project is located along Pacific Coast Highway (State Route 1 or SR-1) in the Malibu area of Los Angeles County. The Project area is understood to be generally between the SR-1 intersection with Topanga Canyon Boulevard to the east and the current Cholada Thai restaurant to the west. In addition, it is understood the Project area extends northerly along Topanga Canyon Boulevard (State Route 27 or SR-27) from SR-1 by approximately 0.4 miles.

SR-1 provides two through travel lanes in each direction in the Project vicinity. In addition, a center two-way left-turn lane is provided, which transitions to the left-turn lane on the eastbound[1] SR-1 approach to its intersection with SR-27. The posted speed limits on both SR-1 and SR-27 in the Project vicinity are 45 miles-per-hour. Improved shoulders are provided along both sides of SR-1 in the Project area which are used to accommodate parallel vehicle parking and pedestrian movements. It is noted that vehicle parking is currently permitted along the shoulders on the existing SR-1 bridge over the Topanga Lagoon.

Vehicle ingress and egress access locations serving a County Beaches and Harbors parking lot are provided along the south side of SR-1 in the Project area. Along the north side of SR-1, there is generally open access to vehicle parking areas serving the current commercial uses (i.e., no demarked vehicle entries and exits).

[1] While SR-1 is a north-south highway through California, this report references SR-1 as an east-west roadway based on its orientation in the Project area.

Specific uses located along the north and south sides of SR-1 in the Project area are as follows:

Department of Parks and Recreation Area (North Side of SR-1)

- A defunct Topanga Ranch Motel with a total of 23 structures, 22 of which are currently not in use. One structure with approximately 910 square feet (square feet) is in active use as a ranger residence;
- Reel Inn restaurant with approximately 2,400 square feet of interior floor area and 1,400 square feet of outdoor area;
- Cholada's restaurant with approximately 1,290 square feet;
- Rosenthal restaurant/wine tasting with approximately 2,200 square feet;
- Oasis (outdoor furniture sales): 5,500 square feet exterior floor area and Feed Bin (farm products) with 3,700 square feet;
- Wylie's Bait and tackle with approximately 825 square feet; and
- A small picnic area (5 tables).

Los Angeles County Department of Beaches and Harbors (South Side of SR-1)

- A lifeguard tower, helipad, and parking.

The Project area and general vicinity are illustrated in ***Figure 1***. An aerial photograph of the existing Project area is presented in ***Figure 2***.

Project Description

The Projects consists of the proposed restoration of Topanga Lagoon will include the replacement of the SR-1 bridge over the lagoon. The new bridge will have similar features in terms of roadway width as compared to the existing bridge. In addition, some changes may be proposed related to vehicle access to the commercial properties located along the north side of SR-1 in the Project area, as well as the vehicle parking area on the south side of SR-1. All existing uses will be removed from the north side of SR-1 west of the Topanga Lagoon. The area north of SR-1 and east of the Topanga Lagoon will be redeveloped with visitor serving uses. Finally, new parking areas may be developed along the west side of SR-27 north of SR-1. Construction of the Topanga Lagoon Restoration is expected to commence in the year 2026 and Project completion is estimated by the year 2030.

Four Project alternatives are being examined as part of the environmental review process, as described in the following paragraphs.

Alternative 1: No Action/No Build Alternative

Under the No Action Alternative, existing conditions throughout the Project area would remain "as-is" in terms of existing functions and conditions. There would be no change to the lagoon footprint or habitat quality, and no new bridge would be constructed. Damage to the lifeguard headquarters due to coastal erosion would continue to occur; the currently unusable Topanga Ranch Motel structures would continue to deteriorate without restoration; and existing non-conforming business leases and septic systems would remain in current operation but may be subject to future restriction or cessation of use by enforcement of recent statewide wastewater policies. No improvements to habitat would occur. Sea level rise would continue to reduce the available beach area.

Alternative 2: Maximum Lagoon Habitat Alternative

Department of Parks and Recreation Area (North Side of SR-1)

Under the Maximum Lagoon Habitat Alternative, all 23 existing structures of the defunct Topanga Ranch Motel (including the functional ranger residence) and the five existing concessions will be removed to accommodate the following:

- A 2,400 square-foot restaurant with 21 parking spaces at location of Reel Inn (or could be located at the TCB/PCH intersection);
- SR-27/SR-1 intersection: Approximately 5,500 square feet of development including: an outdoor interpretive pavilion with restroom (1,650 square feet), a 2-bedroom ranger residence (1,000 square feet), and a maintenance yard/storage/maintenance office (2,900 square feet);
- Retain equivalent picnic area that exists or may be relocated;
- Create new loop trail through site; and
- Provide approximately 65 new parking spaces with overflow parking area along the west side of SR-27.

Los Angeles County Department of Beaches and Harbors (South Side of SR-1)

- Relocate the lifeguard tower, helipad, and modify parking to provide generally the same number of parking spaces; and
- Construct a new 2-car garage for County lifeguard vehicles.

The conceptual site plan for Alternative 2: Maximum Lagoon Habitat along SR-1 is provided in ***Figure 3***.

Alternative 3: Limited Lagoon Habitat Expansion Alternative

Department of Parks and Recreation Area (North Side of SR-1)

Under the Limited Lagoon Habitat Expansion Alternative, four of the 23 existing structures of the defunct Topanga Ranch Motel and the five existing concessions will be removed to accommodate the following:

- One motel with 17 units, one 2-bedroom ranger residence (1,000 square feet), and one office (900 square feet);
- A 2,400 square-foot restaurant with 21 parking spaces at location of Reel Inn;
- SR-1/SR-27 intersection: Approximately 5,500 square feet of development including: an outdoor interpretive pavilion with restroom (1,650 square feet) and a maintenance yard/storage/maintenance offices (3,900 square feet);
- Retain equivalent picnic area that exists or may be relocated;
- Create new loop trail through site; and
- Provide approximately 65 new parking spaces with overflow parking area along the west side of SR-27.

Los Angeles County Department of Beaches and Harbors (South Side of SR-1)

- Relocate the lifeguard tower, helipad, and modify parking to provide generally the same number of parking spaces; and
- Construct a new 2-car garage for County lifeguard vehicles.

The conceptual site plan for Alternative 3: Limited Lagoon Habitat Expansion along SR-1 is provided in ***Figure 4***.

Alternative 4: Maximum Managed Retreat Alternative

Department of Parks and Recreation Area (North Side of SR-1)

Under the Maximum Managed Retreat Alternative, nine of the 23 existing structures of the defunct Topanga Ranch Motel and the five existing concessions will be removed to accommodate the following:

- One motel with 12 units, one 2-bedroom ranger residence (1,000 square feet), and one office (900 square feet);
- A 2,400 square-foot restaurant with 21 parking spaces at location of Reel Inn;
- SR-27/SR-1 intersection: Approximately 5,500 square feet of development including: an outdoor interpretive pavilion with restroom (1,650 square feet) and a maintenance yard/storage/maintenance offices (3,900 square feet);
- Retain equivalent picnic area that exists or may be relocated;

- Create new loop trail through site; and
- Provide approximately 65 new parking spaces with overflow parking area along the west side of SR-27.

Los Angeles County Department of Beaches and Harbors (South Side of SR-1)

- Relocate the lifeguard tower, helipad, and modify parking to provide generally the same number of parking spaces; and
- Construct a new 2-car garage for County lifeguard vehicles.

The conceptual site plan for Alternative 4: Maximum Managed Retreat along SR-1 is provided in ***Figure 5***. The conceptual site plan for potential improvements along SR-27 is illustrated in ***Figure 6***.

Vehicle Miles Traveled (VMT) Assessment

The California Department of Transportation (Caltrans) has formally adopted Vehicle Miles Traveled (VMT) as the metric for evaluating the transportation impacts of local development projects on the State Highway System. Caltrans' *Transportation Impact Study Guide*[2] (TISG) references the December 2018 *Technical Advisory on Evaluating Transportation Impacts in CEQA*[3] prepared by the Governor's Office of Planning and Research (OPR) as the basis for its guidance on VMT assessment (the "OPR Guidance").

Caltrans' TISG states, "Additional future guidance will include the basis for requesting transportation impact analysis that is not based on VMT. This guidance will include a simplified safety analysis approach that reduces risks to all road users and that focuses on multi-modal conflict analysis as well as access management issues." While the final guidance is still being developed, Caltrans has released the *Interim Land Development and Intergovernmental Review (LDIGR) Safety Review Practitioners Guidance*.[4]

[2] *Vehicle Miles Traveled-Focused Transportation Impact Study Guide*, Caltrans, May 20, 2020.
[3] *Technical Advisory on Evaluating Transportation Impacts in CEQA*, Governor's Office of Planning and Research, December 2018.
[4] *Traffic Safety Bulletin 20-02-R1: Interim Local Development Intergovernmental Review Safety Review Practitioners Guidance*, Caltrans, December 18, 2020.

VMT Assessment Related to the Bridge Replacement Component of the Project

The OPR Guidance (page 20) states, "Projects that would not likely lead to a substantial or measurable increase in vehicle travel, and therefore generally should not require an induced travel analysis include: Rehabilitation, maintenance, replacement, safety, and repair projects designed to improve the condition of existing transportation assets (e.g., highways; roadways; bridges; culverts…) and that do not add additional motor vehicle capacity."

The replacement of the bridge over Topanga Lagoon is not intended to increase the vehicle capacity of SR-1. Further, the Project will not lead to an increase in vehicle travel as the number of travel lanes on SR-1 is proposed to remain the same as existing: two travel lanes in each direction, a center lane to accommodate left-turn movements, and shoulders along both sides of the highway. Therefore, the bridge replacement component of the Project is presumed to result in a less than significant VMT impact. Therefore, no additional VMT analysis is required.

VMT Assessment Related to the Commercial Development Components of the Project

The Caltrans TISG (pages 10 and 11) states, "Caltrans references OPR's December 2018 *Technical Advisory on Evaluating Transportation Impacts in CEQA*, which identifies projects and areas presumed to have a less than significant Transportation Impact. Those include…projects that generate or attract fewer than 110 trips per day generally may be assumed to cause a less-than significant transportation impact." To assess the potential for VMT impacts related to the generation of new vehicle trips to the Project area based on the proposed commercial development components of the Project, trip generation forecasts were prepared for each of the build alternatives (i.e., Alternatives 2, 3 and 4).

Trip generation is expressed in vehicle trip ends, defined as one-way vehicular movements, either entering or exiting the generating land use. Traffic volumes expected to be generated by the commercial development component of the Project on a daily basis (as well as during the weekday AM peak hour, PM peak hour, Saturday peak hour) were estimated using rates published in the 11th Edition of the *Trip Generation Manual,* published by the Institute of Transportation Engineers (ITE), [Washington, D.C., 2021]. Traffic volumes expected to be generated by the commercial components of the Project alternatives were based upon rates per occupied rooms, residential dwelling units, and 1,000 square feet of building floor area as applicable.

In addition to the trip generation forecasts for the new development (which are essentially an estimate of the number of vehicles that could be expected to enter and exit the commercial site access points), trip generation forecasts were also prepared for the existing, active uses which currently occupy the north side of SR-1.

The trip generation rates and forecast of the vehicular trips anticipated to be generated by the commercial components of the three Project build alternatives are presented in ***Tables 1A***, ***1B***, and ***1C*** for Alternatives 2, 3, and 4 respectively.

As summarized in *Table 1A* for Alternative 2, over a 24-hour weekday period the Maximum Lagoon Habitat alternative is forecast to result in a net decrease of 365 daily trip ends (approximately 183 fewer inbound trips and 183 fewer outbound trips) during a typical weekday. Additionally, the Maximum Lagoon Habitat alternative is forecast to result in a net decrease of 20 vehicle trips (11 fewer inbound trip and 9 fewer outbound trips) during the weekday AM peak hour. During the weekday PM peak hour, the Maximum Lagoon Habitat alternative is forecast to result in a net decrease of 42 vehicle trips (23 fewer inbound trips and 19 fewer outbound trips). During the Saturday peak hour, the Maximum Lagoon Habitat alternative is forecast to result in a net decrease of 111 vehicle trips (53 fewer inbound trips and 58 fewer outbound trips).

As summarized in *Table 1B* for Alternative 3, over a 24-hour weekday period the Limited Lagoon Habitat Expansion alternative is forecast to result in a net decrease of 270 daily trip ends (approximately 135 fewer inbound trips and 135 fewer outbound trips) during a typical weekday. Additionally, the Limited Lagoon Habitat Expansion alternative is forecast to result in a net decrease of 9 vehicle trips (6 fewer inbound trip and 3 fewer outbound trips) during the weekday AM peak hour. During the weekday PM peak hour, the Limited Lagoon Habitat Expansion alternative is forecast to result in a net decrease of 31 vehicle trips (19 fewer inbound trips and 12 fewer outbound trips). During the Saturday peak hour, the Limited Lagoon Habitat Expansion alternative is forecast to result in a net decrease of 94 vehicle trips (45 fewer inbound trips and 49 fewer outbound trips).

As summarized in *Table 1C* for Alternative 4, over a 24-hour weekday period the Maximum Managed Retreat alternative is forecast to result in a net decrease of 292 daily trip ends (approximately 146 fewer inbound trips and 146 fewer outbound trips) during a typical weekday. Additionally, the Maximum Managed Retreat alternative is forecast to result in a net decrease of 11 vehicle trips (7 fewer inbound trip and 4 fewer outbound trips) during the weekday AM peak hour. During the weekday PM peak hour, the Maximum Managed Retreat alternative is forecast to result in a net decrease of 33 vehicle trips (20 fewer inbound trips and 13 fewer outbound trips). During the Saturday peak hour, the Maximum Managed Retreat alternative is forecast to result in a net decrease of 98 vehicle trips (47 fewer inbound trips and 51 fewer outbound trips).

Based on the above analysis, it is determined that the commercial components associated with the Project build alternatives are forecast to result in a net decrease of daily, as well as peak hour vehicle trips as compared to the existing active uses that

currently occupy the Project area. Accordingly, the commercial components will have a less than significant impact related to VMT.

Site Access and Circulation Review

Vehicular access to the respective off-street parking areas will be provided under each of the Project build alternatives. Specifically, under Project Alternative 2 (as shown in *Figure 3*) and Project Alternative 3 (as shown in *Figure 4*), two driveways located on the north side and two driveways located on the south side of SR-1 are proposed to facilitate vehicular access to the off-street parking areas. Under Project Alternative 4 (as shown in *Figure 5*), three driveways located on the north side and two driveways located on the south side of SR-1 are proposed to facilitate vehicular access to the off-street parking areas.

A review was conducted to determine whether acceleration lanes and/or deceleration lanes (in the form of right-turn only lanes) are required or desired at the proposed project driveways. In general, acceleration/deceleration lanes promote high speed travel by vehicles crossing across the paths of pedestrian and bicycle travel. Based on a review of the posted speed limit, the existing and forecast future traffic volumes, and given the high level of pedestrian and bicycle travel on this section of SR-1, installation of acceleration/deceleration lanes likely would not promote a multi-modal environment. In addition, based on a review of Los Angeles County's *Access Management for Private Developments Guidelines Manual*[5], separate right-turn lanes at the proposed project driveways do not appear to be warranted. Therefore, separate acceleration lanes or deceleration lanes at the proposed project driveways are not required.

Traffic Safety Assessment

Traffic collision records were obtained from Caltrans for SR-1 from approximately 250 feet east of the SR-1/SR-27 intersection to the east to the Malibu city boundary to the west (PM 40.700 – PM 41.101). Collisions were requested for the most recent three-year period, which corresponds to January 1, 2019 through December 31, 2021. Based on the records provided by Caltrans, a total of 39 collisions occurred within the three-year period. No collisions resulting in a fatality were documented. A summary of the collision trends is provided below.

A total of 18 collisions occurred within 250 feet of the SR-1/SR-27 intersection and are therefore assumed to be related to intersection operations. The two most frequent

[5] *Access Management for Private Developments Guidelines Manual*, County of Los Angeles Department of Public Works, May 2011.

primary collision factors for these collisions were Speeding and Improper Turning (five [5] collisions each). The next most common primary collision factors were Other Violations and Influence of Alcohol (three [3] and two [2] collisions, respectively). The most frequent types of collision were sideswipe and rear-end (seven [7] and six [6] collisions, respectively). Collisions in the vicinity of the intersection occurred most frequently on Wednesdays (seven [7] collisions).

A total of 21 collisions occurred west of the SR-1/SR-27 intersection to the Malibu city boundary. The most frequent primary collision factor was Improper Turning (12 collisions), followed by Speeding and Failure to Yield (four [4] and three [3] collisions, respectively). The most frequent type of collision was Sideswipe (nine [9] collisions), followed by Rear-End and Broadside (five [5] collisions each). One collision involving a pedestrian was documented and resulted in minor injuries. Collisions west of the SR-1/SR-27 intersection occurred most frequently on Saturday (eight [8] collisions).

The Project is expected to enhance safety for motorists, pedestrians and bicyclists in the Project area based on the following:

- The Project will provide standard shoulder widths in the Project area which will improve vehicle parking, as well as enhance the overall environment related to pedestrian and bicycle movements as compared to the current condition;

- The Project will result in the removal of existing vehicle parking in the shoulder areas on the bridge structure over the Topanga Lagoon;

- The Project will result in the removal of the existing commercial uses – including associated inbound and outbound traffic movements – located on the north side of SR-1 west of the Topanga Lagoon;

- The Project will provide enhanced vehicular access to the future commercial uses located on the north side of SR-1 east of the Topanga Lagoon, including two to three clearly delineated vehicle access locations, which is an improvement over the existing uncontrolled access conditions located adjacent to the shoulder on the north side of SR-1;

- The Project will improve access to the County parking area located along the south side of SR-1, including relocating the existing exit driveway to the west and away from the SR-1/SR-27 intersection; and

- The Project will remove the existing commercial development– including associated inbound and outbound traffic movements – located adjacent to the

northwest corner of the SR-1/SR-27 intersection, to be replaced with vehicle parking for beach visitors with improved and identifiable access locations.

With respect to the visitor parking area located northwest of the SR-1/SR-27 intersection, it is recommended that a separate left-turn lane be provided on SR-27 to facilitate left-turns from northbound SR-27 to the parking area. Further, the proposed access to the proposed parking area should be located north of the start of the left-turn for southbound SR-27 on its approach to the SR-1 intersection. In addition, the proposed access to the proposed visitor parking area on SR-1 should be limited to right-turn ingress and egress movements only.

Intersection Level of Service Analysis

Traffic Counts

Existing and forecast future operations at the SR-1/SR-27 intersection were evaluated in this transportation assessment (refer to *Figure 1*). Manual counts of vehicular turning movements were conducted at the study intersection during the weekday afternoon (PM) commute period and the Saturday mid-day period to determine the peak hour traffic volumes. The manual counts were conducted at the study intersection from 4:00 to 7:00 PM to determine the weekday PM peak commute hour and from 12:00 to 3:00 PM on Saturday to determine the weekend mid-day peak hour. In addition, existing 24-hour daily traffic volumes were obtained from Caltrans for SR-1 west of SR-27 and SR-27 north of SR-1.

The existing traffic volumes in the Project area are shown in ***Figure 7***. As shown in *Figure 7*, SR-1 currently carries approximately 44,500 vehicles per day (vpd) while SR-27 carries approximately 13,700 vpd in the project vicinity. In addition, *Figure 7* also displays the existing weekday afternoon peak hour and weekend mid-day peak hour traffic volumes at the SR-1/SR-27 intersection. Summary data worksheets of the traffic counts at the study intersection are contained in ***Appendix A***.

Traffic Volume Growth Rates for Year 2045 Conditions

Horizon year background traffic growth estimates have been calculated using a directional traffic growth factor. The directional traffic growth factor is intended to include unknown related projects in the study area as well as account for typical growth in traffic volumes due to the development of projects outside the study area.

Based on coordination with the project team and Caltrans, directional traffic volume growth factors from the current Southern California Association of Governments (SCAG) Regional Travel Demand Model were developed and provided by Caltrans for use for this project. The forecast year 2045 future traffic volumes in the Project

area are shown in ***Figure 8***. The SCAG2020 traffic growth factors for both SR-1 at SR-27 and SR-27 at SR-1 are contained in ***Appendix B***.

As stated in a previous section, the commercial development components for each of the Project build alternatives (as summarized in *Table 1A* for Alternative 2, *Table 1B* for Alternative 3, and *Table 1C* for Alternative 4) are forecast to result in a net decrease of vehicle trips during the daily and peak hour conditions as compared to existing conditions. However, in order to maintain a conservative assessment, no additional trips were included in the development of the forecast future traffic volumes for the year 2045 conditions (beyond the use of the SCAG2020 growth factors).

Traffic Operations Analysis Methodology

The study intersection was evaluated using the Highway Capacity Manual (HCM) operational analysis methodologies. Based on the HCM operations method of analysis, level of service for signalized intersections is defined in terms of control delay, which is a measure of driver discomfort, frustration, fuel consumption, and lost travel time. The delay experienced by a motorist is made up of a number of factors that relate to control, geometries, traffic, and incidents. Total delay is the difference between the travel time actually experienced and the reference travel time that would result during ideal conditions: in the absence of traffic control, in the absence of geometric delay, in the absence of any incidents, and when there are no other vehicles on the road. The HCM signalized methodology calculates the control delay for each of the subject traffic movements and determines the level of service for each constrained movement. The control delay for any particular movement is a function of the capacity of the approach and the degree of saturation. The overall control delay is measured in seconds per vehicle and the level of service is then determined. The term Level of Service (LOS) is used to describe intersection operations. Intersection Levels of Service vary from LOS A (free flow) to LOS F (jammed condition). The six qualitative categories of Level of Service that have been defined along with the corresponding HCM control delay value range for signalized intersections are shown in ***Appendix C***.

Intersection analyses were prepared utilizing the *Synchro 11* software package which implements the HCM operational methods. A *Synchro* network was created based on existing conditions field reviews at the study intersection. In addition, specifics such as lane configurations, storage lengths, crosswalk locations, posted speed limits, traffic signal phasing, and traffic volumes, were coded to complete the existing network.

The SR-1/SR-27 study intersection was analyzed for the following conditions:

[a] Existing conditions.
[b] Year 2045 conditions.

Summaries of the delays and LOS values for the study intersection during the weekday PM peak hour and Saturday mid-day peak hour are shown in ***Table 2***. The HCM data worksheets for the analyzed intersection are contained in *Appendix C*.

Traffic Analysis Existing Conditions
As indicated in column [1] of *Table 2*, the SR-1/SR-27 study intersection is presently operating at LOS B during both the weekday PM peak hour and Saturday mid-day peak hour under existing conditions. As previously mentioned, the existing traffic volumes at the study intersections during the weekday PM peak hour and Saturday mid-day peak hour are displayed in *Figure 7*.

Year 2045 Conditions
The future year 2045 conditions were forecast based on the growth in traffic due to the combined effects of continuing development, intensification of existing developments and other factors. It is noted that while the build Alternatives (Alternatives 2, 3 and 4) are expected to result in a decrease in peak hour vehicle trips generated at the Project area, no reduction was conservatively made to the forecast future traffic volumes at the SR-1/SR-27 intersection. The delay values at the study intersection are incrementally increased with the addition of ambient traffic. As indicated in column [2] of *Table 2*, the SR-1/SR-27 study intersection is expected to operate at LOS C during the weekday PM peak hour and LOS B during the Saturday mid-day peak hour under the year 2045 conditions.

Project Construction

Construction of the Project has been suitably evaluated in other documents such as the *Construction Sequencing Report*.[6] Traffic handling plans related to construction of the Project will be prepared based on relevant standards and approved by Caltrans. It is LLG's understanding that two lanes of through traffic in each direction will be maintained on SR-1 at all times to the extent feasible. The traffic handling plans will address accommodations of vehicular, pedestrian and bicycle traffic through the Project area.

Related to vehicle trips generated to the Project area associated with construction activity, the *Construction Sequencing Report* estimates that on average, 20 construction workers will be on-site on a daily basis. In addition, various vehicle

[6] *Construction Sequencing Report – Topanga Lagoon Restoration Project*, Moffatt & Nichol, July 15, 2022.

trips to and from the Project area can be expected by trucks and other commercial vehicles (e.g., trucks removing soil and other debris from the Project area).

Tables 1A, 1B, and 1C show that the existing commercial uses to be removed from the Project area currently generate approximately 750 vehicle trips per day. By comparison, vehicle trips related to construction of the Project – including trips generated by construction workers, trucks and other commercial vehicles – will likely be fewer than 100 trips per day, which is substantially less than the current trips generated by the existing commercial uses to be removed. Accordingly, no adverse effects are anticipated related to vehicle trips generated by construction of the Project.

Parking

As previously noted, each of the Project build Alternatives proposes to remove a portion of the existing on-street vehicle parking supply along SR-1 (e.g., no parking will be permitted along the replacement bridge structure). Additionally, north of SR-1, off-street parking west of the Topanga Lagoon will be removed completely in conjunction with the removal of the existing commercial structures. East of the Topanga Lagoon, off-street parking north of SR-1 will be reconfigured and provided in a more standard layout based on the various commercial build Alternatives. South of SR-1, new and reconfigured off-street parking will be provided in lots east and west of Topanga Lagoon. Finally, along the west side of SR-27, new off-street parking will be provided in new lots, to supplement the existing on-street parking.

The proposed revisions to the on-street and off-street vehicle parking supply in the Project area as described above are summarized in ***Table 3*** attached.

Availability of vehicle parking is generally not considered to be an issue area under the California Environmental Quality Act (CEQA). It is noted that in the OPR Guidance (page 23), it states, "Removal or relocation of off-street or on-street parking spaces" would likely not lead to a substantial or measurable increase in vehicle travel, and therefore generally should not require an induced travel analysis. While not directly stated in the OPR Guidance, it is inferred that new and additional parking supply could result in induced travel (i.e., VMT). However, in review of *Table 3* it is noted that the overall parking supply in the Project area will be reduced under each of the three build Alternatives (Alternatives 2, 3 and 4). Accordingly, the proposed vehicle parking supply associated with the Project will not result in induced travel in the Project area.

Project Transportation Measures

As discussed above, the proposed Topanga Lagoon Restoration project is expected to result in a less than significant impact as measured by VMT. In addition, the SR-1/SR-27 intersection is forecast to operate at LOS C or better in the year 2045 analysis conditions during the weekday PM peak hour and Saturday mid-day peak hour. Nonetheless, the following transportation improvement measures are recommended for consideration:

Transportation Management Plan

During final design and prior to the issuance of demolition, grading or any construction permits, it is recommended that a Transportation Management Plan be prepared and submitted to Caltrans and the County of Los Angeles for review to address any potential traffic flow disruptions on local roadways prior to construction. The Transportation Management Plan shall be prepared in accordance with the current California Manual on Uniform Traffic Control Devices, Caltrans Standard Plans (2010), and current standards and best practices of the reviewing and approving agencies. The Plan shall be coordinated with applicable agencies regarding construction and maintenance schedules and worksite traffic control plans including, but not limited to, Caltrans, CHP, and local fire and police departments. The Plan shall include, but may not be limited to, the following measures/features:

- Maintain four lanes (i.e., two lanes in each direction) of circulation on PCH, at least one lane in each direction on all other public roadways, and access to neighboring commercial establishments during project construction;
- Minimize traffic delays and effectively maintain an acceptable level of traffic flow throughout the transportation system during construction;
- Minimize detours and impacts to pedestrians and bicyclists;
- Maintain operation of PCH for use as an emergency evacuation route at all times during construction, especially during red flag days;
- Establish communication plan between RCD, construction contractors and emergency service providers;
- Ensure temporary speed limit reduction for the traffic detour approaches and exits conforms to safe highway design speeds;
- Have a flag person present to coordinate north-south traffic during those limited times that only a single lane is open; and
- Prepare a public outreach campaign and signage plans for public notification prior to and during the construction period.

Parking Management Plan

Prior to the issuance of demolition, grading or any construction permits, it is recommended that a Parking Management Plan be prepared and submitted for review and approval by Caltrans and the County of Los Angeles. The Parking Management Plan shall include, at a minimum, the following measures, which shall be implemented during all construction activities as overseen by the Construction Contractor:

- All temporary construction parking areas shall be located within previously disturbed or developed areas within the Project area;
- Temporary parking areas shall provide a minimum replacement parking ratio of 1:1 for standard parking spaces as well as ADA spaces;
- Temporary parking areas shall be identified on the final design plans and signage shall be provided prior to the start of construction activities to notify travelers of the location and duration of the temporary parking provisions; and
- Temporary parking shall be developed and available for use prior to start of construction.

Summary

This memorandum has been prepared to provide a transportation assessment of the Topanga Lagoon Restoration project. The following conclusions are made with respect to the potential transportation effects of the Project:

- The components of the Project related to the proposed Topanga Lagoon bridge replacement and associated improvements to SR-1 are expected to result in a less than significant impact as measured by VMT as the overall vehicle capacity of SR-1 will not change;

- The components of the Project related to the proposed commercial development along the north side of SR-1 are expected to result in a less than significant impact as measured by VMT because each of the build Alternatives (Alternatives 2, 3 and 4) is forecast to result in fewer daily vehicle trips as compared to the existing commercial uses located on the north side of SR-1;

- The Project is expected to result in a less than significant impact related to transportation hazards as in fact, the Project is expected to improve overall safety in the Project area for motorists, pedestrians and bicyclists;

- The SR-1/SR-27 intersection is forecast to operate at LOS C or better in the year 2045 analysis conditions during the weekday PM peak hour and Saturday mid-day peak hour; and

- During final design and prior to the issuance of demolition, grading or any construction permits, it is recommended that a Transportation Management Plan and a Parking Management Plan be prepared and submitted to Caltrans and the County of Los Angeles for review to address any potential traffic flow disruptions on local roadways prior to construction.

MAP SOURCE: RAND MCNALLY & COMPANY

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Project Site

Figure 1
Vicinity Map

Topanga Lagoon Restoration Project

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Figure 2
Aerial Photograph of Exiting Project Site

Topanga Lagoon Restoration Project

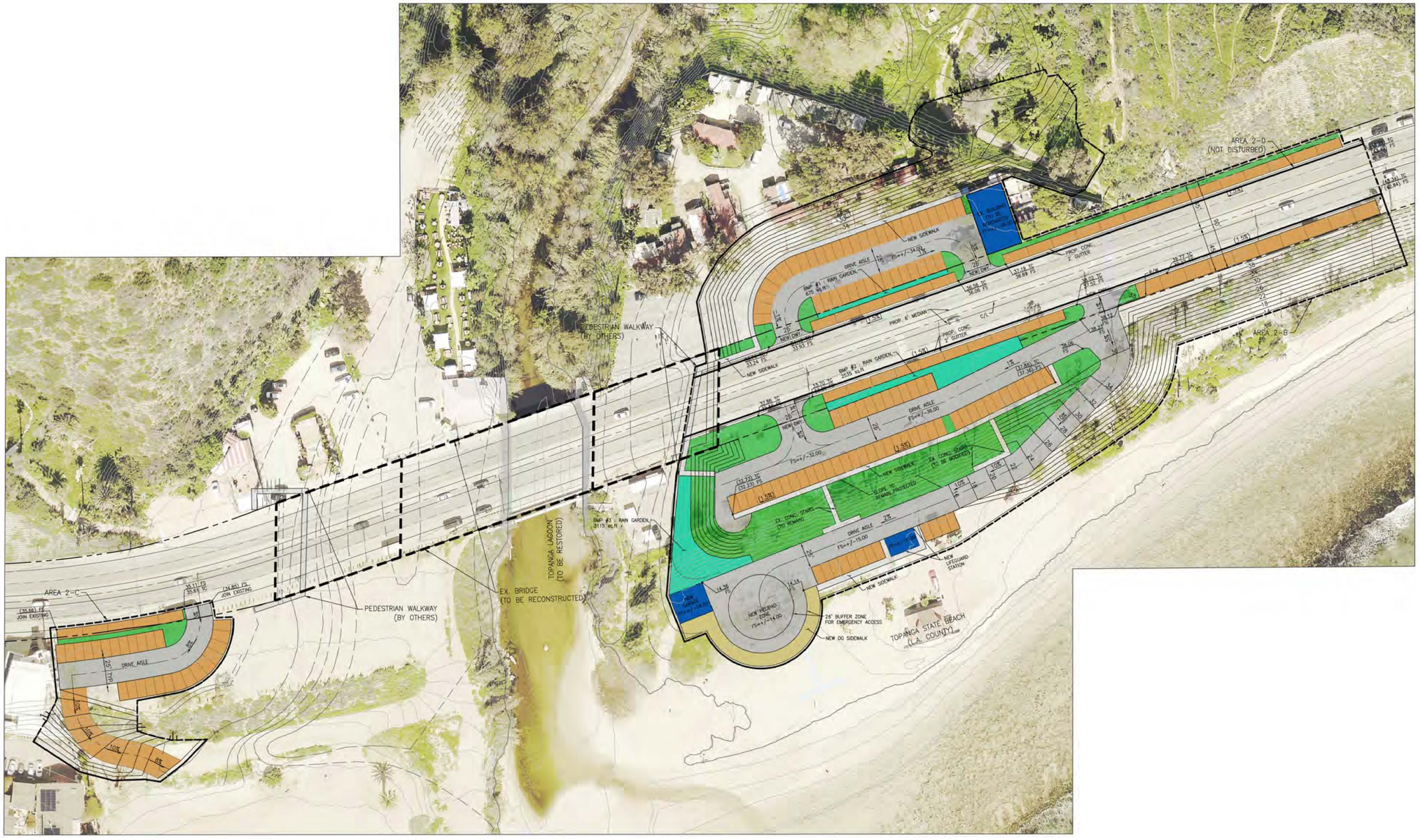

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Figure 3
Conceptual Site Plan Along SR-1
Alternative 2 = Maximum Lagoon Habitat
Topanga Lagoon Restoration Project

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Figure 4
Conceptual Site Plan Along SR-1
Alternative 3 = Limited Lagoon Habitat Expansion
Topanga Lagoon Restoration Project

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Figure 5
Conceptual Site Plan Along SR-1
Alternative 4 = Maximum Managed Retreat
Topanga Lagoon Restoration Project

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Figure 6

Conceptual Site Plan

Topanga Canyon Boulevard Site Area

Topanga Lagoon Restoration Project

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XX(XX) Weekday PM Peak Hour(Weekend Mid-Day Peak Hour)

XX,XXX Average Daily Traffic (ADT)

Figure 7
Existing Traffic Volumes

Topanga Lagoon Restoration Project

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XX(XX) Weekday PM Peak Hour(Weekend Mid-Day Peak Hour)

XX,XXX Average Daily Traffic (ADT)

Figure 8
2045 Traffic Volumes

Topanga Lagoon Restoration Project

Table 1A
ALTERNATIVE 2 PROJECT TRIP GENERATION [1]

LAND USE	SIZE	DAILY TRIP ENDS [2] VOLUMES	AM PEAK HOUR VOLUMES [2]			PM PEAK HOUR VOLUMES [2]			SAT PEAK HOUR VOLUMES [2]		
			IN	OUT	TOTAL	IN	OUT	TOTAL	IN	OUT	TOTAL
Alt. 2: Maximum Lagoon Habitat											
Restaurant [3]	2,400 GSF	257	13	10	23	13	9	22	14	13	27
Retail [4]	1,650 GLSF	90	2	2	4	6	5	11	6	5	11
Ranger Residence [5]	1 DU	7	0	0	0	1	0	1	0	0	0
General Office [6]	2,900 GSF	31	4	0	4	1	3	4	1	1	2
Subtotal		385	19	12	31	21	17	38	21	19	40
Existing Uses to be Removed											
Ranger Residence [5]	1 DU	(7)	0	0	0	(1)	0	(1)	0	0	0
Restaurant [3]	3,690 GSF	(396)	(19)	(16)	(35)	(20)	(13)	(33)	(21)	(20)	(41)
Wine Tasting [7]	2,200 GSF	(101)	(4)	(1)	(5)	(8)	(8)	(16)	(38)	(42)	(80)
Retail [4]	4,525 GLSF	(246)	(7)	(4)	(11)	(15)	(15)	(30)	(15)	(15)	(30)
Subtotal		(750)	(30)	(21)	(51)	(44)	(36)	(80)	(74)	(77)	(151)
NET INCREASE(NET DECREASE)		**(365)**	**(11)**	**(9)**	**(20)**	**(23)**	**(19)**	**(42)**	**(53)**	**(58)**	**(111)**

[1] Source: ITE "Trip Generation Manual", 11th Edition, 2021.

[2] Trips are one-way traffic movements, entering or leaving.

[3] ITE Land Use Code 932 (High-Turnover [Sit-Down] Restaurant) trip generation average rates.
- Daily Trip Rate: 107.20 trips/1,000 SF of floor area; 50% inbound/50% outbound
- AM Peak Hour Trip Rate: 9.57 trips/1,000 SF of floor area; 55% inbound/45% outbound
- PM Peak Hour Trip Rate: 9.05 trips/1,000 SF of floor area; 61% inbound/39% outbound
- SAT Peak Hour Trip Rate: 11.19 trips/1,000 SF of floor area; 51% inbound/49% outbound

[4] ITE Land Use Code 822 (Strip Retail Plaza <40k) trip generation average rates.
- Daily Trip Rate: 54.45 trips/1,000 SF of floor area; 50% inbound/50% outbound
- AM Peak Hour Trip Rate: 2.36 trips/1,000 SF of floor area; 60% inbound/40% outbound
- PM Peak Hour Trip Rate: 6.59 trips/1,000 SF of floor area; 50% inbound/50% outbound
- SAT Peak Hour Trip Rate: 6.57 trips/1,000 SF of floor area; 51% inbound/49% outbound

[5] ITE Land Use Code 220 (Multifamily Housing (Low-Rise) Not Close to Rail Transit trip generation average rates.
- Daily Trip Rate: 6.74 trips/dwelling unit; 50% inbound/50% outbound
- AM Peak Hour Trip Rate: 0.40 trips/dwelling units; 24% inbound/76% outbound
- PM Peak Hour Trip Rate: 0.51 trips/dwelling units; 63% inbound/37% outbound
- SAT Peak Hour Trip Rate: 0.41 trips/dwelling units; 54% inbound/46% outbound

[6] ITE Land Use Code 710 (General Office Building) trip generation average rates.
- Daily Trip Rate: 10.84 trips/1,000 SF of floor area; 50% inbound/50% outbound
- AM Peak Hour Trip Rate: 1.52 trips/1,000 SF of floor area; 88% inbound/12% outbound
- PM Peak Hour Trip Rate: 1.44 trips/1,000 SF of floor area; 17% inbound/83% outbound
- SAT Peak Hour Trip Rate: 0.53 trips/1,000 SF of floor area; 54% inbound/46% outbound

[7] ITE Land Use Code 970 (Wine Tasting Room) trip generation average rates.
- Daily Trip Rate: 45.96 trips/1,000 SF of floor area; 50% inbound/50% outbound
- AM Peak Hour Trip Rate: 2.07 trips/1,000 SF of floor area; 70% inbound/30% outbound
- PM Peak Hour Trip Rate: 7.31 trips/1,000 SF of floor area; 50% inbound/50% outbound
- SAT Peak Hour Trip Rate: 36.5 trips/1,000 SF of floor area; 47% inbound/53% outbound

Table 1B
ALTERNATIVE 3 PROJECT TRIP GENERATION [1]

LAND USE	SIZE	DAILY TRIP ENDS [2] VOLUMES	AM PEAK HOUR VOLUMES [2] IN	AM OUT	AM TOTAL	PM PEAK HOUR VOLUMES [2] IN	PM OUT	PM TOTAL	SAT PEAK HOUR VOLUMES [2] IN	SAT OUT	SAT TOTAL
Alt. 3: Limited Lagoon Habitat Expansion											
Motel [3]	17 Occ. Rooms	74	3	5	8	4	4	8	7	9	16
Restaurant [4]	2,400 GSF	257	13	10	23	13	9	22	14	13	27
Retail [5]	1,650 GLSF	90	2	2	4	6	5	11	6	5	11
Ranger Residence [6]	1 DU	7	0	0	0	1	0	1	0	0	0
General Office [7]	4,800 GSF	52	6	1	7	1	6	7	2	1	3
Subtotal		480	24	18	42	25	24	49	29	28	57
Existing Uses to be Removed											
Ranger Residence [6]	1 DU	(7)	0	0	0	(1)	0	(1)	0	0	0
Restaurant [4]	3,690 GSF	(396)	(19)	(16)	(35)	(20)	(13)	(33)	(21)	(20)	(41)
Wine Tasting [8]	2,200 GSF	(101)	(4)	(1)	(5)	(8)	(8)	(16)	(38)	(42)	(80)
Retail [5]	4,525 GLSF	(246)	(7)	(4)	(11)	(15)	(15)	(30)	(15)	(15)	(30)
Subtotal		(750)	(30)	(21)	(51)	(44)	(36)	(80)	(74)	(77)	(151)
NET INCREASE(NET DECREASE)		**(270)**	**(6)**	**(3)**	**(9)**	**(19)**	**(12)**	**(31)**	**(45)**	**(49)**	**(94)**

[1] Source: ITE "Trip Generation Manual", 11th Edition, 2021.

[2] Trips are one-way traffic movements, entering or leaving.

[3] ITE Land Use Code 320 (Motel) trip generation average rates.
- Daily Trip Rate: 4.37 trips/occupied rooms; 50% inbound/50% outbound
- AM Peak Hour Trip Rate: 0.49 trips/occupied rooms; 36% inbound/64% outbound
- PM Peak Hour Trip Rate: 0.47 trips/occupied rooms; 53% inbound/47% outbound
- SAT Peak Hour Trip Rate: 0.96 trips/occupied rooms; 45% inbound/55% outbound

[4] ITE Land Use Code 932 (High-Turnover [Sit-Down] Restaurant) trip generation average rates.
- Daily Trip Rate: 107.20 trips/1,000 SF of floor area; 50% inbound/50% outbound
- AM Peak Hour Trip Rate: 9.57 trips/1,000 SF of floor area; 55% inbound/45% outbound
- PM Peak Hour Trip Rate: 9.05 trips/1,000 SF of floor area; 61% inbound/39% outbound
- SAT Peak Hour Trip Rate: 11.19 trips/1,000 SF of floor area; 51% inbound/49% outbound

[5] ITE Land Use Code 822 (Strip Retail Plaza <40k) trip generation average rates.
- Daily Trip Rate: 54.45 trips/1,000 SF of floor area; 50% inbound/50% outbound
- AM Peak Hour Trip Rate: 2.36 trips/1,000 SF of floor area; 60% inbound/40% outbound
- PM Peak Hour Trip Rate: 6.59 trips/1,000 SF of floor area; 50% inbound/50% outbound
- SAT Peak Hour Trip Rate: 6.57 trips/1,000 SF of floor area; 51% inbound/49% outbound

[6] ITE Land Use Code 220 (Multifamily Housing (Low-Rise) Not Close to Rail Transit trip generation average rates.
- Daily Trip Rate: 6.74 trips/dwelling unit; 50% inbound/50% outbound
- AM Peak Hour Trip Rate: 0.40 trips/dwelling units; 24% inbound/76% outbound
- PM Peak Hour Trip Rate: 0.51 trips/dwelling units; 63% inbound/37% outbound
- SAT Peak Hour Trip Rate: 0.41 trips/dwelling units; 54% inbound/46% outbound

[7] ITE Land Use Code 710 (General Office Building) trip generation average rates.
- Daily Trip Rate: 10.84 trips/1,000 SF of floor area; 50% inbound/50% outbound
- AM Peak Hour Trip Rate: 1.52 trips/1,000 SF of floor area; 88% inbound/12% outbound
- PM Peak Hour Trip Rate: 1.44 trips/1,000 SF of floor area; 17% inbound/83% outbound

[8] - SAT Peak Hour Trip Rate: 0.53 trips/1,000 SF of floor area; 54% inbound/46% outbound
ITE Land Use Code 970 (Wine Tasting Room) trip generation average rates.
- Daily Trip Rate: 45.96 trips/1,000 SF of floor area; 50% inbound/50% outbound
- AM Peak Hour Trip Rate: 2.07 trips/1,000 SF of floor area; 70% inbound/30% outbound
- PM Peak Hour Trip Rate: 7.31 trips/1,000 SF of floor area; 50% inbound/50% outbound
- SAT Peak Hour Trip Rate: 36.5 trips/1,000 SF of floor area; 47% inbound/53% outbound

Table 1C
ALTERNATIVE 4 PROJECT TRIP GENERATION [1]

LAND USE	SIZE	DAILY TRIP ENDS [2] VOLUMES	AM PEAK HOUR VOLUMES [2] IN	AM PEAK HOUR VOLUMES [2] OUT	AM PEAK HOUR VOLUMES [2] TOTAL	PM PEAK HOUR VOLUMES [2] IN	PM PEAK HOUR VOLUMES [2] OUT	PM PEAK HOUR VOLUMES [2] TOTAL	SAT PEAK HOUR VOLUMES [2] IN	SAT PEAK HOUR VOLUMES [2] OUT	SAT PEAK HOUR VOLUMES [2] TOTAL
Alt. 4: Maximum Managed Retreat											
Motel [3]	12 Occ. Rooms	52	2	4	6	3	3	6	5	7	12
Restaurant [4]	2,400 GSF	257	13	10	23	13	9	22	14	13	27
Retail [5]	1,650 GLSF	90	2	2	4	6	5	11	6	5	11
Ranger Residence [6]	1 DU	7	0	0	0	1	0	1	0	0	0
General Office [7]	4,800 GSF	52	6	1	7	1	6	7	2	1	3
Subtotal		458	23	17	40	24	23	47	27	26	53
Existing Uses to be Removed											
Ranger Residence [6]	1 DU	(7)	0	0	0	(1)	0	(1)	0	0	0
Restaurant [4]	3,690 GSF	(396)	(19)	(16)	(35)	(20)	(13)	(33)	(21)	(20)	(41)
Wine Tasting [8]	2,200 GSF	(101)	(4)	(1)	(5)	(8)	(8)	(16)	(38)	(42)	(80)
Retail [5]	4,525 GLSF	(246)	(7)	(4)	(11)	(15)	(15)	(30)	(15)	(15)	(30)
Subtotal		(750)	(30)	(21)	(51)	(44)	(36)	(80)	(74)	(77)	(151)
NET INCREASE(NET DECREASE)		**(292)**	**(7)**	**(4)**	**(11)**	**(20)**	**(13)**	**(33)**	**(47)**	**(51)**	**(98)**

[1] Source: ITE "Trip Generation Manual", 11th Edition, 2021.
[2] Trips are one-way traffic movements, entering or leaving.
[3] ITE Land Use Code 320 (Motel) trip generation average rates.
- Daily Trip Rate: 4.37 trips/occupied rooms; 50% inbound/50% outbound
- AM Peak Hour Trip Rate: 0.49 trips/occupied rooms; 36% inbound/64% outbound
- PM Peak Hour Trip Rate: 0.47 trips/occupied rooms; 53% inbound/47% outbound
- SAT Peak Hour Trip Rate: 0.96 trips/occupied rooms; 45% inbound/55% outbound

[4] ITE Land Use Code 932 (High-Turnover [Sit-Down] Restaurant) trip generation average rates.
- Daily Trip Rate: 107.20 trips/1,000 SF of floor area; 50% inbound/50% outbound
- AM Peak Hour Trip Rate: 9.57 trips/1,000 SF of floor area; 55% inbound/45% outbound
- PM Peak Hour Trip Rate: 9.05 trips/1,000 SF of floor area; 61% inbound/39% outbound
- SAT Peak Hour Trip Rate: 11.19 trips/1,000 SF of floor area; 51% inbound/49% outbound

[5] ITE Land Use Code 822 (Strip Retail Plaza <40k) trip generation average rates.
- Daily Trip Rate: 54.45 trips/1,000 SF of floor area; 50% inbound/50% outbound
- AM Peak Hour Trip Rate: 2.36 trips/1,000 SF of floor area; 60% inbound/40% outbound
- PM Peak Hour Trip Rate: 6.59 trips/1,000 SF of floor area; 50% inbound/50% outbound
- SAT Peak Hour Trip Rate: 6.57 trips/1,000 SF of floor area; 51% inbound/49% outbound

[6] ITE Land Use Code 220 (Multifamily Housing (Low-Rise) Not Close to Rail Transit trip generation average rates.
- Daily Trip Rate: 6.74 trips/dwelling unit; 50% inbound/50% outbound
- AM Peak Hour Trip Rate: 0.40 trips/dwelling units; 24% inbound/76% outbound
- PM Peak Hour Trip Rate: 0.51 trips/dwelling units; 63% inbound/37% outbound
- SAT Peak Hour Trip Rate: 0.41 trips/dwelling units; 54% inbound/46% outbound

[7] ITE Land Use Code 710 (General Office Building) trip generation average rates.
- Daily Trip Rate: 10.84 trips/1,000 SF of floor area; 50% inbound/50% outbound
- AM Peak Hour Trip Rate: 1.52 trips/1,000 SF of floor area; 88% inbound/12% outbound
- PM Peak Hour Trip Rate: 1.44 trips/1,000 SF of floor area; 17% inbound/83% outbound
- SAT Peak Hour Trip Rate: 0.53 trips/1,000 SF of floor area; 54% inbound/46% outbound

[8] ITE Land Use Code 970 (Wine Tasting Room) trip generation average rates.
- Daily Trip Rate: 45.96 trips/1,000 SF of floor area; 50% inbound/50% outbound
- AM Peak Hour Trip Rate: 2.07 trips/1,000 SF of floor area; 70% inbound/30% outbound
- PM Peak Hour Trip Rate: 7.31 trips/1,000 SF of floor area; 50% inbound/50% outbound
- SAT Peak Hour Trip Rate: 36.5 trips/1,000 SF of floor area; 47% inbound/53% outbound

Table 2
SUMMARY OF INTERSECTION OPERATIONAL ANALYSIS [a]
DELAYS AND LEVELS OF SERVICE
WEEKDAY PM AND SATURDAY MID-DAY PEAK HOURS

NO.	INTERSECTION	TRAFFIC CONTROL	PEAK HOUR	[1] EXISTING Delay [b]	[1] EXISTING LOS [c]	[2] YEAR 2045 CONDITION Delay [b]	[2] YEAR 2045 CONDITION LOS [c]	[2] CHANGE Delay [b] [(2)-(1)]
1	Topanga Canyon Boulevard SR-27/ Pacific Coast Highway SR-1	Signalized	PM	19.2	B	20.1	C	0.9
			SAT	19.6	B	19.6	B	0.0

[a] Intersection analysis based on the Highway Capacity Manual, 6th Edition operational analysis methodologies.

[b] Reported control delay values in seconds per vehicle.

[c] Intersection Levels of Service are based on the following criteria:

[d] Oversaturated conditions. Under these conditions, minor changes in volumes may result in disproportionate changes in delay.

Signalized Intersection Control Delay (s/veh)	Unsignalized Intersection Control Delay (s/veh)	LOS
<= 10	<= 10	A
> 10-20	> 10-15	B
> 20-35	> 15-25	C
> 35-55	> 25-35	D
> 55-80	> 35-50	E
> 80	> 50	F

Table 3
PROJECT AREA PARKING SUPPLY

01-Feb-23

LOCATION	ALT. 1 EXISTING	ALT. 2 PROPOSED	ALT. 3 PROPOSED	ALT. 4 PROPOSED
North Side SR-1 (CDPR) [1]				
Concessions (West of Lagoon)	83	0	0	0
Fee (East of Lagoon)	51	20	16	10
Concessions (East of Lagoon)	20	20	20	20
Motel Exclusive	0	0	24	17
Subtotal CDPR	**154**	**40**	**60**	**47**
SR-1 Shoulders (North and South Sides Combined)				
Conforming Free	**72**	**47**	**47**	**56**
South Side SR-1 (DBH) [2]				
Lot on West of Lagoon	0	28	28	28
Fee East of Lagoon (Conforming)	78	73	65	88
Fee East of Lagoon (Non-Conforming)	10	0	0	0
Total Conforming	**78**	**101**	**93**	**116**
Total Non-Conforming	**10**	**0**	**0**	**0**
OVERALL DBH TOTAL	**88**	**101**	**93**	**116**
West Side SR-27:SR-1 to 500 Feet Northerly Therefrom				
Free Along Road Shoulder	28	28	28	28
Existing Concessions at Gateway Corner	23	0	0	0
Fee in New CDPR Lot at Gateway Corner	0	33	37	37
Fee in New Overflow Lot Along SR-27	0	65	65	65
TOTAL SR-27	**51**	**126**	**130**	**130**
TOTAL PROJECT AREA PARKING SUPPLY	**365**	**314**	**330**	**349**

[1] CDPR = California Department of Parks and Recreation
[2] DBH = Department of Beaches and Harbors

APPENDIX A

TRAFFIC COUNTS

CITY TRAFFIC COUNTERS

WWW.CTCOUNTERS.COM

File Name : TopangaCanyonBlvd_PacificCoastHwy_Passenger_06-24-22
Site Code : 00000000
Start Date : 6/24/2022
Page No : 1

Groups Printed- Passenger

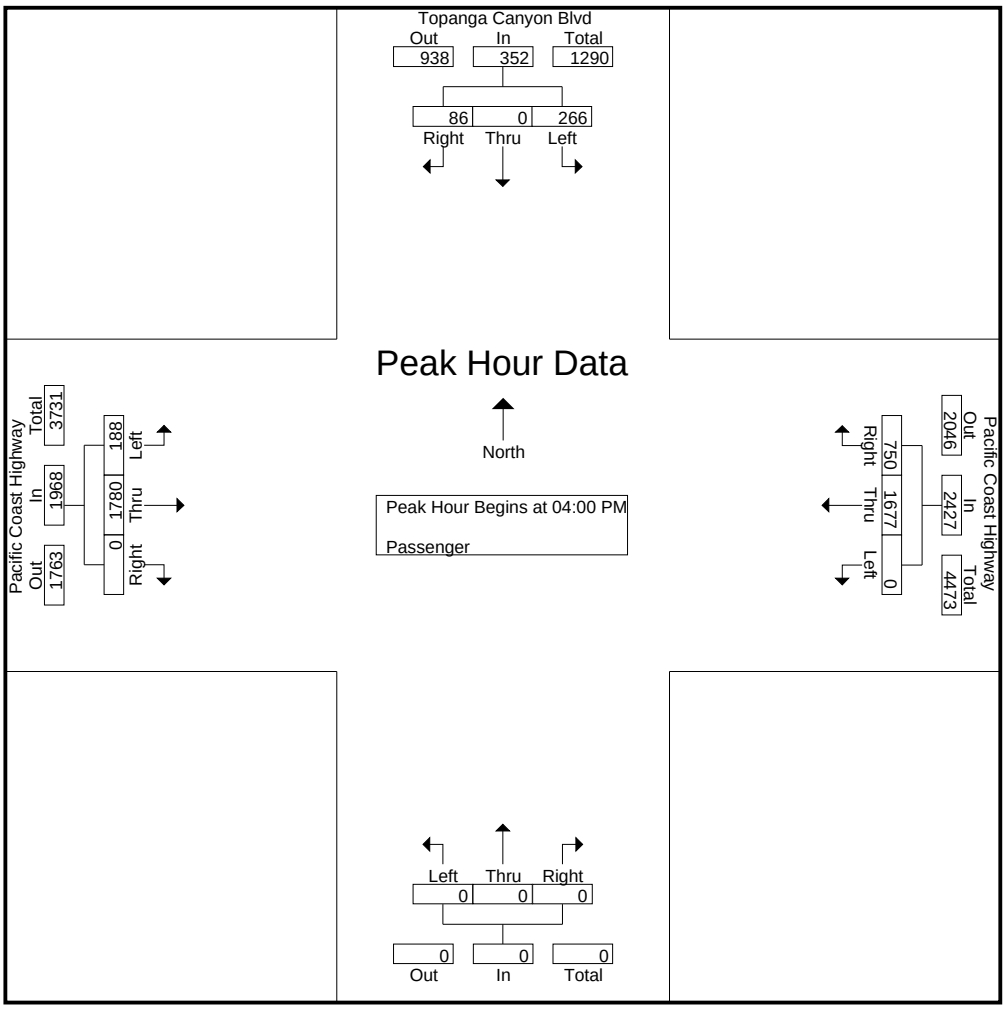
	Topanga Canyon Blvd Southbound			Pacific Coast Highway Westbound			Northbound			Pacific Coast Highway Eastbound			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
04:00 PM	53	0	20	0	434	211	0	0	0	48	495	0	1261
04:15 PM	76	0	20	0	400	183	0	0	0	53	448	0	1180
04:30 PM	66	0	21	0	400	166	0	0	0	47	425	0	1125
04:45 PM	71	0	25	0	443	190	0	0	0	40	412	0	1181
Total	266	0	86	0	1677	750	0	0	0	188	1780	0	4747
05:00 PM	59	0	19	0	457	168	0	0	0	53	388	0	1144
05:15 PM	70	0	28	0	407	172	0	0	0	41	375	0	1093
05:30 PM	67	0	25	0	431	159	0	0	0	41	385	0	1108
05:45 PM	73	0	23	0	400	133	0	0	0	48	375	0	1052
Total	269	0	95	0	1695	632	0	0	0	183	1523	0	4397
06:00 PM	47	0	15	0	436	150	0	0	0	33	322	0	1003
06:15 PM	69	0	15	0	323	104	0	0	0	41	317	0	869
06:30 PM	61	0	18	0	342	96	0	0	0	40	340	0	897
06:45 PM	64	0	21	0	273	98	0	0	0	33	337	0	826
Total	241	0	69	0	1374	448	0	0	0	147	1316	0	3595
Grand Total	776	0	250	0	4746	1830	0	0	0	518	4619	0	12739
Apprch %	75.6	0	24.4	0	72.2	27.8	0	0	0	10.1	89.9	0	
Total %	6.1	0	2	0	37.3	14.4	0	0	0	4.1	36.3	0	

CITY TRAFFIC COUNTERS

WWW.CTCOUNTERS.COM

File Name : TopangaCanyonBlvd_PacificCoastHwy_Passenger_06-24-22
Site Code : 00000000
Start Date : 6/24/2022
Page No : 2

	Topanga Canyon Blvd Southbound				Pacific Coast Highway Westbound				Northbound				Pacific Coast Highway Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 06:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	53	0	20	73	0	434	**211**	**645**	0	0	0	0	48	**495**	0	**543**	**1261**
04:15 PM	**76**	0	20	**96**	0	400	183	583	0	0	0	0	**53**	448	0	501	1180
04:30 PM	66	0	21	87	0	400	166	566	0	0	0	0	47	425	0	472	1125
04:45 PM	71	0	**25**	96	0	**443**	190	633	0	0	0	0	40	412	0	452	1181
Total Volume	266	0	86	352	0	1677	750	2427	0	0	0	0	188	1780	0	1968	4747
% App. Total	75.6	0	24.4		0	69.1	30.9		0	0	0		9.6	90.4	0		
PHF	.875	.000	.860	.917	.000	.946	.889	.941	.000	.000	.000	.000	.887	.899	.000	.906	.941



CITY TRAFFIC COUNTERS

WWW.CTCOUNTERS.COM

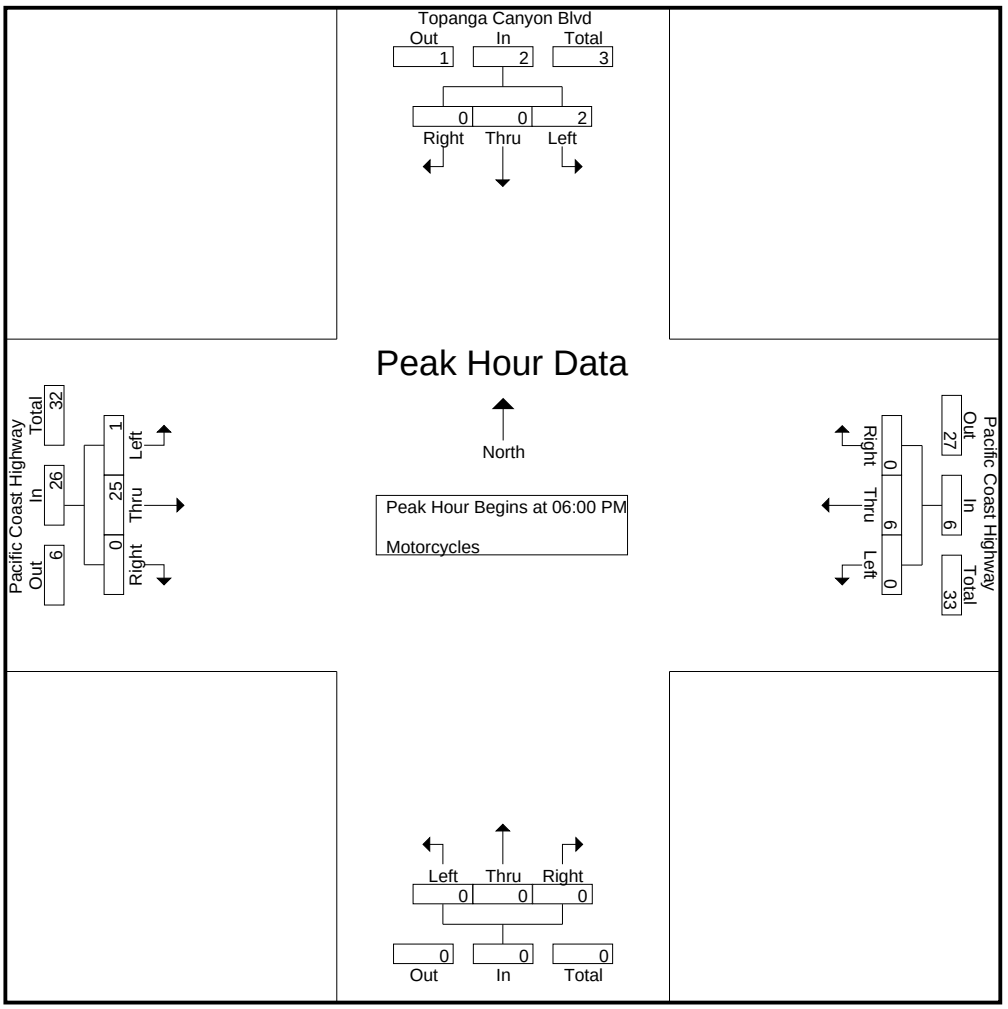
File Name : TopangaCanyonBlvd_PacificCoastHwy_Motorcycles_06-24-22
Site Code : 00000000
Start Date : 6/24/2022
Page No : 1

Groups Printed- Motorcycles

	Topanga Canyon Blvd Southbound			Pacific Coast Highway Westbound			Northbound			Pacific Coast Highway Eastbound			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	4	2	0	6
04:15 PM	0	0	0	0	5	0	0	0	0	0	1	0	6
04:30 PM	1	0	0	0	4	0	0	0	0	0	2	0	7
04:45 PM	0	0	0	0	1	0	0	0	0	0	1	0	2
Total	1	0	0	0	10	0	0	0	0	4	6	0	21
05:00 PM	0	0	0	0	1	0	0	0	0	0	2	0	3
05:15 PM	0	0	0	0	0	0	0	0	0	0	7	0	7
05:30 PM	2	0	0	0	0	0	0	0	0	0	1	0	3
05:45 PM	0	0	0	0	1	0	0	0	0	0	1	0	2
Total	2	0	0	0	2	0	0	0	0	0	11	0	15
06:00 PM	1	0	0	0	1	0	0	0	0	1	5	0	8
06:15 PM	0	0	0	0	1	0	0	0	0	0	7	0	8
06:30 PM	0	0	0	0	2	0	0	0	0	0	11	0	13
06:45 PM	1	0	0	0	2	0	0	0	0	0	2	0	5
Total	2	0	0	0	6	0	0	0	0	1	25	0	34
Grand Total	5	0	0	0	18	0	0	0	0	5	42	0	70
Apprch %	100	0	0	0	100	0	0	0	0	10.6	89.4	0	
Total %	7.1	0	0	0	25.7	0	0	0	0	7.1	60	0	

File Name : TopangaCanyonBlvd_PacificCoastHwy_Motorcycles_06-24-22
Site Code : 00000000
Start Date : 6/24/2022
Page No : 2

	Topanga Canyon Blvd Southbound				Pacific Coast Highway Westbound				Northbound				Pacific Coast Highway Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 06:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 06:00 PM																	
06:00 PM	**1**	0	0	**1**	0	1	0	1	0	0	0	0	**1**	5	0	6	8
06:15 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	7	0	7	8
06:30 PM	0	0	0	0	0	**2**	0	**2**	0	0	0	0	0	**11**	0	**11**	**13**
06:45 PM	1	0	0	1	0	2	0	2	0	0	0	0	0	2	0	2	5
Total Volume	2	0	0	2	0	6	0	6	0	0	0	0	1	25	0	26	34
% App. Total	100	0	0		0	100	0		0	0	0		3.8	96.2	0		
PHF	.500	.000	.000	.500	.000	.750	.000	.750	.000	.000	.000	.000	.250	.568	.000	.591	.654



CITY TRAFFIC COUNTERS

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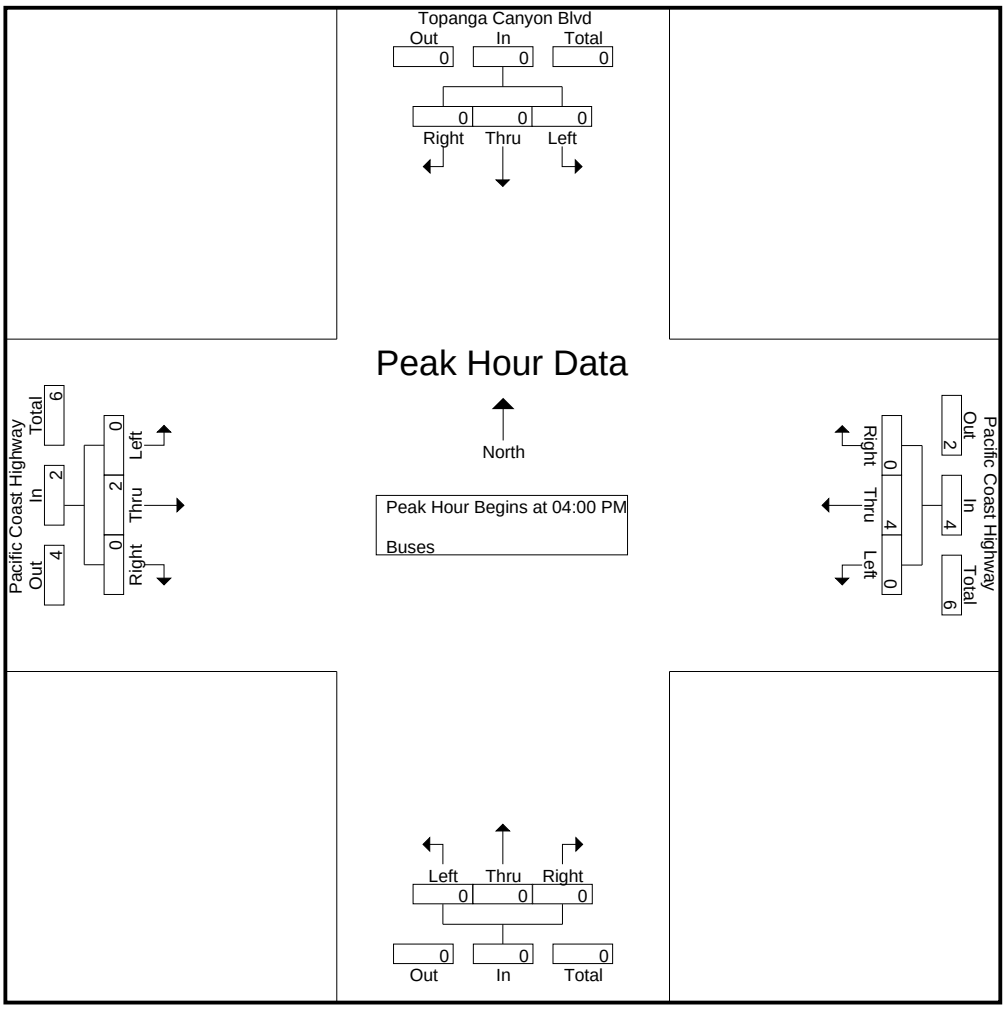
File Name : TopangaCanyonBlvd_PacificCoastHwy_Buses_06-24-22
Site Code : 00000000
Start Date : 6/24/2022
Page No : 1

Groups Printed- Buses

	Topanga Canyon Blvd Southbound			Pacific Coast Highway Westbound			Northbound			Pacific Coast Highway Eastbound			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
04:00 PM	0	0	0	0	1	0	0	0	0	0	1	0	2
04:15 PM	0	0	0	0	2	0	0	0	0	0	0	0	2
04:30 PM	0	0	0	0	1	0	0	0	0	0	1	0	2
Total	0	0	0	0	4	0	0	0	0	0	2	0	6
05:00 PM	0	0	0	0	1	0	0	0	0	0	1	0	2
05:15 PM	0	0	0	0	1	0	0	0	0	0	0	0	1
05:30 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
Total	0	0	0	0	2	0	0	0	0	0	2	0	4
06:15 PM	0	0	0	0	1	0	0	0	0	0	1	0	2
06:45 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
Total	0	0	0	0	1	0	0	0	0	0	2	0	3
Grand Total	0	0	0	0	7	0	0	0	0	0	6	0	13
Apprch %	0	0	0	0	100	0	0	0	0	0	100	0	
Total %	0	0	0	0	53.8	0	0	0	0	0	46.2	0	

File Name : TopangaCanyonBlvd_PacificCoastHwy_Buses_06-24-22
Site Code : 00000000
Start Date : 6/24/2022
Page No : 2

	Topanga Canyon Blvd Southbound				Pacific Coast Highway Westbound				Northbound				Pacific Coast Highway Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 06:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	**1**	0	**1**	**2**
04:15 PM	0	0	0	0	0	**2**	0	**2**	0	0	0	0	0	0	0	0	2
04:30 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	1	2
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	4	0	4	0	0	0	0	0	2	0	2	6
% App. Total	0	0	0		0	100	0		0	0	0		0	100	0		
PHF	.000	.000	.000	.000	.000	.500	.000	.500	.000	.000	.000	.000	.000	.500	.000	.500	.750



CITY TRAFFIC COUNTERS

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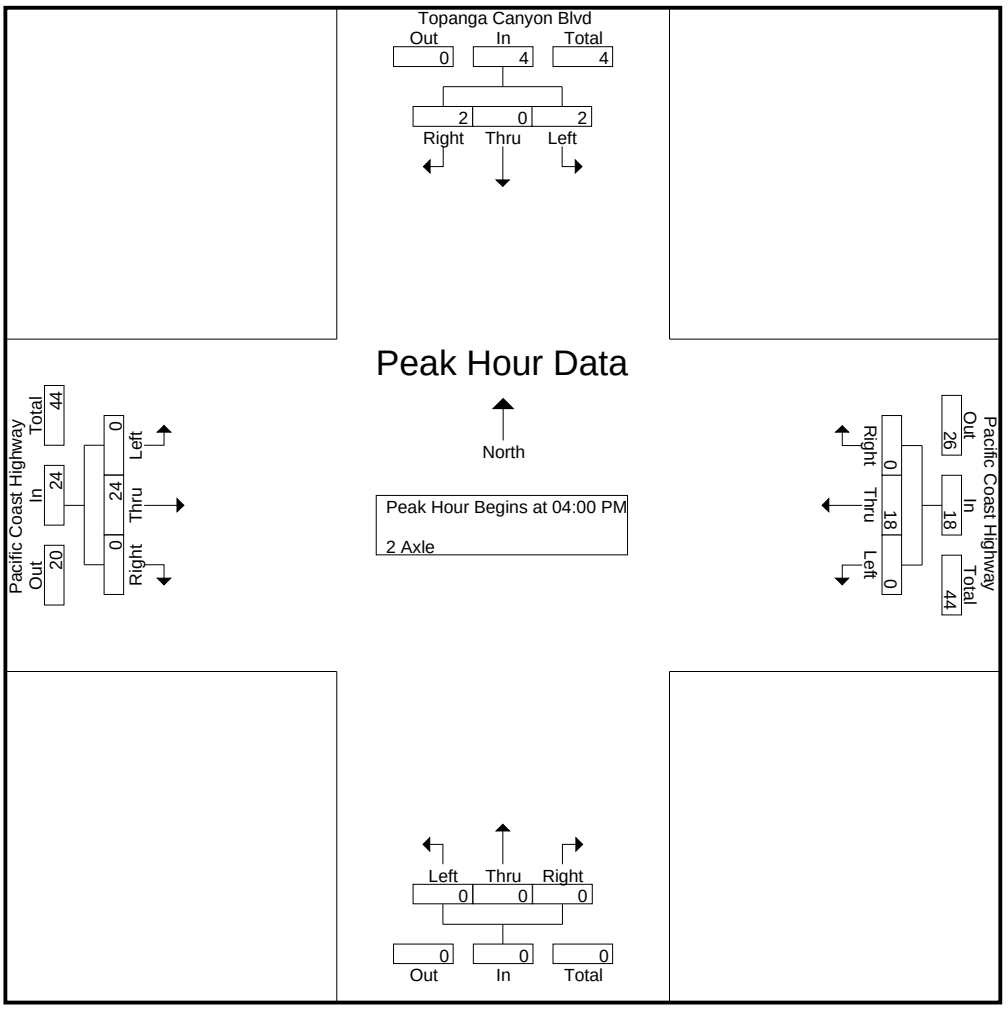
File Name : TopangaCanyonBlvd_PacificCoastHwy_2-Axle_06-24-22
Site Code : 00000000
Start Date : 6/24/2022
Page No : 1

Groups Printed- 2 Axle

	Topanga Canyon Blvd Southbound			Pacific Coast Highway Westbound			Northbound			Pacific Coast Highway Eastbound			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
04:00 PM	0	0	1	0	6	0	0	0	0	0	8	0	15
04:15 PM	0	0	1	0	3	0	0	0	0	0	11	0	15
04:30 PM	1	0	0	0	6	0	0	0	0	0	4	0	11
04:45 PM	1	0	0	0	3	0	0	0	0	0	1	0	5
Total	2	0	2	0	18	0	0	0	0	0	24	0	46
05:00 PM	0	0	0	0	2	0	0	0	0	2	3	0	7
05:15 PM	0	0	0	0	3	1	0	0	0	1	4	0	9
05:30 PM	1	0	0	0	3	0	0	0	0	0	5	0	9
05:45 PM	0	0	0	0	1	0	0	0	0	0	4	0	5
Total	1	0	0	0	9	1	0	0	0	3	16	0	30
06:00 PM	0	0	0	0	3	0	0	0	0	0	2	0	5
06:15 PM	0	0	0	0	1	0	0	0	0	0	2	0	3
06:30 PM	0	0	0	0	1	0	0	0	0	1	3	0	5
06:45 PM	0	0	0	0	2	0	0	0	0	3	0	0	5
Total	0	0	0	0	7	0	0	0	0	4	7	0	18
Grand Total	3	0	2	0	34	1	0	0	0	7	47	0	94
Apprch %	60	0	40	0	97.1	2.9	0	0	0	13	87	0	
Total %	3.2	0	2.1	0	36.2	1.1	0	0	0	7.4	50	0	

File Name : TopangaCanyonBlvd_PacificCoastHwy_2-Axle_06-24-22
Site Code : 00000000
Start Date : 6/24/2022
Page No : 2

	Topanga Canyon Blvd Southbound				Pacific Coast Highway Westbound				Northbound				Pacific Coast Highway Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 06:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	0	0	**1**	**1**	0	**6**	0	**6**	0	0	0	0	0	8	0	8	**15**
04:15 PM	0	0	1	1	0	3	0	3	0	0	0	0	0	**11**	0	**11**	15
04:30 PM	**1**	0	0	1	0	6	0	6	0	0	0	0	0	4	0	4	11
04:45 PM	1	0	0	1	0	3	0	3	0	0	0	0	0	1	0	1	5
Total Volume	2	0	2	4	0	18	0	18	0	0	0	0	0	24	0	24	46
% App. Total	50	0	50		0	100	0		0	0	0		0	100	0		
PHF	.500	.000	.500	1.00	.000	.750	.000	.750	.000	.000	.000	.000	.000	.545	.000	.545	.767



CITY TRAFFIC COUNTERS

WWW.CTCOUNTERS.COM

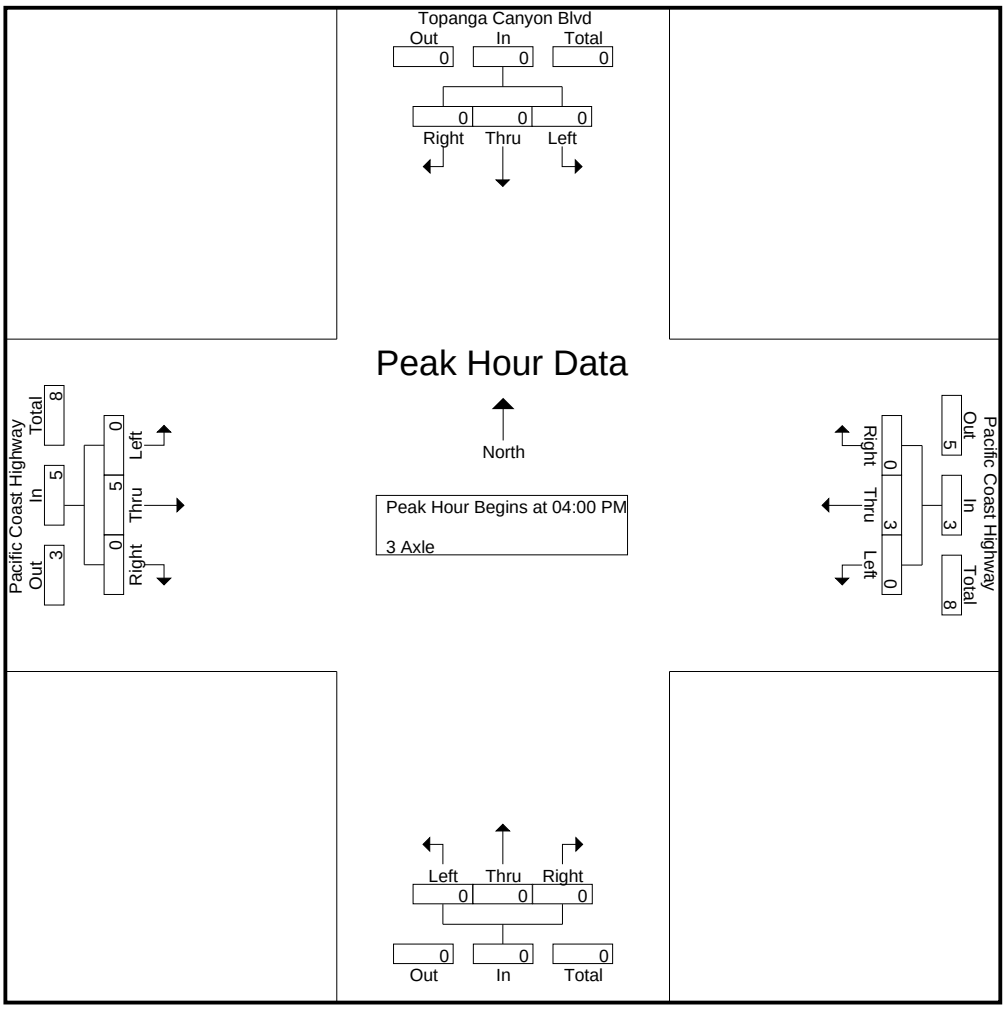
File Name : TopangaCanyonBlvd_PacificCoastHwy_3-Axle_06-24-22
Site Code : 00000000
Start Date : 6/24/2022
Page No : 1

Groups Printed- 3 Axle

	Topanga Canyon Blvd Southbound			Pacific Coast Highway Westbound			Northbound			Pacific Coast Highway Eastbound			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
04:15 PM	0	0	0	0	2	0	0	0	0	0	3	0	5
04:30 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
04:45 PM	0	0	0	0	1	0	0	0	0	0	0	0	1
Total	0	0	0	0	3	0	0	0	0	0	5	0	8
05:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	1
05:30 PM	0	0	0	0	1	0	0	0	0	0	0	0	1
05:45 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
Total	0	0	0	0	1	0	0	0	0	1	1	0	3
06:45 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
Total	0	0	0	0	0	0	0	0	0	0	1	0	1
Grand Total	0	0	0	0	4	0	0	0	0	1	7	0	12
Apprch %	0	0	0	0	100	0	0	0	0	12.5	87.5	0	
Total %	0	0	0	0	33.3	0	0	0	0	8.3	58.3	0	

File Name : TopangaCanyonBlvd_PacificCoastHwy_3-Axle_06-24-22
Site Code : 00000000
Start Date : 6/24/2022
Page No : 2

	Topanga Canyon Blvd Southbound				Pacific Coast Highway Westbound				Northbound				Pacific Coast Highway Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 06:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
04:15 PM	0	0	0	0	0	**2**	0	**2**	0	0	0	0	0	**3**	0	**3**	**5**
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
04:45 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
Total Volume	0	0	0	0	0	3	0	3	0	0	0	0	0	5	0	5	8
% App. Total	0	0	0		0	100	0		0	0	0		0	100	0		
PHF	.000	.000	.000	.000	.000	.375	.000	.375	.000	.000	.000	.000	.000	.417	.000	.417	.400



CITY TRAFFIC COUNTERS

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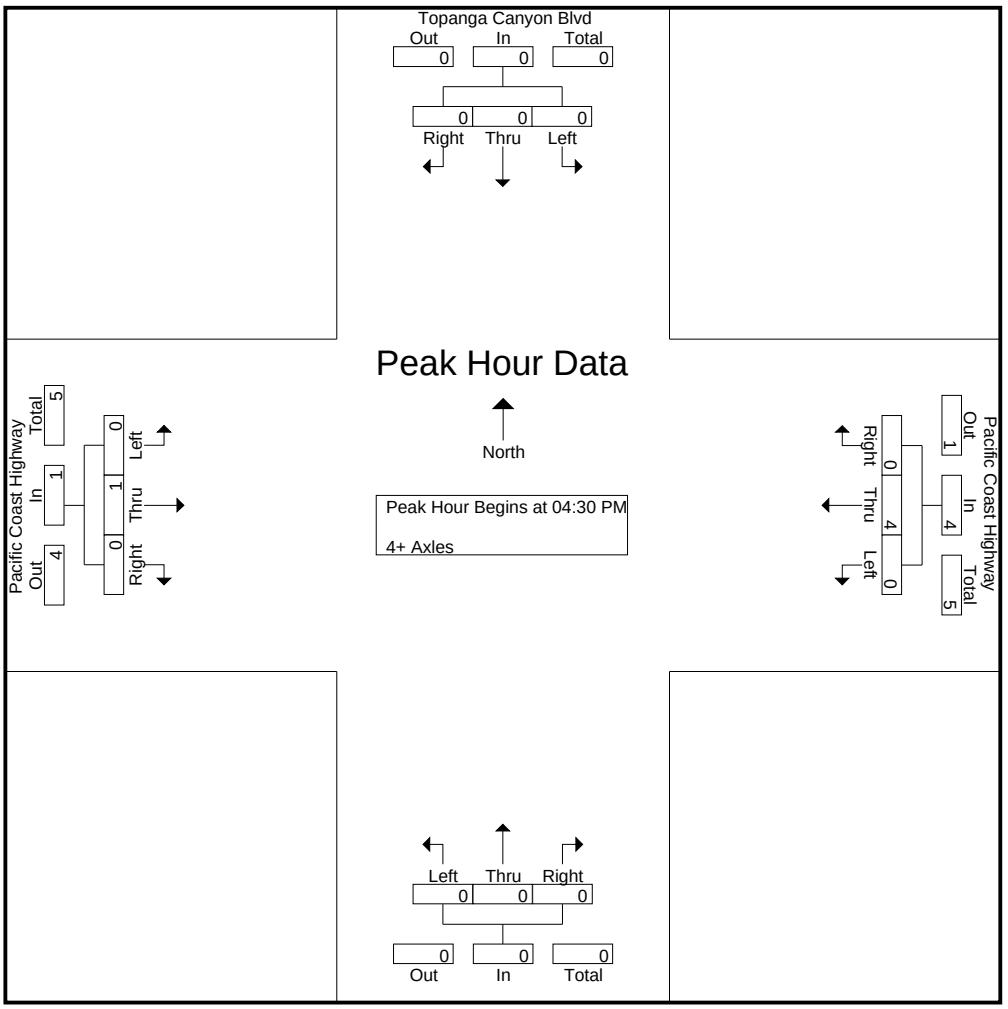
File Name : TopangaCanyonBlvd_PacificCoastHwy_4+Axles_06-24-22
Site Code : 00000000
Start Date : 6/24/2022
Page No : 1

Groups Printed- 4+ Axles

	Topanga Canyon Blvd Southbound			Pacific Coast Highway Westbound			Northbound			Pacific Coast Highway Eastbound			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0	2	0	2
04:30 PM	0	0	0	0	1	0	0	0	0	0	0	0	1
04:45 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
Total	0	0	0	0	1	0	0	0	0	0	3	0	4
05:00 PM	0	0	0	0	1	0	0	0	0	0	0	0	1
05:15 PM	0	0	0	0	2	0	0	0	0	0	0	0	2
Total	0	0	0	0	3	0	0	0	0	0	0	0	3
06:00 PM	0	0	0	0	1	0	0	0	0	0	0	0	1
06:15 PM	0	0	0	0	0	0	0	0	0	0	2	0	2
Total	0	0	0	0	1	0	0	0	0	0	2	0	3
Grand Total	0	0	0	0	5	0	0	0	0	0	5	0	10
Apprch %	0	0	0	0	100	0	0	0	0	0	100	0	
Total %	0	0	0	0	50	0	0	0	0	0	50	0	

File Name : TopangaCanyonBlvd_PacificCoastHwy_4+Axles_06-24-22
Site Code : 00000000
Start Date : 6/24/2022
Page No : 2

	Topanga Canyon Blvd Southbound				Pacific Coast Highway Westbound				Northbound				Pacific Coast Highway Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 06:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	**1**	1
05:00 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
05:15 PM	0	0	0	0	0	**2**	0	**2**	0	0	0	0	0	0	0	0	**2**
Total Volume	0	0	0	0	0	4	0	4	0	0	0	0	0	1	0	1	5
% App. Total	0	0	0		0	100	0		0	0	0		0	100	0		
PHF	.000	.000	.000	.000	.000	.500	.000	.500	.000	.000	.000	.000	.000	.250	.000	.250	.625



CITY TRAFFIC COUNTERS

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File Name : TopangaCanyonBlvd_PacificCoastHwy_BP_06-24-22
Site Code : 00000000
Start Date : 6/24/2022
Page No : 1

Groups Printed- Pedestrians and Bikes

	Topanga Canyon Blvd South Leg		Pacific Coast Highway West Leg		North Leg		Pacific Coast Highway East Leg		
Start Time	Bikes	Peds	Bikes	Peds	Bikes	Peds	Bikes	Peds	Int. Total
04:00 PM	0	0	0	14	0	1	0	0	15
04:15 PM	0	0	0	2	0	1	0	0	3
04:30 PM	0	0	0	7	0	0	0	0	7
04:45 PM	0	0	1	18	0	2	0	0	21
Total	0	0	1	41	0	4	0	0	46
05:00 PM	0	0	0	6	0	3	0	0	9
05:15 PM	0	0	0	3	0	1	1	0	5
05:30 PM	0	0	0	6	0	1	0	0	7
05:45 PM	0	0	0	4	0	0	0	0	4
Total	0	0	0	19	0	5	1	0	25
06:00 PM	0	0	0	3	0	0	0	0	3
06:15 PM	0	0	0	2	0	4	1	0	7
06:30 PM	0	0	0	6	0	2	0	0	8
06:45 PM	0	0	0	5	0	0	1	0	6
Total	0	0	0	16	0	6	2	0	24
Grand Total	0	0	1	76	0	15	3	0	95
Apprch %	0	0	1.3	98.7	0	100	100	0	
Total %	0	0	1.1	80	0	15.8	3.2	0	

CITY TRAFFIC COUNTERS

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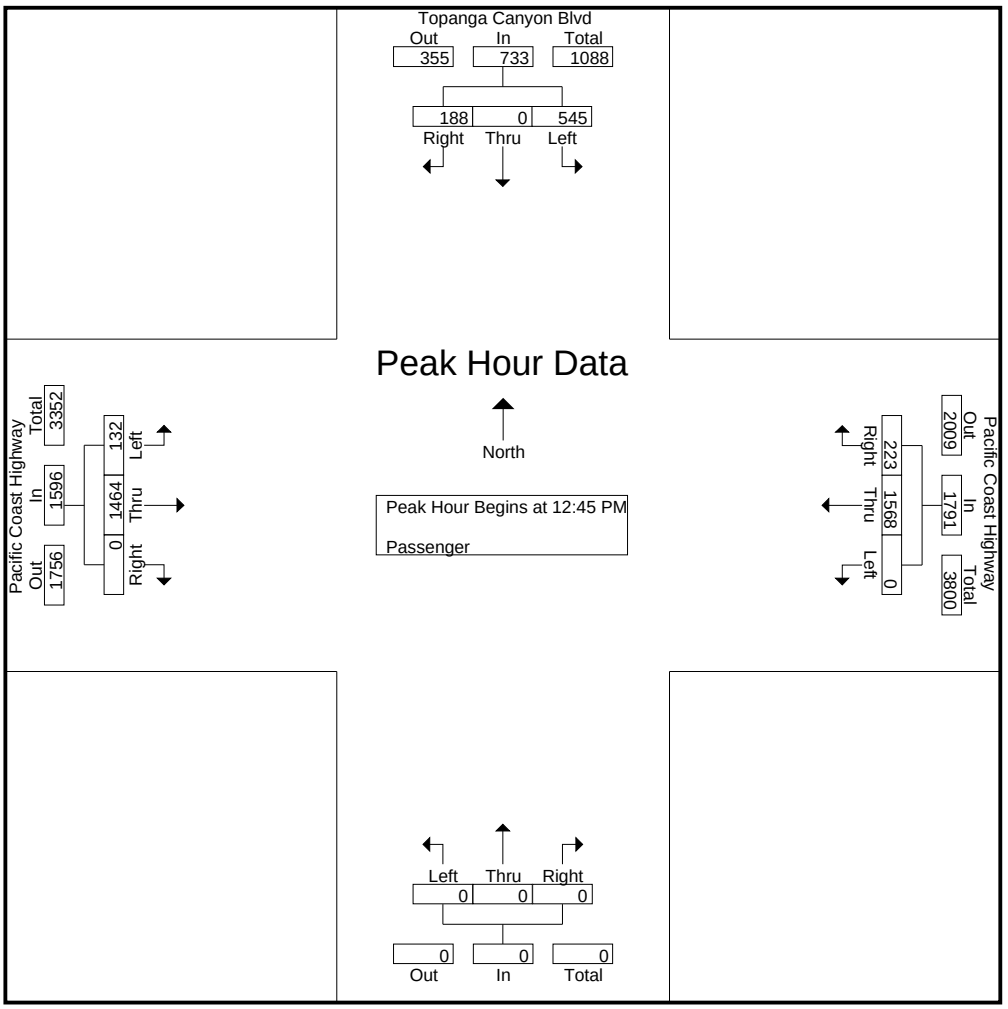
File Name : TopangaCanyonBlvd_PacificCoastHwy_Passenger_06-25-22
Site Code : 00000000
Start Date : 6/25/2022
Page No : 1

Groups Printed- Passenger

	Topanga Canyon Blvd Southbound			Pacific Coast Highway Westbound			Northbound			Pacific Coast Highway Eastbound			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
12:00 PM	98	0	59	0	425	32	0	0	0	20	329	0	963
12:15 PM	114	0	62	0	431	38	0	0	0	29	236	0	910
12:30 PM	132	0	60	0	410	40	0	0	0	20	223	0	885
12:45 PM	118	0	46	0	408	59	0	0	0	25	421	0	1077
Total	462	0	227	0	1674	169	0	0	0	94	1209	0	3835
01:00 PM	154	0	52	0	364	51	0	0	0	39	370	0	1030
01:15 PM	110	0	47	0	424	60	0	0	0	37	380	0	1058
01:30 PM	163	0	43	0	372	53	0	0	0	31	293	0	955
01:45 PM	117	0	57	0	400	35	0	0	0	34	305	0	948
Total	544	0	199	0	1560	199	0	0	0	141	1348	0	3991
02:00 PM	140	0	36	0	337	61	0	0	0	30	326	0	930
02:15 PM	146	0	35	0	401	43	0	0	0	38	371	0	1034
02:30 PM	107	0	51	0	377	67	0	0	0	30	222	0	854
02:45 PM	140	0	45	0	389	55	0	0	0	31	245	0	905
Total	533	0	167	0	1504	226	0	0	0	129	1164	0	3723
Grand Total	1539	0	593	0	4738	594	0	0	0	364	3721	0	11549
Apprch %	72.2	0	27.8	0	88.9	11.1	0	0	0	8.9	91.1	0	
Total %	13.3	0	5.1	0	41	5.1	0	0	0	3.2	32.2	0	

File Name : TopangaCanyonBlvd_PacificCoastHwy_Passenger_06-25-22
Site Code : 00000000
Start Date : 6/25/2022
Page No : 2

	Topanga Canyon Blvd Southbound				Pacific Coast Highway Westbound				Northbound				Pacific Coast Highway Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 02:00 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 12:45 PM																	
12:45 PM	118	0	46	164	0	408	59	467	0	0	0	0	25	**421**	0	**446**	**1077**
01:00 PM	154	0	**52**	**206**	0	364	51	415	0	0	0	0	**39**	370	0	409	1030
01:15 PM	110	0	47	157	0	**424**	**60**	**484**	0	0	0	0	37	380	0	417	1058
01:30 PM	**163**	0	43	206	0	372	53	425	0	0	0	0	31	293	0	324	955
Total Volume	545	0	188	733	0	1568	223	1791	0	0	0	0	132	1464	0	1596	4120
% App. Total	74.4	0	25.6		0	87.5	12.5		0	0	0		8.3	91.7	0		
PHF	.836	.000	.904	.890	.000	.925	.929	.925	.000	.000	.000	.000	.846	.869	.000	.895	.956



CITY TRAFFIC COUNTERS

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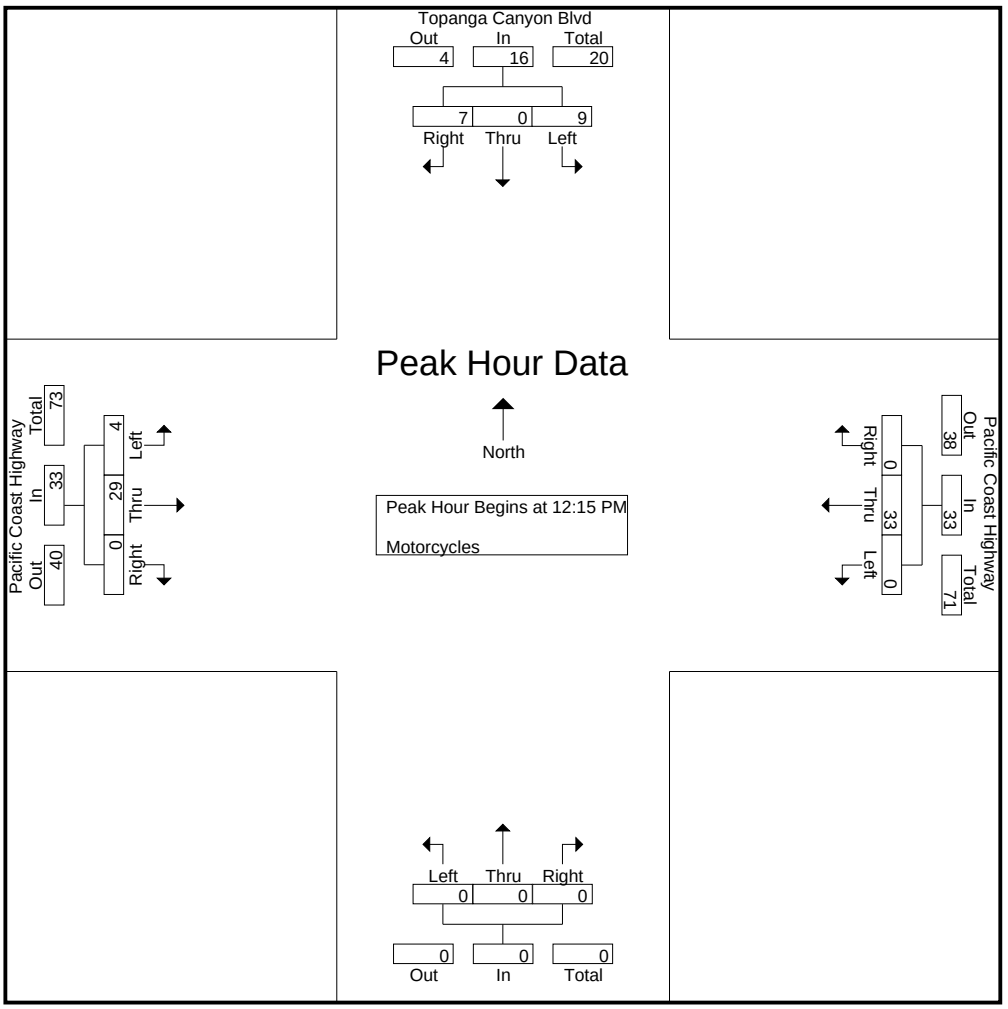
File Name : TopangaCanyonBlvd_PacificCoastHwy_Motorcycles_06-25-22
Site Code : 00000000
Start Date : 6/25/2022
Page No : 1

Groups Printed- Motorcycles

	Topanga Canyon Blvd Southbound			Pacific Coast Highway Westbound			Northbound			Pacific Coast Highway Eastbound			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
12:00 PM	0	0	1	0	6	0	0	0	0	0	3	0	10
12:15 PM	0	0	0	0	7	0	0	0	0	2	7	0	16
12:30 PM	2	0	6	0	9	0	0	0	0	0	6	0	23
12:45 PM	3	0	0	0	6	0	0	0	0	1	12	0	22
Total	5	0	7	0	28	0	0	0	0	3	28	0	71
01:00 PM	4	0	1	0	11	0	0	0	0	1	4	0	21
01:15 PM	5	0	0	0	2	0	0	0	0	1	6	0	14
01:30 PM	0	0	2	0	7	0	0	0	0	1	9	0	19
01:45 PM	5	0	0	0	8	0	0	0	0	0	8	0	21
Total	14	0	3	0	28	0	0	0	0	3	27	0	75
02:00 PM	9	0	0	0	0	0	0	0	0	0	3	0	12
02:15 PM	13	0	0	0	3	0	0	0	0	0	4	0	20
02:30 PM	1	0	1	0	1	0	0	0	0	1	3	0	7
02:45 PM	0	0	1	0	2	0	0	0	0	0	3	0	6
Total	23	0	2	0	6	0	0	0	0	1	13	0	45
Grand Total	42	0	12	0	62	0	0	0	0	7	68	0	191
Apprch %	77.8	0	22.2	0	100	0	0	0	0	9.3	90.7	0	
Total %	22	0	6.3	0	32.5	0	0	0	0	3.7	35.6	0	

File Name : TopangaCanyonBlvd_PacificCoastHwy_Motorcycles_06-25-22
Site Code : 00000000
Start Date : 6/25/2022
Page No : 2

	Topanga Canyon Blvd Southbound				Pacific Coast Highway Westbound				Northbound				Pacific Coast Highway Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 02:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 12:15 PM																	
12:15 PM	0	0	0	0	0	7	0	7	0	0	0	0	**2**	7	0	9	16
12:30 PM	2	0	**6**	**8**	0	9	0	9	0	0	0	0	0	6	0	6	**23**
12:45 PM	3	0	0	3	0	6	0	6	0	0	0	0	1	**12**	0	**13**	22
01:00 PM	**4**	0	1	5	0	**11**	0	**11**	0	0	0	0	1	4	0	5	21
Total Volume	9	0	7	16	0	33	0	33	0	0	0	0	4	29	0	33	82
% App. Total	56.2	0	43.8		0	100	0		0	0	0		12.1	87.9	0		
PHF	.563	.000	.292	.500	.000	.750	.000	.750	.000	.000	.000	.000	.500	.604	.000	.635	.891



CITY TRAFFIC COUNTERS

WWW.CTCOUNTERS.COM

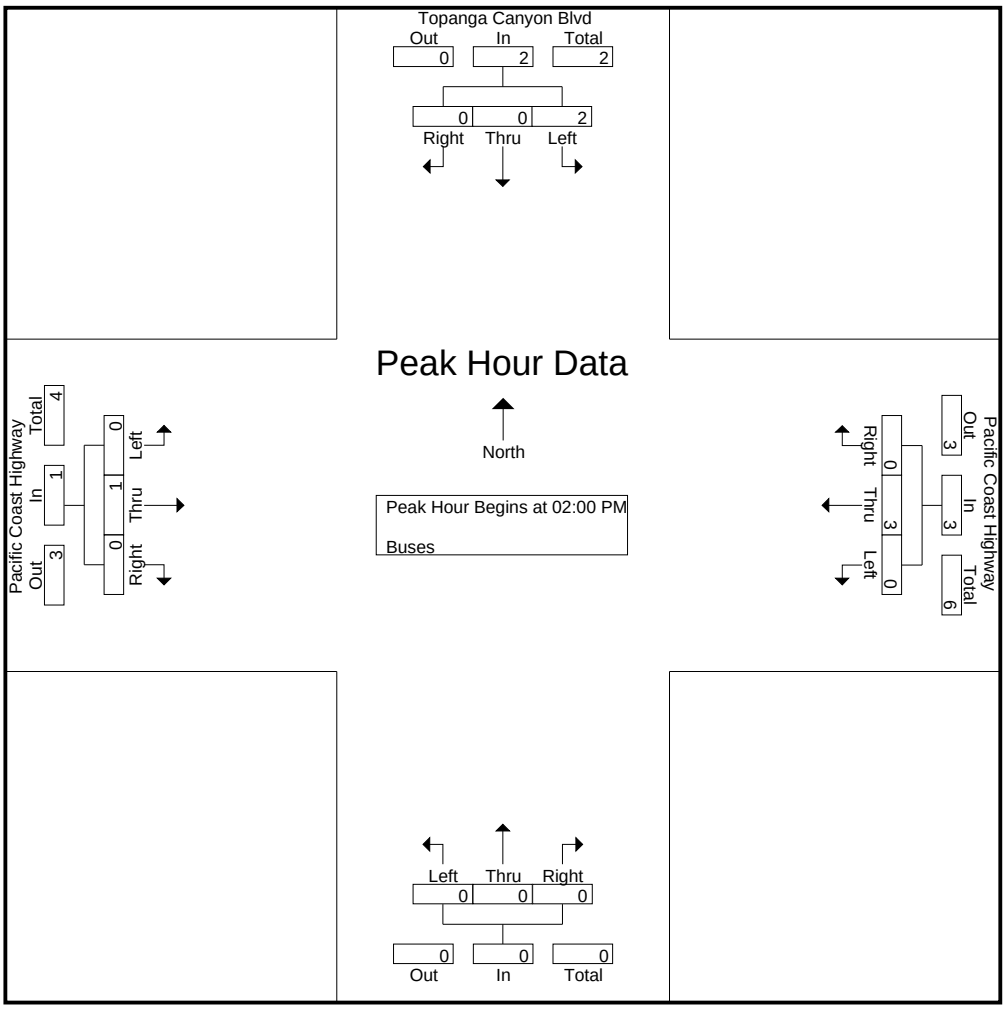
File Name : TopangaCanyonBlvd_PacificCoastHwy_Buses_06-25-22
Site Code : 00000000
Start Date : 6/25/2022
Page No : 1

Groups Printed- Buses

	Topanga Canyon Blvd Southbound			Pacific Coast Highway Westbound			Northbound			Pacific Coast Highway Eastbound			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
12:00 PM	0	0	0	0	2	1	0	0	0	0	0	0	3
12:30 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
12:45 PM	0	0	0	0	1	0	0	0	0	0	0	0	1
Total	0	0	0	0	3	1	0	0	0	0	1	0	5
01:15 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
01:45 PM	0	0	0	0	1	0	0	0	0	0	0	0	1
Total	0	0	0	0	1	0	0	0	0	0	1	0	2
02:00 PM	0	0	0	0	2	0	0	0	0	0	0	0	2
02:15 PM	0	0	0	0	1	0	0	0	0	0	1	0	2
02:45 PM	2	0	0	0	0	0	0	0	0	0	0	0	2
Total	2	0	0	0	3	0	0	0	0	0	1	0	6
Grand Total	2	0	0	0	7	1	0	0	0	0	3	0	13
Apprch %	100	0	0	0	87.5	12.5	0	0	0	0	100	0	
Total %	15.4	0	0	0	53.8	7.7	0	0	0	0	23.1	0	

File Name : TopangaCanyonBlvd_PacificCoastHwy_Buses_06-25-22
Site Code : 00000000
Start Date : 6/25/2022
Page No : 2

	Topanga Canyon Blvd Southbound				Pacific Coast Highway Westbound				Northbound				Pacific Coast Highway Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 02:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 02:00 PM																	
02:00 PM	0	0	0	0	0	**2**	0	**2**	0	0	0	0	0	0	0	0	**2**
02:15 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	**1**	0	**1**	2
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:45 PM	**2**	0	0	**2**	0	0	0	0	0	0	0	0	0	0	0	0	2
Total Volume	2	0	0	2	0	3	0	3	0	0	0	0	0	1	0	1	6
% App. Total	100	0	0		0	100	0		0	0	0		0	100	0		
PHF	.250	.000	.000	.250	.000	.375	.000	.375	.000	.000	.000	.000	.000	.250	.000	.250	.750



CITY TRAFFIC COUNTERS

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File Name : TopangaCanyonBlvd_PacificCoastHwy_2-Axle_06-25-22
Site Code : 00000000
Start Date : 6/25/2022
Page No : 1

Groups Printed- 2 Axle

	Topanga Canyon Blvd Southbound			Pacific Coast Highway Westbound			Northbound			Pacific Coast Highway Eastbound			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
12:00 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
12:15 PM	3	0	1	0	4	0	0	0	0	0	0	0	8
12:30 PM	1	0	0	0	3	0	0	0	0	0	5	0	9
12:45 PM	0	0	0	0	5	0	0	0	0	2	4	0	11
Total	4	0	1	0	12	0	0	0	0	2	10	0	29
01:00 PM	0	0	0	0	1	0	0	0	0	0	3	0	4
01:15 PM	2	0	0	0	2	0	0	0	0	0	3	0	7
01:30 PM	0	0	1	0	1	0	0	0	0	1	2	0	5
01:45 PM	0	0	0	0	2	0	0	0	0	0	1	0	3
Total	2	0	1	0	6	0	0	0	0	1	9	0	19
02:00 PM	2	0	0	0	2	0	0	0	0	0	0	0	4
02:15 PM	1	0	0	0	2	0	0	0	0	0	1	0	4
02:30 PM	0	0	0	0	3	0	0	0	0	0	2	0	5
02:45 PM	0	0	0	0	1	0	0	0	0	0	1	0	2
Total	3	0	0	0	8	0	0	0	0	0	4	0	15
Grand Total	9	0	2	0	26	0	0	0	0	3	23	0	63
Apprch %	81.8	0	18.2	0	100	0	0	0	0	11.5	88.5	0	
Total %	14.3	0	3.2	0	41.3	0	0	0	0	4.8	36.5	0	

CITY TRAFFIC COUNTERS

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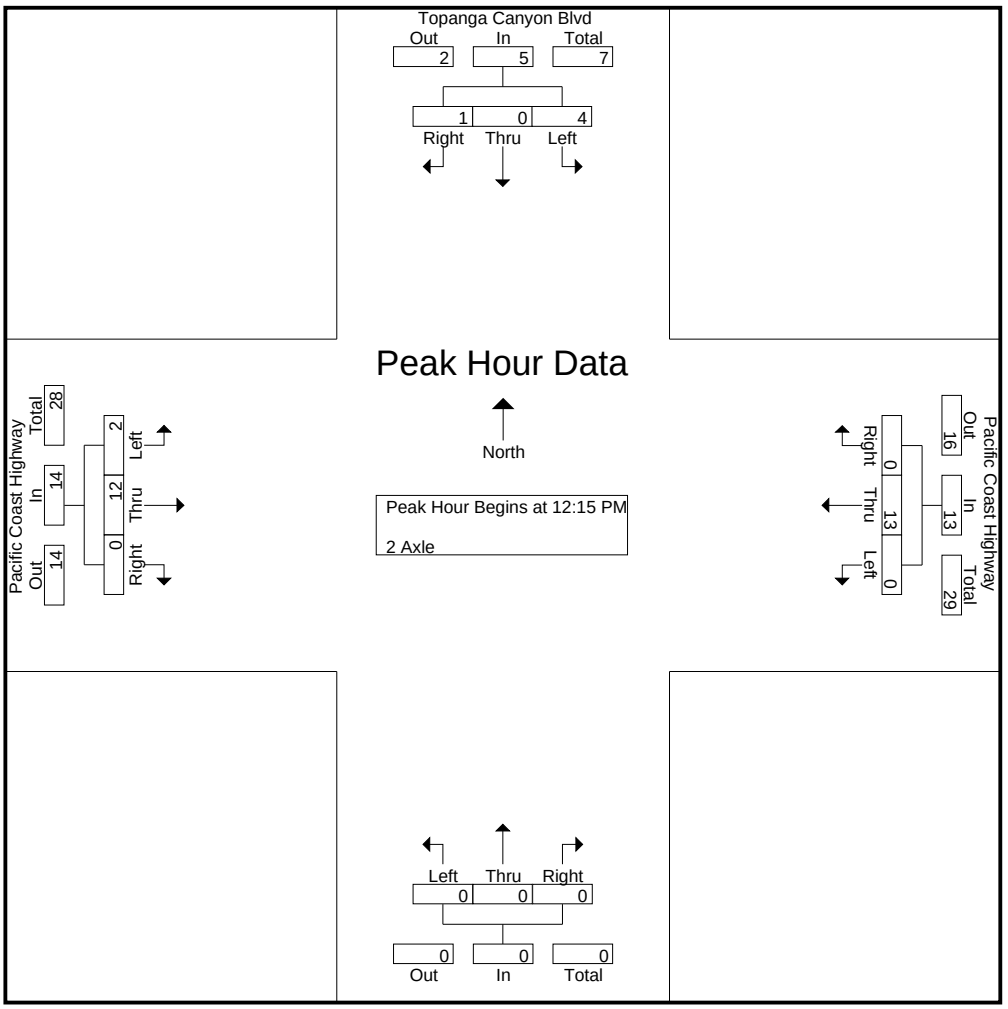
File Name : TopangaCanyonBlvd_PacificCoastHwy_2-Axle_06-25-22
Site Code : 00000000
Start Date : 6/25/2022

	Topanga Canyon Blvd Southbound				Pacific Coast Highway Westbound				Northbound				Pacific Coast Highway Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 02:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 12:15 PM																	
12:15 PM	**3**	0	**1**	**4**	0	4	0	4	0	0	0	0	0	0	0	0	8
12:30 PM	1	0	0	1	0	3	0	3	0	0	0	0	0	**5**	0	5	9
12:45 PM	0	0	0	0	0	**5**	0	**5**	0	0	0	0	**2**	4	0	**6**	**11**
01:00 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	3	0	3	4
Total Volume	4	0	1	5	0	13	0	13	0	0	0	0	2	12	0	14	32
% App. Total	80	0	20		0	100	0		0	0	0		14.3	85.7	0		
PHF	.333	.000	.250	.313	.000	.650	.000	.650	.000	.000	.000	.000	.250	.600	.000	.583	.727



CITY TRAFFIC COUNTERS

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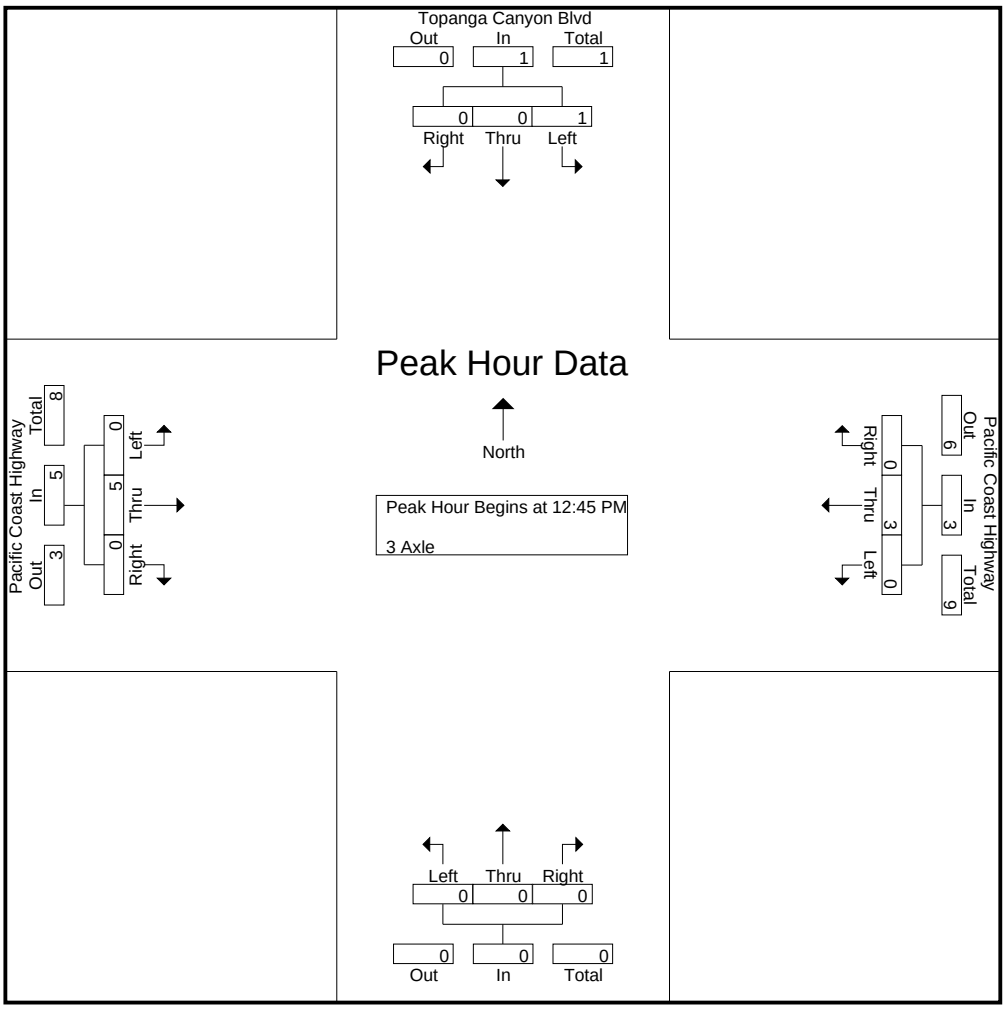
File Name : TopangaCanyonBlvd_PacificCoastHwy_3-Axle_06-25-22
Site Code : 00000000
Start Date : 6/25/2022
Page No : 1

Groups Printed- 3 Axle

	Topanga Canyon Blvd Southbound			Pacific Coast Highway Westbound			Northbound			Pacific Coast Highway Eastbound			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
12:00 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
12:15 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
12:30 PM	0	0	0	0	1	0	0	0	0	0	1	0	2
12:45 PM	0	0	0	0	1	0	0	0	0	0	0	0	1
Total	0	0	0	0	2	0	0	0	0	0	3	0	5
01:00 PM	0	0	0	0	1	0	0	0	0	0	1	0	2
01:15 PM	1	0	0	0	0	0	0	0	0	0	0	0	1
01:30 PM	0	0	0	0	1	0	0	0	0	0	4	0	5
Total	1	0	0	0	2	0	0	0	0	0	5	0	8
02:00 PM	0	0	0	0	1	0	0	0	0	0	0	0	1
02:45 PM	0	0	0	0	1	0	0	0	0	0	0	0	1
Total	0	0	0	0	2	0	0	0	0	0	0	0	2
Grand Total	1	0	0	0	6	0	0	0	0	0	8	0	15
Apprch %	100	0	0	0	100	0	0	0	0	0	100	0	
Total %	6.7	0	0	0	40	0	0	0	0	0	53.3	0	

File Name : TopangaCanyonBlvd_PacificCoastHwy_3-Axle_06-25-22
Site Code : 00000000
Start Date : 6/25/2022
Page No : 2

	Topanga Canyon Blvd Southbound				Pacific Coast Highway Westbound				Northbound				Pacific Coast Highway Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 02:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 12:45 PM																	
12:45 PM	0	0	0	0	0	**1**	0	**1**	0	0	0	0	0	0	0	0	1
01:00 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	1	2
01:15 PM	**1**	0	0	**1**	0	0	0	0	0	0	0	0	0	0	0	0	1
01:30 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	**4**	0	**4**	**5**
Total Volume	1	0	0	1	0	3	0	3	0	0	0	0	0	5	0	5	9
% App. Total	100	0	0		0	100	0		0	0	0		0	100	0		
PHF	.250	.000	.000	.250	.000	.750	.000	.750	.000	.000	.000	.000	.000	.313	.000	.313	.450



CITY TRAFFIC COUNTERS

WWW.CTCOUNTERS.COM

File Name : TopangaCanyonBlvd_PacificCoastHwy_4+Axles_06-25-22
Site Code : 00000000
Start Date : 6/25/2022
Page No : 1

Groups Printed- 4+ Axles

	Topanga Canyon Blvd Southbound			Pacific Coast Highway Westbound			Northbound			Pacific Coast Highway Eastbound			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
12:00 PM	0	0	0	0	1	0	0	0	0	0	0	0	1
12:15 PM	0	0	0	0	1	0	0	0	0	0	1	0	2
12:45 PM	0	0	0	0	1	0	0	0	0	0	1	0	2
Total	0	0	0	0	3	0	0	0	0	0	2	0	5
01:15 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
01:45 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
Total	0	0	0	0	0	0	0	0	0	0	2	0	2
Grand Total	0	0	0	0	3	0	0	0	0	0	4	0	7
Apprch %	0	0	0	0	100	0	0	0	0	0	100	0	
Total %	0	0	0	0	42.9	0	0	0	0	0	57.1	0	

CITY TRAFFIC COUNTERS

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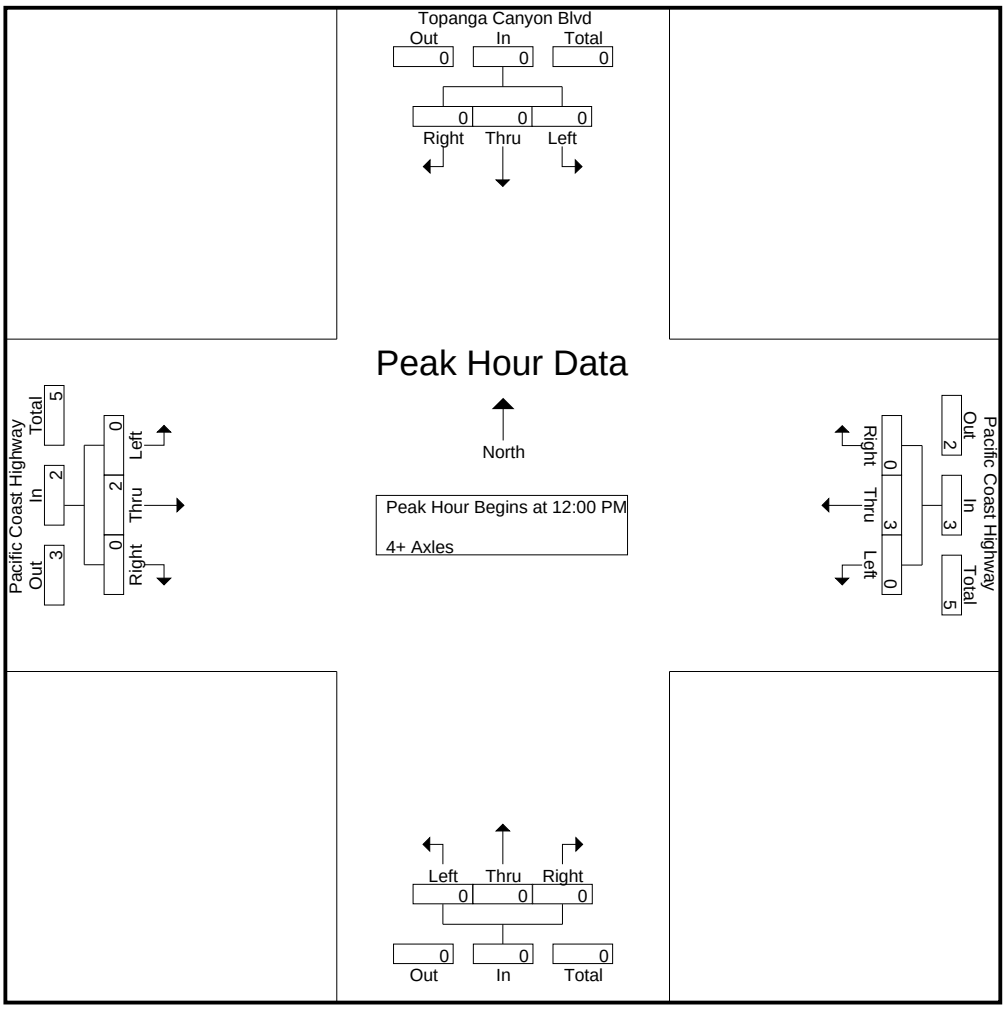
File Name : TopangaCanyonBlvd_PacificCoastHwy_4+Axles_06-25-22
Site Code : 00000000
Start Date : 6/25/2022
Page No : 2

	Topanga Canyon Blvd Southbound				Pacific Coast Highway Westbound				Northbound				Pacific Coast Highway Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 02:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 12:00 PM																	
12:00 PM	0	0	0	0	0	**1**	0	**1**	0	0	0	0	0	0	0	0	1
12:15 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	**1**	0	**1**	**2**
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	1	2
Total Volume	0	0	0	0	0	3	0	3	0	0	0	0	0	2	0	2	5
% App. Total	0	0	0		0	100	0		0	0	0		0	100	0		
PHF	.000	.000	.000	.000	.000	.750	.000	.750	.000	.000	.000	.000	.000	.500	.000	.500	.625



CITY TRAFFIC COUNTERS

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File Name : TopangaCanyonBlvd_PacificCoastHwy_BP_06-25-22
Site Code : 00000000
Start Date : 6/25/2022
Page No : 1

Groups Printed- Pedestrians and Bikes

	Topanga Canyon Blvd South Leg		Pacific Coast Highway West Leg		North Leg		Pacific Coast Highway East Leg		
Start Time	Bikes	Peds	Bikes	Peds	Bikes	Peds	Bikes	Peds	Int. Total
12:00 PM	0	0	46	4	4	5	1	0	60
12:15 PM	0	0	15	7	6	1	2	0	31
12:30 PM	0	0	12	13	7	8	2	0	42
12:45 PM	0	0	25	13	6	4	1	0	49
Total	0	0	98	37	23	18	6	0	182
01:00 PM	0	0	5	10	1	4	2	0	22
01:15 PM	0	0	1	6	7	2	2	0	18
01:30 PM	0	0	6	22	0	4	2	0	34
01:45 PM	0	0	2	20	0	3	0	0	25
Total	0	0	14	58	8	13	6	0	99
02:00 PM	0	0	1	11	0	7	3	0	22
02:15 PM	0	0	0	5	2	2	0	0	9
02:30 PM	0	0	4	18	0	5	0	0	27
02:45 PM	0	0	2	17	1	4	0	0	24
Total	0	0	7	51	3	18	3	0	82
Grand Total	0	0	119	146	34	49	15	0	363
Apprch %	0	0	44.9	55.1	41	59	100	0	
Total %	0	0	32.8	40.2	9.4	13.5	4.1	0	

APPENDIX B

SCAG 2020 Growth Factors

EA 23930 : Topanga Lagoon Restoration Project

	SCAG2020 (2016-2045) Growth Factor					
	AM Peak		PM Peak		AADT	
Description	E/B	W/B	E/B	W/B	E/B	W/B
SR1 at topango Canyon Blvd (SR 27)	1.02	1.04	1.03	1.02	1.07	1.09

	SCAG2020 (2016-2045) Growth Factor					
	AM Peak		PM Peak		AADT	
Description	N/B	S/B	N/B	S/B	N/B	S/B
Topango Canyon Blvd (SR 27) at SR 1	0.98	0.98	0.99	0.99	1.01	1.01

APPENDIX C

HCM AND LEVELS OF SERVICE EXPLANATION
HCM DATA WORKSHEETS

LEVEL OF SERVICE FOR SIGNALIZED INTERSECTIONS

In the *Highway Capacity Manual (HCM)*, published by the Transportation Research Board, 2000, level of service for signalized intersections is defined in terms of delay, which is a measure of driver discomfort, frustration, fuel consumption, and increased travel time. The delay experienced by a motorist is made up of a number of factors that relate to control, geometrics, traffic, and incidents. Total delay is the difference between the travel time actually experienced and the reference travel time that would result during base conditions: in the absence of traffic control, in the absence of geometric delay, in the absence of incidents, and when there are no other vehicles on the road. Only the portion of total delay attributed to the control facility is quantified. This delay is called *control delay*. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay.

Level of Service criteria for traffic signals are stated in terms of the average control delay per vehicle. Delay is a complex measure and is dependent on a number of variables, including the quality of progression, the cycle length, the green ratio, and the *v/c* ratio for the lane group in question.

Level of Service Criteria for Signalized Intersections

Level of Service	Control Delay (Sec/Veh)
A	≤ 10
B	> 10 and ≤ 20
C	> 20 and ≤ 35
D	> 35 and ≤ 55
E	> 55 and ≤ 80
F	> 80

Level of Service (LOS) values are used to describe intersection operations with service levels varying from LOS A (free flow) to LOS F (jammed condition). The following descriptions summarize *HCM* criteria for each level of service:

LOS A describes operations with very low control delay, up to 10 seconds per vehicle. This level of service occurs when progression is extremely favorable and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay values.

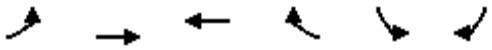
LOS B describes operations with control delay greater than 10 and up to 20 seconds per vehicle. This level generally occurs with good progression, short cycle lengths, or both. More vehicles stop than with LOS A, causing higher levels of delay.

LOS C describes operations with control delay greater than 20 and up to 35 seconds per vehicle. These higher delays may result from fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant at this level, though many still pass through the intersection without stopping.

LOS D describes operations with control delay greater than 35 and up to 55 seconds per vehicle. At LOS D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high *v/c* ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.

LOS E describes operations with control delay greater than 55 and up to 80 seconds per vehicle. This level is considered by many agencies to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high *v/c* ratios. Individual cycle failures are frequent occurrences.

LOS F describes operations with control delay in excess of 80 seconds per vehicle. This level, considered to be unacceptable to most drivers, often occurs with oversaturation, that is, when arrival flow rates exceed the capacity of the lane groups. It may also occur at high *v/c* ratios with many individual cycle failures. Poor progression and long cycle lengths may also be major contributing factors to such delay levels.



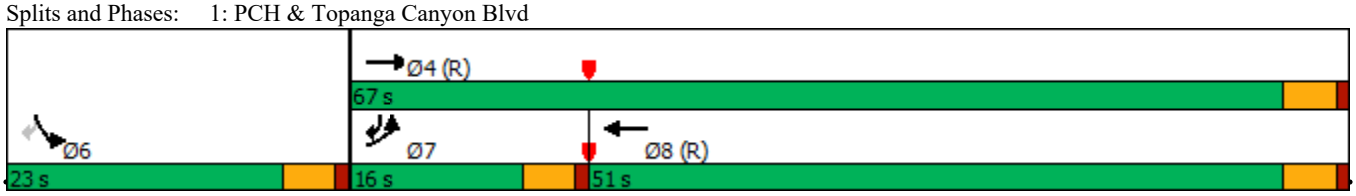
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	189	1837	1712	750	270	88
Future Volume (vph)	189	1837	1712	750	270	88
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	16	12	12
Storage Length (ft)	300			100	280	180
Storage Lanes	1			1	1	0
Taper Length (ft)	110				25	
Lane Util. Factor	1.00	0.95	0.91	0.91	0.97	1.00
Frt			0.954			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1711	3421	4690	0	3433	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1711	3421	4690	0	3433	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			181			8
Link Speed (mph)		45	45		45	
Link Distance (ft)		242	258		751	
Travel Time (s)		3.7	3.9		11.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	205	1997	1861	815	293	96
Shared Lane Traffic (%)						
Lane Group Flow (vph)	205	1997	2676	0	293	96
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		11	11		24	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	0		16	
Two way Left Turn Lane		Yes				
Headway Factor	1.04	1.04	1.04	0.85	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	2	2		1	1
Detector Template	Left	Thru	Thru		Left	Right
Leading Detector (ft)	20	100	100		20	20
Trailing Detector (ft)	0	0	0		0	0
Detector 1 Position(ft)	0	0	0		0	0
Detector 1 Size(ft)	20	6	6		20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(ft)		94	94			
Detector 2 Size(ft)		6	6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	Prot	NA	NA		Prot	pm+ov
Protected Phases	7	4	8		6	7
Permitted Phases						6
Detector Phase	7	4	8		6	7
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0
Minimum Split (s)	9.5	22.5	22.5		22.5	9.5

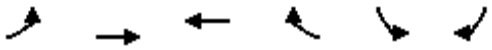
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Total Split (s)	16.0	67.0	51.0		23.0	16.0
Total Split (%)	17.8%	74.4%	56.7%		25.6%	17.8%
Maximum Green (s)	11.5	62.5	46.5		18.5	11.5
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Lead/Lag	Lead		Lag			Lead
Lead-Lag Optimize?	Yes		Yes			Yes
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	C-Max	C-Max		Max	None
Walk Time (s)		7.0	7.0		7.0	
Flash Dont Walk (s)		11.0	11.0		11.0	
Pedestrian Calls (#/hr)		0	0		0	
Act Effct Green (s)	11.5	62.5	46.5		18.5	34.5
Actuated g/C Ratio	0.13	0.69	0.52		0.21	0.38
v/c Ratio	0.94	0.84	1.07		0.42	0.16
Control Delay	88.6	14.4	60.2		33.2	17.5
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	88.6	14.4	60.2		33.2	17.5
LOS	F	B	E		C	B
Approach Delay		21.3	60.2		29.3	
Approach LOS		C	E		C	
Queue Length 50th (ft)	117	376	~603		75	32
Queue Length 95th (ft)	#251	495	#700		113	65
Internal Link Dist (ft)		162	178		671	
Turn Bay Length (ft)	300				280	180
Base Capacity (vph)	218	2375	2510		705	611
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.94	0.84	1.07		0.42	0.16

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 39 (43%), Referenced to phase 4:EBT and 8:WBT, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.07
Intersection Signal Delay: 41.7 Intersection LOS: D
Intersection Capacity Utilization 79.3% ICU Level of Service D
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: PCH & Topanga Canyon Blvd





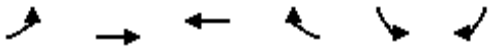
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	189	1837	1712	750	270	88
Future Volume (veh/h)	189	1837	1712	750	270	88
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1945	1870	1870
Adj Flow Rate, veh/h	205	1997	1861	0	293	96
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	228	2468	2638		710	528
Arrive On Green	0.13	0.69	0.52	0.00	0.21	0.21
Sat Flow, veh/h	1781	3647	5443	0	3456	1585
Grp Volume(v), veh/h	205	1997	1861	0	293	96
Grp Sat Flow(s),veh/h/ln	1781	1777	1702	0	1728	1585
Q Serve(g_s), s	10.2	35.3	24.9	0.0	6.6	3.9
Cycle Q Clear(g_c), s	10.2	35.3	24.9	0.0	6.6	3.9
Prop In Lane	1.00			0.00	1.00	1.00
Lane Grp Cap(c), veh/h	228	2468	2638		710	528
V/C Ratio(X)	0.90	0.81	0.71		0.41	0.18
Avail Cap(c_a), veh/h	228	2468	2638		710	528
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	38.7	9.6	16.5	0.0	31.0	21.3
Incr Delay (d2), s/veh	34.3	3.0	1.6	0.0	1.8	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	10.5	15.6	13.6	0.0	5.0	7.4
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	73.0	12.6	18.2	0.0	32.8	22.0
LnGrp LOS	E	B	B		C	C
Approach Vol, veh/h		2202	1861		389	
Approach Delay, s/veh		18.2	18.2		30.1	
Approach LOS		B	B		C	

Timer - Assigned Phs	4	6	7	8
Phs Duration (G+Y+Rc), s	67.0	23.0	16.0	51.0
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	62.5	18.5	11.5	46.5
Max Q Clear Time (g_c+I1), s	37.3	8.6	12.2	26.9
Green Ext Time (p_c), s	17.2	0.9	0.0	12.7

Intersection Summary	
HCM 6th Ctrl Delay	19.2
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

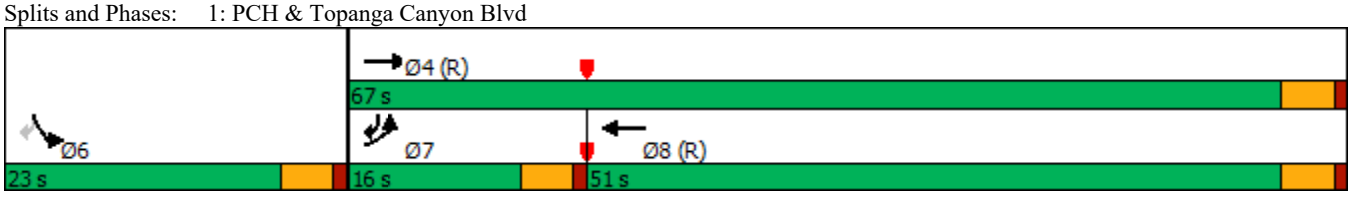


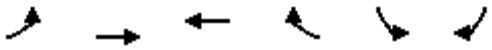
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	138	1513	1623	223	561	196
Future Volume (vph)	138	1513	1623	223	561	196
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	16	12	12
Storage Length (ft)	300			100	280	180
Storage Lanes	1			1	1	0
Taper Length (ft)	110				25	
Lane Util. Factor	1.00	0.95	0.91	0.91	0.97	1.00
Frt			0.982			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1711	3421	4827	0	3433	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1711	3421	4827	0	3433	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			41			10
Link Speed (mph)		45	45		45	
Link Distance (ft)		242	258		751	
Travel Time (s)		3.7	3.9		11.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	150	1645	1764	242	610	213
Shared Lane Traffic (%)						
Lane Group Flow (vph)	150	1645	2006	0	610	213
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		11	11		24	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	0		16	
Two way Left Turn Lane		Yes				
Headway Factor	1.04	1.04	1.04	0.85	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	2	2		1	1
Detector Template	Left	Thru	Thru		Left	Right
Leading Detector (ft)	20	100	100		20	20
Trailing Detector (ft)	0	0	0		0	0
Detector 1 Position(ft)	0	0	0		0	0
Detector 1 Size(ft)	20	6	6		20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(ft)		94	94			
Detector 2 Size(ft)		6	6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	Prot	NA	NA		Prot	pm+ov
Protected Phases	7	4	8		6	7
Permitted Phases						6
Detector Phase	7	4	8		6	7
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0
Minimum Split (s)	9.5	22.5	22.5		22.5	9.5

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Total Split (s)	16.0	67.0	51.0		23.0	16.0
Total Split (%)	17.8%	74.4%	56.7%		25.6%	17.8%
Maximum Green (s)	11.5	62.5	46.5		18.5	11.5
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Lead/Lag	Lead		Lag			Lead
Lead-Lag Optimize?	Yes		Yes			Yes
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	C-Max	C-Max		Max	None
Walk Time (s)		7.0	7.0		7.0	
Flash Dont Walk (s)		11.0	11.0		11.0	
Pedestrian Calls (#/hr)		0	0		0	
Act Effct Green (s)	10.9	62.5	47.1		18.5	33.9
Actuated g/C Ratio	0.12	0.69	0.52		0.21	0.38
v/c Ratio	0.73	0.69	0.79		0.87	0.35
Control Delay	59.1	10.1	20.0		48.8	21.0
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	59.1	10.1	20.0		48.8	21.0
LOS	E	B	C		D	C
Approach Delay		14.2	20.0		41.6	
Approach LOS		B	C		D	
Queue Length 50th (ft)	83	249	320		173	80
Queue Length 95th (ft)	#167	320	385		#263	138
Internal Link Dist (ft)		162	178		671	
Turn Bay Length (ft)	300				280	180
Base Capacity (vph)	218	2375	2546		705	612
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.69	0.69	0.79		0.87	0.35

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 39 (43%), Referenced to phase 4:EBT and 8:WBT, Start of Green			
Natural Cycle: 75			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.87			
Intersection Signal Delay: 21.6		Intersection LOS: C	
Intersection Capacity Utilization 71.2%		ICU Level of Service C	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 1: PCH & Topanga Canyon Blvd





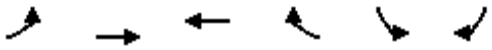
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	138	1513	1623	223	561	196
Future Volume (veh/h)	138	1513	1623	223	561	196
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1945	1870	1870
Adj Flow Rate, veh/h	150	1645	1764	0	610	213
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	183	2468	2765		710	489
Arrive On Green	0.10	0.69	0.54	0.00	0.21	0.21
Sat Flow, veh/h	1781	3647	5443	0	3456	1585
Grp Volume(v), veh/h	150	1645	1764	0	610	213
Grp Sat Flow(s),veh/h/ln	1781	1777	1702	0	1728	1585
Q Serve(g_s), s	7.4	23.7	21.8	0.0	15.3	9.7
Cycle Q Clear(g_c), s	7.4	23.7	21.8	0.0	15.3	9.7
Prop In Lane	1.00			0.00	1.00	1.00
Lane Grp Cap(c), veh/h	183	2468	2765		710	489
V/C Ratio(X)	0.82	0.67	0.64		0.86	0.44
Avail Cap(c_a), veh/h	228	2468	2765		710	489
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	39.5	7.8	14.5	0.0	34.5	24.9
Incr Delay (d2), s/veh	17.0	1.4	1.1	0.0	12.8	2.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	7.1	11.0	11.9	0.0	11.7	14.4
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	56.5	9.3	15.6	0.0	47.3	27.7
LnGrp LOS	E	A	B		D	C
Approach Vol, veh/h		1795	1764		823	
Approach Delay, s/veh		13.2	15.6		42.2	
Approach LOS		B	B		D	

Timer - Assigned Phs	4	6	7	8
Phs Duration (G+Y+Rc), s	67.0	23.0	13.8	53.2
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	62.5	18.5	11.5	46.5
Max Q Clear Time (g_c+I1), s	25.7	17.3	9.4	23.8
Green Ext Time (p_c), s	16.4	0.4	0.1	13.2

Intersection Summary	
HCM 6th Ctrl Delay	19.6
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.



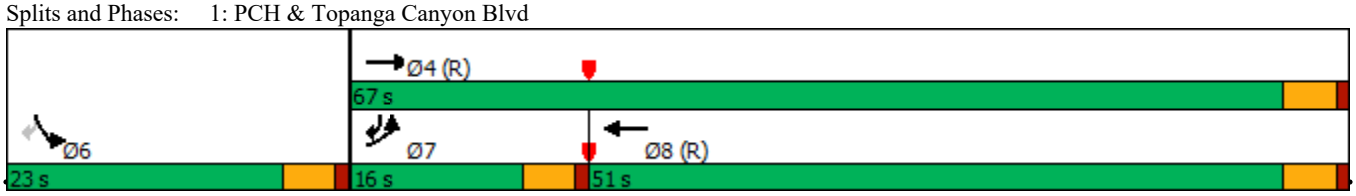
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	195	1892	1746	765	267	87
Future Volume (vph)	195	1892	1746	765	267	87
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	16	12	12
Storage Length (ft)	300			100	280	180
Storage Lanes	1			1	1	0
Taper Length (ft)	110				25	
Lane Util. Factor	1.00	0.95	0.91	0.91	0.97	1.00
Frt			0.954			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1711	3421	4690	0	3433	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1711	3421	4690	0	3433	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			182			7
Link Speed (mph)		45	45		45	
Link Distance (ft)		242	258		751	
Travel Time (s)		3.7	3.9		11.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	212	2057	1898	832	290	95
Shared Lane Traffic (%)						
Lane Group Flow (vph)	212	2057	2730	0	290	95
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		11	11		24	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	0		16	
Two way Left Turn Lane		Yes				
Headway Factor	1.04	1.04	1.04	0.85	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	2	2		1	1
Detector Template	Left	Thru	Thru		Left	Right
Leading Detector (ft)	20	100	100		20	20
Trailing Detector (ft)	0	0	0		0	0
Detector 1 Position(ft)	0	0	0		0	0
Detector 1 Size(ft)	20	6	6		20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(ft)		94	94			
Detector 2 Size(ft)		6	6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	Prot	NA	NA		Prot	pm+ov
Protected Phases	7	4	8		6	7
Permitted Phases						6
Detector Phase	7	4	8		6	7
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0
Minimum Split (s)	9.5	22.5	22.5		22.5	9.5

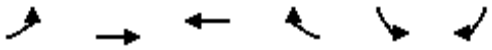
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Total Split (s)	16.0	67.0	51.0		23.0	16.0
Total Split (%)	17.8%	74.4%	56.7%		25.6%	17.8%
Maximum Green (s)	11.5	62.5	46.5		18.5	11.5
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Lead/Lag	Lead		Lag			Lead
Lead-Lag Optimize?	Yes		Yes			Yes
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	C-Max	C-Max		Max	None
Walk Time (s)		7.0	7.0		7.0	
Flash Dont Walk (s)		11.0	11.0		11.0	
Pedestrian Calls (#/hr)		0	0		0	
Act Effct Green (s)	11.5	62.5	46.5		18.5	34.5
Actuated g/C Ratio	0.13	0.69	0.52		0.21	0.38
v/c Ratio	0.97	0.87	1.09		0.41	0.16
Control Delay	96.0	15.8	68.5		33.1	17.7
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	96.0	15.8	68.5		33.1	17.7
LOS	F	B	E		C	B
Approach Delay		23.3	68.5		29.3	
Approach LOS		C	E		C	
Queue Length 50th (ft)	122	406	~627		74	32
Queue Length 95th (ft)	#260	536	#724		112	65
Internal Link Dist (ft)		162	178		671	
Turn Bay Length (ft)	300				280	180
Base Capacity (vph)	218	2375	2511		705	611
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.97	0.87	1.09		0.41	0.16

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 39 (43%), Referenced to phase 4:EBT and 8:WBT, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.09
Intersection Signal Delay: 46.6 Intersection LOS: D
Intersection Capacity Utilization 80.5% ICU Level of Service D
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: PCH & Topanga Canyon Blvd





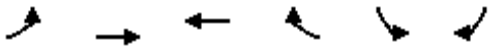
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	195	1892	1746	765	267	87
Future Volume (veh/h)	195	1892	1746	765	267	87
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1945	1870	1870
Adj Flow Rate, veh/h	212	2057	1898	0	290	95
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	228	2468	2638		710	528
Arrive On Green	0.13	0.69	0.52	0.00	0.21	0.21
Sat Flow, veh/h	1781	3647	5443	0	3456	1585
Grp Volume(v), veh/h	212	2057	1898	0	290	95
Grp Sat Flow(s),veh/h/ln	1781	1777	1702	0	1728	1585
Q Serve(g_s), s	10.6	37.8	25.7	0.0	6.5	3.8
Cycle Q Clear(g_c), s	10.6	37.8	25.7	0.0	6.5	3.8
Prop In Lane	1.00			0.00	1.00	1.00
Lane Grp Cap(c), veh/h	228	2468	2638		710	528
V/C Ratio(X)	0.93	0.83	0.72		0.41	0.18
Avail Cap(c_a), veh/h	228	2468	2638		710	528
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	38.9	10.0	16.7	0.0	31.0	21.3
Incr Delay (d2), s/veh	41.1	3.5	1.7	0.0	1.7	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	11.3	16.6	13.9	0.0	4.9	7.3
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	80.0	13.5	18.5	0.0	32.7	22.0
LnGrp LOS	E	B	B		C	C
Approach Vol, veh/h		2269	1898		385	
Approach Delay, s/veh		19.7	18.5		30.1	
Approach LOS		B	B		C	

Timer - Assigned Phs	4	6	7	8
Phs Duration (G+Y+Rc), s	67.0	23.0	16.0	51.0
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	62.5	18.5	11.5	46.5
Max Q Clear Time (g_c+I1), s	39.8	8.5	12.6	27.7
Green Ext Time (p_c), s	16.5	0.9	0.0	12.5

Intersection Summary	
HCM 6th Ctrl Delay	20.1
HCM 6th LOS	C

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.



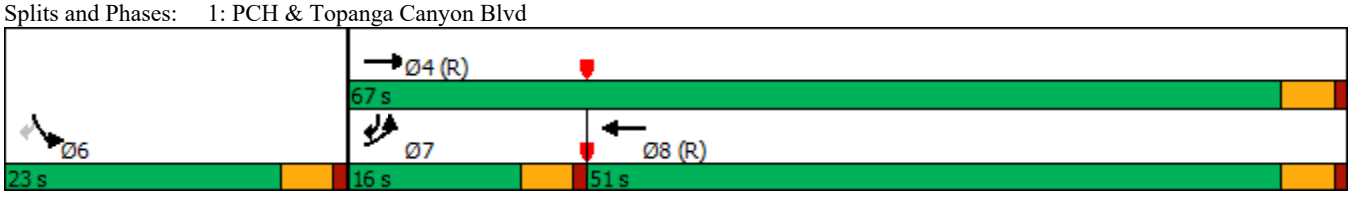
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	142	1558	1655	227	555	194
Future Volume (vph)	142	1558	1655	227	555	194
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	16	12	12
Storage Length (ft)	300			100	280	180
Storage Lanes	1			1	1	0
Taper Length (ft)	110				25	
Lane Util. Factor	1.00	0.95	0.91	0.91	0.97	1.00
Frt			0.982			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1711	3421	4827	0	3433	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1711	3421	4827	0	3433	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			41			9
Link Speed (mph)		45	45		45	
Link Distance (ft)		242	258		751	
Travel Time (s)		3.7	3.9		11.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	154	1693	1799	247	603	211
Shared Lane Traffic (%)						
Lane Group Flow (vph)	154	1693	2046	0	603	211
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		11	11		24	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	0		16	
Two way Left Turn Lane		Yes				
Headway Factor	1.04	1.04	1.04	0.85	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	2	2		1	1
Detector Template	Left	Thru	Thru		Left	Right
Leading Detector (ft)	20	100	100		20	20
Trailing Detector (ft)	0	0	0		0	0
Detector 1 Position(ft)	0	0	0		0	0
Detector 1 Size(ft)	20	6	6		20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(ft)		94	94			
Detector 2 Size(ft)		6	6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	Prot	NA	NA		Prot	pm+ov
Protected Phases	7	4	8		6	7
Permitted Phases						6
Detector Phase	7	4	8		6	7
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0
Minimum Split (s)	9.5	22.5	22.5		22.5	9.5

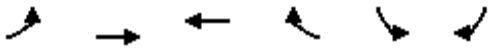
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Total Split (s)	16.0	67.0	51.0		23.0	16.0
Total Split (%)	17.8%	74.4%	56.7%		25.6%	17.8%
Maximum Green (s)	11.5	62.5	46.5		18.5	11.5
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Lead/Lag	Lead		Lag			Lead
Lead-Lag Optimize?	Yes		Yes			Yes
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	C-Max	C-Max		Max	None
Walk Time (s)		7.0	7.0		7.0	
Flash Dont Walk (s)		11.0	11.0		11.0	
Pedestrian Calls (#/hr)		0	0		0	
Act Effct Green (s)	10.9	62.5	47.1		18.5	33.9
Actuated g/C Ratio	0.12	0.69	0.52		0.21	0.38
v/c Ratio	0.74	0.71	0.80		0.86	0.35
Control Delay	60.6	10.5	20.6		48.0	21.0
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	60.6	10.5	20.6		48.0	21.0
LOS	E	B	C		D	C
Approach Delay		14.6	20.6		41.0	
Approach LOS		B	C		D	
Queue Length 50th (ft)	85	263	331		171	80
Queue Length 95th (ft)	#174	340	398		#258	137
Internal Link Dist (ft)		162	178		671	
Turn Bay Length (ft)	300				280	180
Base Capacity (vph)	218	2375	2544		705	612
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.71	0.71	0.80		0.86	0.34

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 39 (43%), Referenced to phase 4:EBT and 8:WBT, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.86
Intersection Signal Delay: 21.8 Intersection LOS: C
Intersection Capacity Utilization 72.0% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: PCH & Topanga Canyon Blvd





Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	142	1558	1655	227	555	194
Future Volume (veh/h)	142	1558	1655	227	555	194
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1945	1870	1870
Adj Flow Rate, veh/h	154	1693	1799	0	603	211
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	188	2468	2753		710	493
Arrive On Green	0.11	0.69	0.54	0.00	0.21	0.21
Sat Flow, veh/h	1781	3647	5443	0	3456	1585
Grp Volume(v), veh/h	154	1693	1799	0	603	211
Grp Sat Flow(s),veh/h/ln	1781	1777	1702	0	1728	1585
Q Serve(g_s), s	7.6	25.0	22.6	0.0	15.1	9.5
Cycle Q Clear(g_c), s	7.6	25.0	22.6	0.0	15.1	9.5
Prop In Lane	1.00			0.00	1.00	1.00
Lane Grp Cap(c), veh/h	188	2468	2753		710	493
V/C Ratio(X)	0.82	0.69	0.65		0.85	0.43
Avail Cap(c_a), veh/h	228	2468	2753		710	493
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	39.4	8.0	14.8	0.0	34.4	24.7
Incr Delay (d2), s/veh	17.8	1.6	1.2	0.0	12.1	2.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	7.4	11.5	12.2	0.0	11.5	14.3
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	57.2	9.6	16.0	0.0	46.5	27.4
LnGrp LOS	E	A	B		D	C
Approach Vol, veh/h		1847	1799		814	
Approach Delay, s/veh		13.6	16.0		41.5	
Approach LOS		B	B		D	

Timer - Assigned Phs			4		6	7	8
Phs Duration (G+Y+Rc), s			67.0		23.0	14.0	53.0
Change Period (Y+Rc), s			4.5		4.5	4.5	4.5
Max Green Setting (Gmax), s			62.5		18.5	11.5	46.5
Max Q Clear Time (g_c+I1), s			27.0		17.1	9.6	24.6
Green Ext Time (p_c), s			16.9		0.5	0.1	13.2

Intersection Summary	
HCM 6th Ctrl Delay	19.6
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

MEMORANDUM

To:	Rosi Dagit Resource Conservation District of the Santa Monica Mountains	Date:	October 3, 2023
From:	David S. Shender, P.E. Linscott, Law & Greenspan, Engineers	LLG Ref:	1-22-4487-1
Subject:	**Transportation Study Addendum** **Topanga Lagoon Restoration Project**		

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This memorandum has been prepared by Linscott, Law & Greenspan, Engineers (LLG) to provide an addendum to the transportation study[1] previously prepared by LLG related to the Topanga Lagoon Restoration Project (the "Project"). Specifically, this addendum reviews transportation issues related to construction of various wastewater management techniques that are proposed in conjunction with the Project.

The prior transportation study evaluates the Project effects related to construction of the replacement bridge on Pacific Coast Highway (State Route 1 or SR-1[2]) over the Topanga Lagoon west of Topanga Canyon Boulevard (State Route 27 or SR-27). In addition, the transportation study estimates the net changes in vehicular trip generation associated with proposed changes to concessions and vehicle parking in the Project area, which was generally defined as the segment of SR-1 from SR-27 to a point approximately one-third of a mile west therefrom, and the segment of SR-27 from SR-1 to a point approximately one-quarter of a mile north therefrom. The transportation study includes existing and forecast future traffic volume data for the segments of SR-1 and SR-27 in the Project area, as well as an evaluation of Vehicle Miles Traveled (VMT).

Potential Transportation Impacts and Corresponding Mitigation Measures Identified in the Forthcoming Project Draft EIR

While the transportation study did not identify a potentially transportation impact related to the Project under CEQA, LLG understands the Draft Environmental Impact Report (Draft EIR) to be prepared for the Project has identified potentially significant impacts related to construction of the Project associated with possible temporary travel lane closures and detours, as well as the temporary removal and/or relocation of vehicle parking (on-street and off-street). To address these potentially significant and temporary impacts during construction of the Project, the Draft EIR will recommend that the Project implement the following mitigation measures:

[1] *Topanga Lagoon Restoration Project – Transportation Assessment*, LLG, February 3, 2023.
[2] While SR-1 is a north-south highway through California, this report references SR-1 as an east-west roadway based on its orientation in the Project area.

- Mitigation Measure TRA-1: Preparation of a Construction Traffic Management and Emergency Response Plan; and

- Mitigation Measure TRA-2: Preparation of a Parking Management Plan.

Additional Assessment Related to Wastewater Management Alternatives

LLG understands that further evaluation has been conducted of the wastewater management needs associated with the proposed concessions to be constructed as part of the Project. Three options for addressing wastewater management will be discussed in the forthcoming Draft EIR for the Project, two of which may have an effect related to transportation.

- Option 1 – SDI: Option 1 consists of onsite subsurface drip irrigation (SDI). An SDI system would be constructed onsite at the Project beneath the parking area proposed at the Gateway Corner northwest of the intersection of SR-27 and SR-1. Construction of Option 1 would not have any substantial effects related to transportation.

- Option 2 – Seepage Pits: Option 2 proposes that wastewater be transported to a dispersal site located east of SR-27. The proposed pipe would be constructed along the west side of SR-27 (outside of Caltrans right-of-way but adjacent to the westerly shoulder of SR-27) and then cross SR-27 at a point approximately one-half mile north of SR-27. Construction of the pipe may require the need to temporarily restrict shoulder parking along the west side of SR-27 to accommodate construction related equipment and vehicles. The construction of the pipe crossing on SR-27 approximately one-half mile north of SR-1 can likely be accommodated at nighttime hours, maintaining one lane for alternating traffic. Estimated construction duration of Option 2 is three to six months, which would be concurrent with construction of the Project.

- Option 3 – Sewer: Option 3 proposes construction of an underground extension of the Los Angele County Sanitation District public sewer within the SR-1 right-of-way from its current terminus on SR-1 east of the Coastline Drive intersection (approximately two-thirds of a mile east of SR-27) to the Project site. On a preliminary basis, it is anticipated that the sewer extension may be constructed within the center median of SR-1 from Coastline Drive to the Project site. Construction techniques may consist of a combination of open trench work and/or trenchless methods. While the sewer would be constructed within the center median, periodic closure of at least one travel lane on SR-1 would be required to accommodate construction related equipment and vehicles. In addition, existing on-street parking along the

north and/or south sides of SR-1 may need to be restricted during construction of Option 3 to accommodate possible temporary restriping of travel lanes and/or construction equipment and vehicles. Construction of Option 3 is expected to take one year to complete. To the extent feasible, construction management components of Option 3 would consist of the following:

- Schedule construction activities which may require travel lane closures during the Labor Day to Memorial Day time period to avoid peak summer travel on SR-1;

- Avoid travel lane closures during weekday commuter periods corresponding to peak travel flows (e.g., no lane closures eastbound on SR-1 from 7:00 to 9:00 a.m. and no lane closures on westbound SR-1 from 4:00 to 6:00 p.m.);

- Maintain a travel lane for eastbound left-turns from SR-1 at the Coastline Drive intersection at all times; and

- Avoid travel lane closures on SR-1 during red flag warning days as determined by the Los Angeles County Fire Department.

It is noted that related to any construction of the wastewater management options which results in work in Caltrans right-of-way, traffic handling plans related to construction will be required to be prepared and submitted for review and approval by Caltrans prior to the issuance of any building permit.

Conclusion

This addendum has been prepared to evaluate the potential transportation effects associated with construction of various wastewater management techniques that are proposed in conjunction with the Project. As discussed herein, construction of Option 2 (Seepage Pits) and Option 3 (Sewer) may result in similar effects related to traffic management, emergency access, and temporary loss of street parking as associated with construction of the Project. Accordingly, the mitigation measures recommended in the Draft EIR for the Project – TRA-1: Preparation of a Construction Traffic Management and Emergency Response Plan and TRA-2: Preparation of a Parking Management Plan – are sufficient to address the traffic management and parking effects associated with Options 2 and 3. No additional review or analysis is required associated with construction of the wastewater management options.

c: File