VEN-1 Permanent Slope Restoration Project

VENTURA COUNTY, CALIFORNIA
DISTRICT 7 – VEN-1 (PM 4.0/4.2)
318200/0715000286

Negative Declaration/ Finding of No Significant Impact

Prepared by the
State of California, Department of Transportation

The environmental review, consultation, and any other actions required by applicable Federal environmental laws for this project are being, or have been, carried out by Caltrans pursuant to 23 USC 327 and the Memorandum of Understanding dated December 23, 2016 and executed by FHWA and Caltrans.

June 2019

Caltrans

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District 07 – VEN – 01 – PM 4.0/4.2
EA: 07-31820 / EFIS: 0715000286
SCH: 2017101045

VEN – 01 Permanent Slope Restoration Project
in the County of Ventura (Post Mile 4.0 to Post Mile 4.2)

INITIAL STUDY WITH PROPOSED MITIGATED NEGATIVE DECLARATION/ ENVIRONMENTAL ASSESSMENT

Submitted Pursuant to State Division 13, California Public Resources Code
Federal 42 USC 4332(2)(C), 49 USC 303, and/or 23 USC 138

THE STATE OF CALIFORNIA
Department of Transportation
Lead Agency

Cooperating Agencies: United States Army Corps of Engineers
Responsible Agenices: California Coastal Commission,
California State Water Resources Control Board

Oct 19, 2018
Date of Approval

Ron Kosinski
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Deputy District Director
District 7
California Department of Transportation
NEPA/CEQA Lead Agency

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CALIFORNIA DEPARTMENT OF TRANSPORTATION FINDING OF NO SIGNIFICANT IMPACT (FONSI)

VEN-1 Permanent Slope Restoration Project

FOR

The California Department of Transportation (Caltrans) has determined that Alternative 1 – Cantilever Option will have no significant impact on the human environment. This FONSI is based on the attached Environmental Assessment (EA) which has been independently evaluated by Caltrans and determined to adequately and accurately discuss the need, environmental issues, and impacts of the proposed project and appropriate mitigation measures. It provides sufficient evidence and analysis for determining that an Environmental Impact Statement is not required. Caltrans takes full responsibility for the accuracy, scope, and content of the attached EA.

The environmental review, consultation, and any other actions required by applicable Federal environmental laws for this project are being, or have been, carried out by Caltrans pursuant to 23 USC 327 and the Memorandum of Understanding dated December 23, 2016 and executed by FHWA and Caltrans.

Notwithstanding any other provision of law, a claim arising under federal law seeking judicial review of a permit, license, or approval issued by a federal agency for a highway or public transportation project shall be barred unless it is filled within 180 days after publication of a notice in the Federal Register announcing that the permit, license, or approval is the final pursuant to the law under which the agency action is taken, unless a shorter time is specified in the federal law pursuant to which judicial review is allowed.

Ronald Kosinski

Ron Kosinski
Deputy District Director
District 7
California Department of Transportation

June 12, 2019

Date

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District 07 – VEN – 01 – PM 4.0/4.2
EA: 07-31820 / EFIS: 0715000286
SCH: 2017101045

NEGATIVE DECLARATION

Pursuant to: Division 13, Public Resources Code

Project Description

The California Department of Transportation (Caltrans) District 7 proposes to construct two secant walls at post mile (PM) 4.0 and PM 4.2 on Pacific Coast Highway (State Route 1) in Ventura County to serve as a permanent stabilization of the slope and corresponding roadway from wave induced slope erosion.

Determination

Caltrans has prepared an Initial Study for this project, and following public review, has determined from this study that the proposed project would not have a significant effect on the environment for the following reasons:

The proposed project would have no effect on community character and cohesion, relocations and real property acquisition, environmental justice, farmlands/timberlands, growth, paleontology, noise, and wild and scenic rivers.

In addition, the proposed project would have less than significant effects to land use, coastal zone, parks and recreational facilities, utilities, traffic and transportation/pedestrian and bicycle facilities, visual/aesthetics, cultural resources, hydrology and floodplain, water quality and storm water runoff, geology and soils, hazardous waste/materials, air quality, and biological resources.

Ronald Kosinski — June 12, 2019

Ron Kosinski
Deputy District Director
District 7
California Department of Transportation

Date

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Chapter 1: Proposed Project

1.1 Introduction

The California Department of Transportation (Caltrans), proposes to construct 2 secant walls[1] on the southbound/coastal side of State Route (SR) 1, also known as Pacific Coast Highway (PCH), in Ventura County at post mile 4.0 and 4.2 to prevent coastal erosion and stabilize the roadway foundation. The proposed project is subject to both the California Environmental Quality Act (CEQA) and the National Environmental Policy Act of 1969 (NEPA). Caltrans is the lead agency under CEQA and NEPA.

California participated in the "Surface Transportation Project Delivery Pilot Program" (Pilot Program) pursuant to 23 USC 327, for more than five years, beginning July 1, 2007, and ending September 30, 2012. MAP-21 (P.L. 112-141), signed by President Obama on July 6, 2012, amended 23 USC 327 to establish a permanent Surface Transportation Project Delivery Program. As a result, Caltrans entered into a Memorandum of Understanding pursuant to 23 USC 327 (NEPA Assignment MOU) with FHWA. The NEPA Assignment MOU became effective October 1, 2012, and was renewed on December 23, 2016 for a term of five years. In summary, Caltrans continues to assume FHWA responsibilities under NEPA and other federal environmental laws in the same manner as was assigned under the Pilot Program, with minor changes. With NEPA Assignment, FHWA assigned and Caltrans assumed all of the United States Department of Transportation (USDOT) Secretary's responsibilities under NEPA. This assignment includes projects on the State Highway System and Local Assistance Projects off of the State Highway System within the State of California, except for certain categorical exclusions that FHWA assigned to the Department under the 23 USC 326 CE Assignment MOU, projects excluded by definition, and specific project exclusions.

PCH is a major north-south thoroughfare that runs along the Pacific Coast originating near the town of Leggett in Mendocino County and extends on and off, to the City of Dana Point in Orange County. The highway is highly scenic because it runs adjacent to the coast with both coastal and mountain views. In an effort to conserve the beauty and scenic views of the PCH, parts of the highway have been designated as an All-American Road or protected under the National Scenic Byways Program. PCH at the location of the proposed project, is an Eligible State Scenic Highway; however, Ventura County has not sought designation. Nevertheless the 2 to 3 lane highway through the project area, offers scenic views of the Santa Monica Mountains to the east and the Pacific Ocean to the west within unincorporated Ventura County. The project area is fairly remote with the closest city being Oxnard located about 14 miles to the north and Malibu located about 15 miles to the south. Figure 1-1 shows the project location and general vicinity.

[1] A secant wall is a structural wall formed by constructing intersecting reinforced concrete piles (see Figure 1-17).

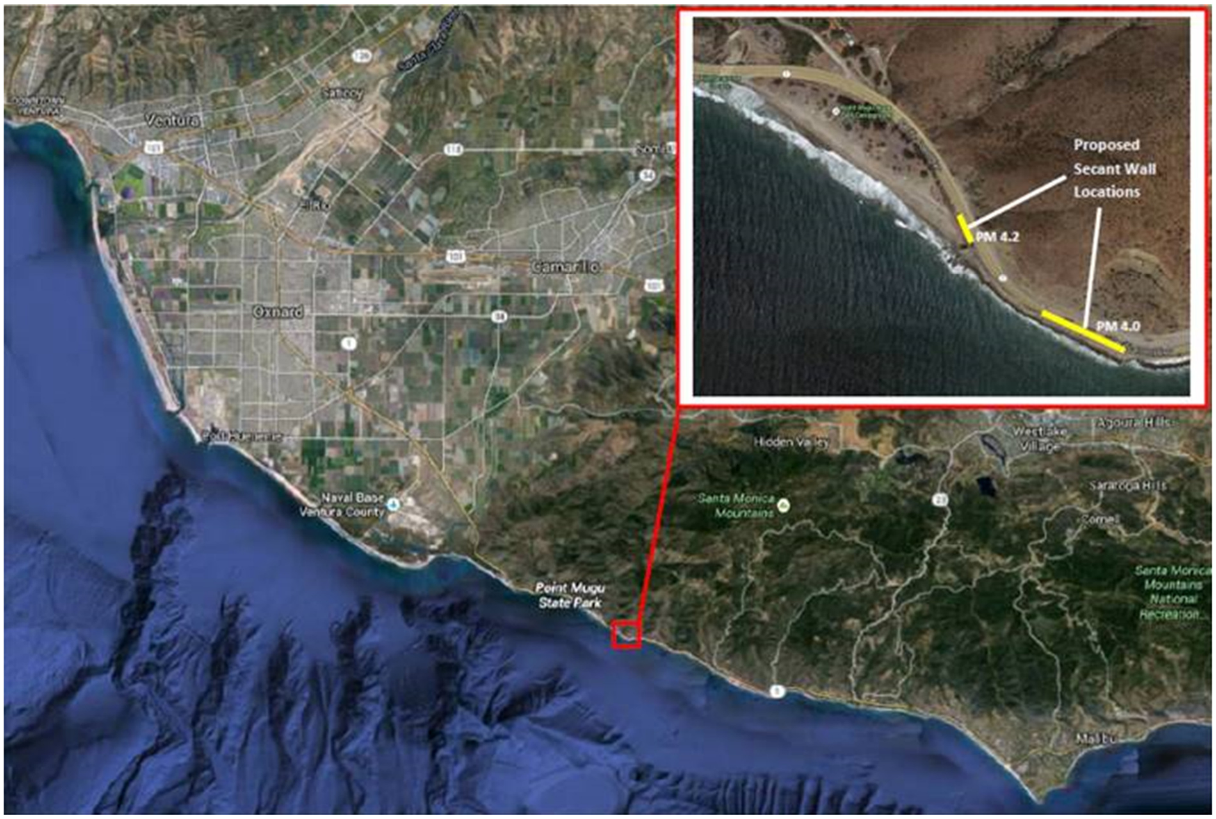

Figure 1-1 Project vicinity

1.1.1 History of Project Area

The project study area has historically been susceptible to erosion as a result of high surf caused by successive storms that have passed through the region. At PM 4.2, the fill embankment was severely eroded during Hurricane Marie in August 27-28, 2014 which included the loss of a lifeguard structure on the southeasterly end of the beach. The high tide produced by the storm can be seen in the aerial photo in Figure 1-2. Conditions worsened at PM 4.2 during the storms of December 2014. On January 14, 2015 at PM 4.0, a major storm caused portions of the unprotected and eroded fill embankment to collapse leaving the guardrail hanging off the cliff and traveling motorists on the highway unprotected (Figure 1-3 and Figure 1-4). Slope erosion at PM 4.2 shown in Figure 1-7.

To stabilize the slope and embankment at both locations, under Director's Order (0715000159) Caltrans constructed a project from February 2, 2015 through March 3, 2015 (EA 4X370) to reinforce and stabilize the slope at both PM 4.0 and PM 4.2. The project utilized a crane to place 8-ton rocks at the waterline on the toe of the slope at PM 4.0 for a height of about 20 feet, and place 4-6 ton rocks for approximately a height of two-thirds from the waterline with fabric for a length of about 400 feet (Figure 1-5 and Figure 1-6). Reinforced fill was put in for the last 20 feet of the length. At PM 4.2, the dirt fill slope was replaced in-kind, without rock slope protection (Figure 1-8). However, high surf continued to erode the slope, and eventually State of California Department of Parks and Recreation located about 300 feet away, had to cordon off beach area due to the instability of the slope (Figure 1-9). Therefore, later that year in November 2015 under Director's Order (0716000099), Caltrans implemented (EA 4X760) a 4-ton rock slope protection wall at the toe of the slope for 75 feet (Figure 1-10).

Figure 1-2: Aerial photo of PM 4.2 during Hurricane Marie. Photo taken on 08/27/2014

Figure 1-3: Fill slope eroded at PM 4.0 with guardrail hanging. Photo taken on 01/29/2015.

Figure 1-4: Guardrail at PM 4.0 shown hanging off the roadway due to severe slope erosion. Photo taken on 01/14/2015.

Figure 1-5: Construction of 8-ton boulder placement onto the fill slope at PM 4.0. Photo taken on 02/02/2015.

Figure 1-6: Crane placing 8-ton boulder at the toe of the slope at PM 4.0. Photo time stamped on 02/02/2015.

Figure 1-7: Slope erosion at PM 4.2 after Hurricane Marie in August 2014 and additional storms in December 2014. Photo taken on 01/29/2015.

Figure 1-8: Fill slope at PM 4.2 was repaired in-kind without rock slope protection at the toe of the slope. Photo taken on 03/02/2015.

Figure 1-9: High surf causes the fill slope to erode months after reconstruction. Photo taken on 09/30/2015.

Figure 1-10: Rock slope protection is constructed at the toe of the slope after high surf causes the fill slope to erode. Photo taken on 12/17/2015.

Caltrans Geologists conducted field reviews of the proposed project area in July 2015 to assess the condition of the stabilized slopes following construction of Director's Order (0715000159). The field reviews concluded that wave erosion can be temporarily minimized by the constructed slope protection, however major storms will continue eroding the big rocks, slope, and ultimately the highway, unless a permanent solution is implemented. The slope condition at PM 4.2 in October 2017 is shown in Figure 1 11, with obvious slope erosion. The slope has eroded to meet the rock slope protection wall that was constructed at the toe of the slope in late 2015 (shown newly constructed in Figure 1-10). The slope condition worsens in March 2018 at PM 4.2, as shown in Figure 1-12. The slope condition at PM 4.0 is shown from the perspective of the roadway in Figure 1-13 (photo taken in March 2018) and in Figure 1-14 as a panoramic view (photo taken in January 2018).

Figure 1-11: Slope on PM 4.2 in October 2017. Slope has eroded to meet the rock slope protection wall at the toe of the slope.

Figure 1-12: Slope at PM 4.2 showing erosion failure. Photo taken on March 15, 2018.

Figure 1-13: Slope condition at PM 4.0. Photo taken on March 15, 2018.

Figure 1-14: Panoramic view of the slope condition at PM 4.0 taken on January 29, 2018

1.1.2 Northbound Shoulder of PCH

Caltrans Geologists identified rock scaling of the slope at 5 locations along PCH. As a temporary measure to prevent loosened rocks from impacting drivers on the roadway, about 6 feet of rock fence protection was installed on top of k-rail[2] along the shoulder of these identified 5 locations along PCH in January

[2] K-rail, also known as a Jersey barrier, is used to separate lanes of traffic or block shoulder access to vehicles with a modular concrete or plastic barrier.

2011. Then on May 2, 2013 the Camarillo Springs wildfire started along US-101 in the Camarillo area. The intense blaze scorned through coastal wilderness and encompassed canyons towards inland neighborhoods. The wildfire burned about 28,000 acres including damage to 15 homes and causing evacuations of 4,000 homes and California State University Channel Islands. The wildfire put PCH in threat of becoming bombarded by post-fire rock fall and debris that could potentially harm traveling motorists. Therefore k-rail was installed from PM 2.6 to 10.2 on the northbound shoulder of PCH to prevent debris from entering the roadway after rain events. Some portions of PM 2.6 to 10.2, such as this proposed project area, already had rock fence protection on top of the k-rail deployed from 2011 (Figure 1-15). Installation of k-rail throughout PM 2.6 to 10.2 was completed on May 4, 2014 (EA 4X060). The Ventura County Planning Division issued a Zoning Clearance for this work, under the contingency that Caltrans would eventually remove the k-rail and rock fence.

The k-rail and rock fence is still deployed on the northbound shoulder of PCH through the project area. Coordination between Caltrans Traffic and regulatory agencies will be necessary to determine if it is feasible to open the shoulder to public access through PM 4.0 to PM 4.2, after construction is completed. Caltrans will need to seek a Coastal Development Permit (CDP) from regulatory agencies if the deployed k-rail and fencing is to be permanently incorporated. Figure 1-16 and Figure 1-17 depicts the current condition of the k-rail and fencing within the project area.

Figure 1-15: Access on the shoulder of northbound PCH through the project area is blocked with K-rail and metal fencing.

Figure 1-16: K-rail and fencing deployed within the project area. Photo taken on August 27, 2018.

Figure 1-17: Rocks lying within the shoulder blocked from vehicle access with k-rail and fencing. Photo taken on August 27, 2018.

The proposed project is programmed in the 2019/2020 State Highway Operation and Protection Program (SHOPP) and is eligible for federal-aid funding as shown in the 2017 Federal Transportation Improvement Program (FTIP) (ID VENLS10).

1.2 Purpose and Need

The purpose of this project is to perform permanent restoration of damage incurred by severe storm events in August 2014 through January 2015 within the project limits. This project is intended to alleviate future slope undermining due to severe erosion and possible failure of the roadway itself.

The project is needed because there has been accelerated structural undermining of the slope due to severe surf erosion which has resulted in cracks and displacements of the roadway shoulder. The project area is prone to erosion and needs adequate slope protection.

1.2.1 Independent Utility and Logical Termini

Federal Highway Administration (FHWA) regulations (23 Code of Federal Regulations [CFR 771.111(f)]) require that proposed projects have logical end limits and be of sufficient length to address environmental matters on a broad scope. The regulations also require for projects to have independent utility or independent significance, in that construction of the project be usable and a reasonable use of funds even if no additional transportation improvements in the area are made. Furthermore, it stipulates that approval of the proposed project does not restrict consideration of alternatives for other reasonably foreseeable transportation improvements.

The proposed project is a stand-alone project intended to restore slope stability along the stretch of PCH that has endured severe erosion in unincorporated Ventura County. The project's north and south terminus was selected based on the extent of slope damage caused by tidal surges from storm events. Proposing rock slope stabilization for a portion of PCH that was not afflicted by storm damage would be unnecessary and an inappropriate use of public funds. The proposed project is not dependent on the completion of another Caltrans project and does not restrict the consideration of alternatives for other reasonably foreseeable transportation improvements. Therefore, pursuant to 23 CFR 771.11(f), this project has independent utility and logical termini.

1.3 Project Description

This section describes the proposed action and design alternatives that were developed by a multidisciplinary team to achieve the identified purpose and need of the project while avoiding or minimizing environmental impacts. The alternatives are Alternative 1 – Cantilever Option, Alternative 2 – Ground Anchor Option, and Alternative 3 – No Build Alternative.

The two build alternatives are Alternative 1 – Cantilever Option and Alternative 2 – Ground Anchor Option. Both alternatives propose construction of secant walls as a permanent solution to stabilize the slope and the corresponding roadway. The slope has undergone extensive erosion due to powerful storms. The first recent storm that greatly compromised the stability of the roadway and left the slope fill embankment severely eroded, occurred in August 2014 and worsened through December 2014 at PM 4.2. Additional storms in January 2015 caused the eroded fill embankment at PM 4.0 to collapse which proved so severe that the guardrail was left hanging from the roadway. Rock slope protection was temporarily placed at these locations in 2015 to minimize damage from future storms. However, Caltrans Geologists have concluded that these repairs are only a temporary solution to minimize erosion. Instead, a permanent improvement must be implemented to effectively stabilize the roadway for future years and the secant walls are intended to serve as a permanent stabilization of the slope and roadway.

The two build alternatives will be analyzed alongside Alternative 3 – No Build Alternative. The No Build Alternative proposes no action to be made within the project area. Current conditions would remain with the temporary measures deployed. No permanent modifications would be proposed.

1.4 Project Alternatives

1.4.1 Alternative 1 – Cantilever Option

Secant Walls Construction and Guardrail Replacement

Alternative 1 proposes to construct 2 secant walls on the southbound/coastal side of PCH at post mile 4.0 and 4.2. The secant wall at post mile 4.0 is proposed at about 100 feet high and 600 feet long, stretching from PM 3.944 to 4.06. The second secant wall at post mile 4.2 is proposed at about 100 feet high and 200 feet long, stretching from PM 4.16 to PM 4.19. Both walls will be completely underground, thereby the walls will be about 100 feet underground along the roadway.

The walls will be constructed through closely spaced 60" [inches] cast-in-drilled-hole piles (CIDH) that include both reinforced secondary and unreinforced primary piles. The secondary piles typically overlap the primary piles, with the primary piles essentially acting as concrete lagging (see Figure 1-18). The reinforcement cages are then inserted in the holes and concrete is poured to complete the pile. If ground water is encountered within the pile hole, special methods are utilized to pour concrete under water. Primary and secondary piles are drilled staggered, drilling alternate piles in position and then drilling the piles in between. In the final configuration, there is no gap between the piles.

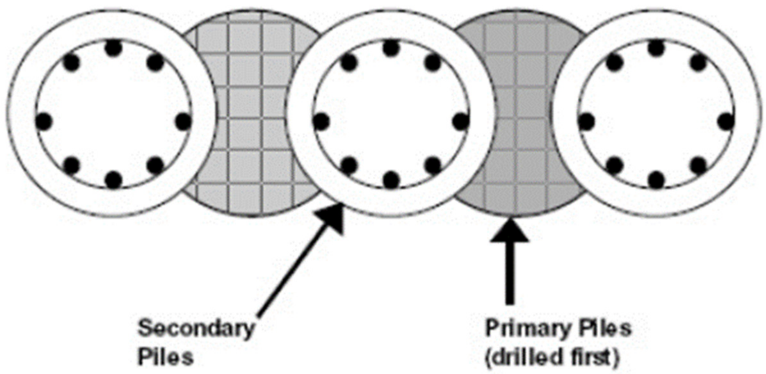

Figure 1-18: Typical Schematic Plan View of a Secant Pile Wall

Alternative 1 – Cantilever Option involves drilling the holes for the piles of the wall from the shoulder of the roadway without any slope excavation (see Figure 1-19). The soil excavated during drilling is stock piled, properly covered to avoid airborne particles and disposed of. Minor excavation for about 20 inches or so will also be involved to place a concrete barrier on top of the piles. The metal beam guardrail will be removed for construction and replaced with Midwest Guardrail System after the secant walls are constructed.

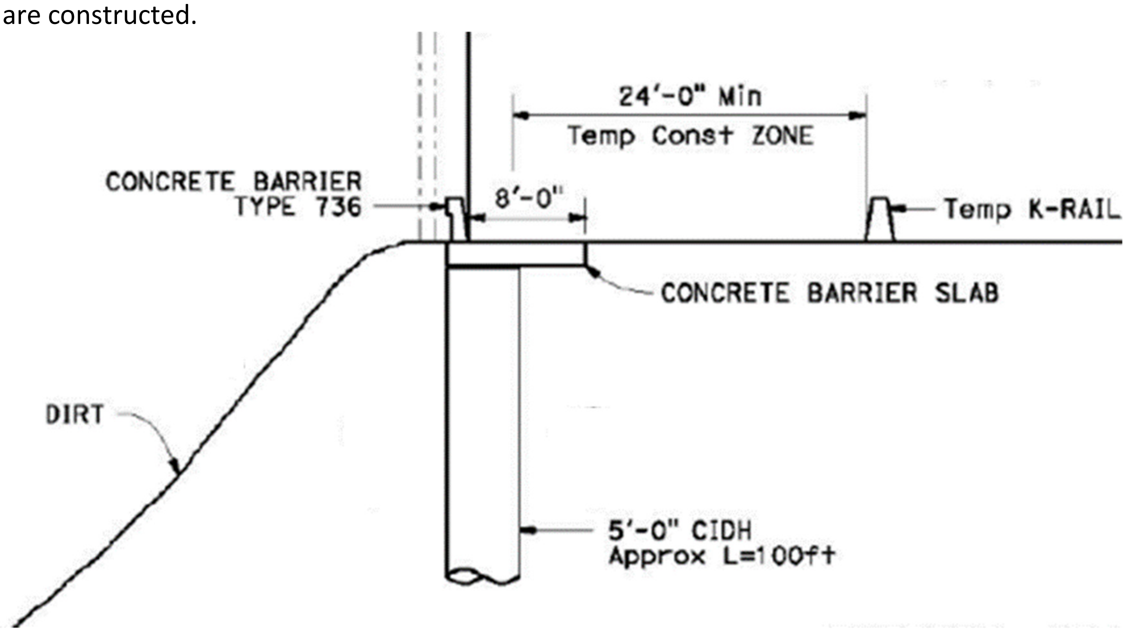

Figure 1-19: Schematic drawing of Alternative 1 – Cantilever Option.

Shoulder Paving

The northbound shoulder of PCH is unpaved and blocked from access to motorists with K-rail and 8-foot metal fencing. K-rail and fencing was emplaced to exclude shoulder access under a temporary CDP to avoid unstable rock fall on the roadway and motorists. Construction was completed on May 4, 2014 but the shoulder continues to be unpaved and blocked from access. For use as traffic management during project construction, the shoulder along northbound PCH would be paved. The northbound shoulder would be used as the travel through lane for southbound traffic during project construction. In order to provide drivers with rockfall protection along the shoulder, cable net mesh will be installed on the mountain prior to construction. Coordination between Caltrans Geotechnical and regulatory agencies was ongoing after the circulation of the draft environmental document to determine if the shoulder would be reopened for public access after project construction. Caltrans decided that to ensure public safety, the cable net mesh should remain in place while also restoring the k-rail and fencing to their pre-construction location to block vehicular access to the northbound shoulder. Loose rock is known to fall from the mountain and collect on the northbound shoulder, see Figure 1-20. The roadway is vulnerable to falling rock and Caltrans has decided to provide double protection for the traveling public due to the risk of injury through this area.

Figure 1-20: Condition of the northbound shoulder on May 3, 2019.

Power poles located on the roadway throughout the project area will be relocated for the project. All construction work will occur within the roadway and shoulder. Temporary construction easement of 0.244 acre will be required from State Parks for construction access and staging. The estimated cost for the secant walls for Alternative 1 is: $17,619,000 at PM 4.0 and $6,106,000 at PM 4.2. Construction is expected to last 1 year.

1.4.2 Alternative 2 – Ground Anchor Option

Secant Walls Construction and Guardrail Replacement

Similar to Alternative 1, Alternative 2 – Ground Anchor Option proposes to construct 2 secant walls on the southbound/coastal side of PCH at post mile 4.0 and 4.2. The location of the secant walls is also the same as Alternative 1 with an about 100 foot high secant wall proposed at 600 feet long at PM 4.0 stretching from PM 3.944 to 4.06. The second secant wall at post mile 4.2 is proposed at about 100 feet high and 200 feet long, stretching from PM 4.16 to PM 4.19. Both walls will be completely underground, therefore the walls will be about 100 feet underground from the roadway.

The secant walls will be constructed by 42" CIDH piles that include both reinforced secondary and unreinforced primary piles. The secondary piles typically overlap the primary piles, with reinforcement cages inserted into the holes and concrete poured to complete the pile, as shown in Figure 1-18 and described in Section 1.4.1 Alternative 1 – Cantilever Option. The walls will be further stabilized with anchors running perpendicular to the vertical piles, see Figure 1-21. The vertical concrete piles will be constructed by drilling in the shoulder just outside the metal beam guardrail. An auger drill will be placed on the roadway to construct the CIDH piles. The metal beam guardrail will be removed for construction and replaced with Midwest Guardrail System after the secant walls are constructed.

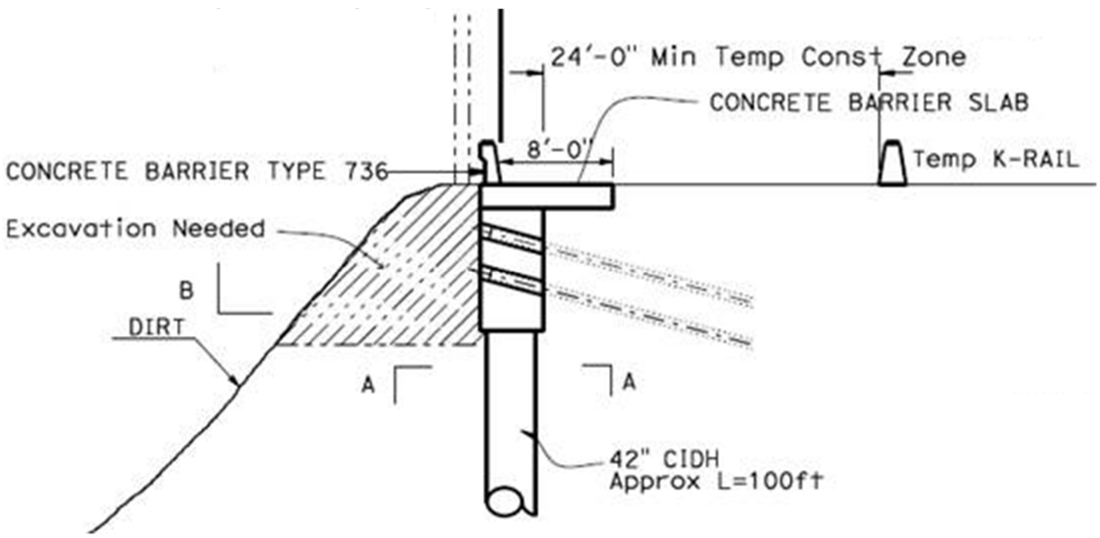

Figure 1-21: Schematic drawing of Alternative 2 – Ground Anchor Option.

The anchors are designed to reinforce the piles of the wall. The ground anchors are installed laterally in the wall a few feet below the top of the piles, about 4 feet below ground surface. To install the anchors an access road along the slope will be needed. The drilling machines use this area as a platform to drill laterally. Small holes are drilled laterally into the wall, steel strands wound in the form of cables as anchors are inserted in these holes, stressed against the walls to pre-determined values and capped against the walls. The space around the anchors is then grouted. The slopes are then restored to their original condition. Because of the anchors, the size of the piles is reduced considerably.

In order to install the anchors, the face of the slope will need to be excavated, as shown in Figure 1. The face of the slope must be exposed in order for machinery to attach the anchors onto the concrete piles. Therefore, the top 4 feet deep of dirt must be removed from the face of slope. Within the roadway, excavation for the width of 24 feet is needed for the entire length of the wall (shown as "24'-0" Min Temp Const Zone" in Figure 1-21). The ground anchors will be installed from the side of the hill which requires dirt removal to grant access to the drill machines. In addition, a concrete barrier on top of the walls will also be constructed and involve the excavation as well. The soil excavated during vertical and lateral drilling will be stock piled, properly covered to avoid airborne particles, and reused onsite to restore the slope. Excess soil that cannot be incorporated into the project will be disposed of.

Shoulder Paving

Prior to construction of the secant walls, the shoulder of northbound PCH would be paved. Currently the shoulder is dirt and blocked from access to motorists with K-rail and 8-foot metal fencing. K-rail and fencing was emplaced to exclude shoulder access under a temporary CDP permit to avoid unstable rock fall onto the roadway and motorists. Project construction is complete. The shoulder would be paved and used for traffic management during project construction. In order to provide drivers with rockfall protection along the shoulder, cable net mesh will be installed on the mountain prior to construction.

Coordination between Caltrans Geotechnical and regulatory agencies was ongoing after the circulation of the draft environmental document to determine if the shoulder would be reopened for motorists to utilize after project construction. Caltrans decided that to ensure public safety, the cable net mesh should remain in place while also restoring the k-rail and fencing to their pre-construction location to block vehicular access to the northbound shoulder. Loose rock is known to fall from the mountain and collect on the northbound shoulder. The traveling public is vulnerable to falling rock and Caltrans has decided to provide double protection through this area due to the risk of injury.

Power poles located on the roadway throughout the project area will be relocated for the project. All construction work will occur with the roadway and shoulder. Temporary construction easement of 0.244 acre will be required from State Parks for construction access and staging. The estimated cost for Alternative 2 – Ground Anchor Option is: $13,345,000 at PM 4.0 and $4,823,000 at PM 4.2. Construction is expected to last 1 year.

1.4.3 Alternative 3 – No Build Alternative

Alternative 3 constitutes the “No-Build Alternative” in which none of the proposed improvements would be constructed and the stability of the roadway would remain unchanged. The slope along PCH would not be reinforced with permanent slope protection, therefore the slope would continue to endure surf erosion from storms and cause the foundation of the roadway to be compromised.

1.5 Comparison of Alternatives

Table 1.1 Common and Unique Features of Alternatives

Project Feature	Alternative 1	Alternative 2	Alternative 3
Construct 2 secant walls about: 600 feet long, 100 feet high and 200 feet long, 100 feet high	X	X	
Secant walls constructed with 42" CIDH concrete piles		X	
Secant walls constructed with 60" CIDH concrete piles	X		
Secant wall design includes anchors running perpendicular to vertical piles		X	
Excavation of the face of the slope		X	
Metal beam guardrail replaced on southbound PCH with Midwest Guardrail System	X	X	
Paving shoulder on northbound PCH and removing K-rail and fencing	X	X	
Temporary construction easement of 0.244 acres	X	X	
Relocation of power poles along the southbound shoulder	X	X	
Estimated project cost	$23,725,000	$18,168,000	$0

The 2 build alternatives are similar in that both require CIDH piles to construct 2 underground secant walls, one at PM 4.0 stretching for 601 feet long and one at PM 4.2 stretching for 202 feet long. The main difference between the 2 alternatives is that Alternative 2 – Ground Anchor Option uses a smaller diameter for the CIDH piles because the wall will be further stabilized by ground anchors. The anchors will extend perpendicularly from the piles, into the face of the slope. In order to install the anchors, the face of the slope would be excavated during construction and restored following construction. Alternative 1 – Cantilever Option would not require installation of a ground anchor and instead would use thicker CIDH piles to construct the secant walls. Excavation of the face of the slope would not be required for Alternative 1 – Cantilever Option. Because both build alternatives are equal in structural strength and soundness, both alternatives are being considered as possible engineering design options.

1.6 Identification of a Preferred Alternative

The preferred alternative was selected after circulation of the draft environmental document and completion of preliminary design studies. Input from public agencies also aided in the decision to solidify the preferred alternative. After comparing the impacts of all the alternatives and analyzing the constructability of each alternative, Alternative 1 – Cantilever Option has been selected as the preferred alternative.

The project was initiated to stabilize the roadway by strengthening the cliffside against wave erosion. Without any action, the cliff would continue to erode and eventually compromise the usability of the road. This may eventually lead to the inability to utilize PCH and restrict accessibility to the communities along PCH, as well as the adjacent Point Mugu State Park. Therefore, the No Build Alternative was removed from consideration as the preferred alternative.

Both build alternatives would satisfy the purpose and need of the project. However, upon further development of Advance Planning Studies, Alternative 2 – Ground Anchor was not found to be feasible. This alternative required excavation of the seaward slopes to install the ground anchors, which presented equipment staging, horizontal anchor installation, and construction worker safety issues. The Advance Planning Studies revealed that the excavation depth of the slope would have to be about 11 feet below ground surface as opposed to the initial planned 4 feet that was scoped in the draft environmental document. The additional excavation depth created concerns with slope instability. The amount of excavation may compromise the slope, creating worker safety concerns. Additionally, construction equipment would need to utilize the seaward slope which is not feasible if the slope is instable and work space on the slope is simply not available. The slope instability and lack of space created feasibility concerns with Alternative 2 – Ground Anchor Option, therefore the alternative was not chosen as the preferred alternative. Alternative 1 – Cantilever Option satisfies the purpose and need of the project, while also creates less environmental impacts due to no slope excavation, will not disturb the seaside slopes, is safer to construct, and more strongly supported by public agencies. Although Alternative 1 – Cantilever Option is costlier, it is the alternative that will produce the most benefits with the least impacts.

1.7 Permits and Approvals Needed

The following permits and approvals are required prior to construction of the project:

Table 1.2 Regulatory Agencies Requiring Permits and Approval

Agency	Permit/Approval	Status
California Coastal Commission & Ventura County Planning Division	Coastal Development Permit (CDP)	Application for CDP expected after final environmental document
Regional Water Quality Control Board	Section 401 Water Quality Certification	Interagency coordination found permit not needed
United States Army Corps of Engineers	Section 404 Permit - Nationwide	Interagency coordination found permit not needed
United States Army Corps of Engineers	Section 10 Navigable Waters Permit	Interagency coordination found permit not needed
Utilities (power lines)	Approvals to relocate	Prior to any construction activities that would affect utility facilities

Chapter 2: Affected Environment, Environmental Consequences, and Avoidance, Minimization And/Or Mitigation Measures

This chapter discusses project impacts on human, physical, and biological environments within the study area defined for each environmental resource. Analysis of each environmental factor includes discussion of the affected environment, potential environmental impacts (i.e., construction impacts, permanent impacts, cumulative impacts, and indirect impacts), and avoidance, minimization, and mitigation measures for each alternative

ENVIRONMENTAL TOPICS CONSIDERED BUT DETERMINED NOT TO BE RELEVANT

As part of the scoping and environmental analysis carried out for the project, the following environmental issues were considered but no adverse impacts were identified. As a result, there is no further discussion about these issues in this document.

Community Impacts – Community Character and Cohesion. The proposed project consists of purely reinforcing the stability of the slope on which PCH rests upon. The associated physical changes do not present the potential to evoke any social or economic changes within the community of the project study area.

Community Impacts – Relocations and Real Property Acquisition. No relocations and/or real property acquisition is associated with the proposed project; therefore, no potential community impacts exist within this context.

Community Impacts – Environmental Justice. The proposed project is restricted to the prism of the roadway and does not have the potential to affect any populations located within the project site. No minority or low-income populations that would be adversely affected by the proposed project have been identified as determined above. Therefore, this project is not subject to the provisions of Executive Order 12898.

Farmlands/Timberlands. The proposed project is located in a somewhat rural setting, however the proposed improvements will remain within the roadway's right of way. No potential exists for direct or indirect irreversible conversion of protected farmlands or timberlands.

Growth. The project does not present the potential to affect growth in the project area as the proposed project will only involve construction of secant walls.

Paleontology. Paleontology is a natural science focused on the study of ancient animal and plant life as it is preserved in the geologic record as fossils. The project site is not situated within an area with high paleontological resources potential. No impacts on paleontological resources are anticipated.

Noise. A Noise Analysis Memorandum (September 20, 2017) was prepared for this project by Caltrans Office of Environmental Engineering, Noise and Vibration Branch. A Type 1 classification for Caltrans projects is defined in the implementing regulations (23 Code of Federal Regulations [CFR]) of the

Federal-Aid Highway Act of 1970 and given to projects that generally propose construction of a highway on a new location, increase freeway capacity or speed, or propose changes to the alignment of a constructed freeway or highway. This project does not meet the Type 1 criteria defined in 23 CFR 772.

The noise levels within the project area will remain at pre-project levels after construction is completed. During construction, an estimated increase of 3 – 4dBA from construction noise is expected. This increase is considered a less than significant impact on human receptors according to Caltrans' Traffic Noise Analysis Protocol for New Highway Construction and Reconstruction Projects (May 2011), that states 12dBA as a substantial increase. Additionally, no communities were found to exist within the vicinity of the project to experience noise impacts.

Wild and Scenic Rivers. No Wild and/or Scenic Designated rivers exist with the project study area, therefore the proposed project does not have the potential to adversely affect resources protected by the National Wild and Scenic Rivers Act (16 United States Code ([USC] 1271) and the California Wild and Scenic Rivers Act (CA Public Resources Code [PRC] Section 5093.50 et seq.).

HUMAN ENVIRONMENT

This section describes the existing land uses in the project area and summarizes current planning activities in the project area.

2.1 Land Use

2.1.1 Existing and Future Land Use

The project site is within a rural area of unincorporated Ventura County. Ventura County is bounded by Santa Barbara County to the northwest, portions of Kern County to the north, and Los Angeles County to the east and south. Unincorporated Ventura County encompasses the majority of the county and is the largest jurisdictional entity. The county also contains 10 incorporated cities known as the Cities of: Ventura, Oxnard, Camarillo, Thousand Oaks, Simi Valley, Moorpark, Port Hueneme, Santa Paula, Fillmore, and Ojai.

The incorporated cities contain the more urbanized portions of the county due to the 1969 County-City agreement, called the Guidelines for Orderly Development. The agreement encourages urban-level development, including dense housing, to incorporated cities within Ventura County. The agreement also severely limits urban-level development within unincorporated Ventura County. As a result, the cities contain the majority of the County's urban development and population, while much of the County remains rural or semi-rural with large parcels of land dedicated to open space[3].

The land use trends of the County are consistent with the land use regulations described in the Guidelines for Orderly Development. Ninety-seven percent of the county land is currently planned for open space or agriculture by the General Plan[3]. The open space areas include the Los Padres National Forest, Santa Monica Mountains Conservancy, Coastal Conservancy, land protected by the Save Open-Space and Agricultural Resources (SOAR) voter initiatives, and private land trusts. Agriculture is a vital

[3] Ventura County General Plan. 2016. County of Ventura Resource Management Agency Planning Division.

part of the county's economy and large portions of land is subject to the State Land Conservation Act (LCA) contracts. The Los Padres National Forest is undeveloped, protected forested land that makes up the majority of the northern county.

The project site is located under the designation for Open Space in the Ventura County General Plan. The Open Space designation is defined under Section 65560 of the State Government Code, as any parcel or area of land or water which is essentially unimproved and devoted to an open space as defined as: open space for the preservation of natural resources, open space used for the managed production of resources, open space for outdoor recreation, and open space for public health and safety. The Ventura County General Plan also includes "open space" to define open space to promote the formation and continuation of cohesive communities by defining the boundaries and by helping to prevent urban sprawl; and open space to promote efficient municipal services and facilities by confining urban development to defined development areas[3]. Figure 2-1 shows the General Plan Land Use Map for Ventura County.

The project site is also zoned under Coastal Open Space (COS) Zone in the Ventura County Coastal Zoning Ordinance. The establishment of zones is an effort to regulate population density and segregate the uses of land. Zoning ordinances are designed to be consistent with the general plan of the corresponding county or city. The COS zone is described under Sec 8173-1 as: "The purpose of this zone is to provide for the preservation, maintenance, and enhancement of natural and recreational resources in the coastal areas of the County while allowing reasonable and compatible uses of the land."[4]

The project area is also under Sec. 8173-13, the Santa Monica Mountains (M) Overlay Zone, and is described as "The Santa Monica Mountains are a unique coastal resource of statewide and national significance. The mountains provide habitats for several unique, rare, or endangered plant and animal species. These habitats can be easily damaged by human activities; therefore, the mountains require specific protective measures." Therefore, development in this overlay area requires case-by-case consideration and must be consistent with the Coastal Act[4]. The project site is within the South Coast Subarea of the Ventura County's coastal zone and the land use is designated as approximately: 710 acres of agriculture, 13,545 acres of open space, and 4.0 acres of commercial[5]. The South Coast Subarea Zoning Map of the Ventura County Coastal Area Plan is shown in Figure 2-2.

[4] Ventura County Coastal Zoning Ordinance. 2017. Ventura County Planning Division
[5] Ventura County General Plan: Coastal Area Plan. 2017. Ventura County Planning Division.

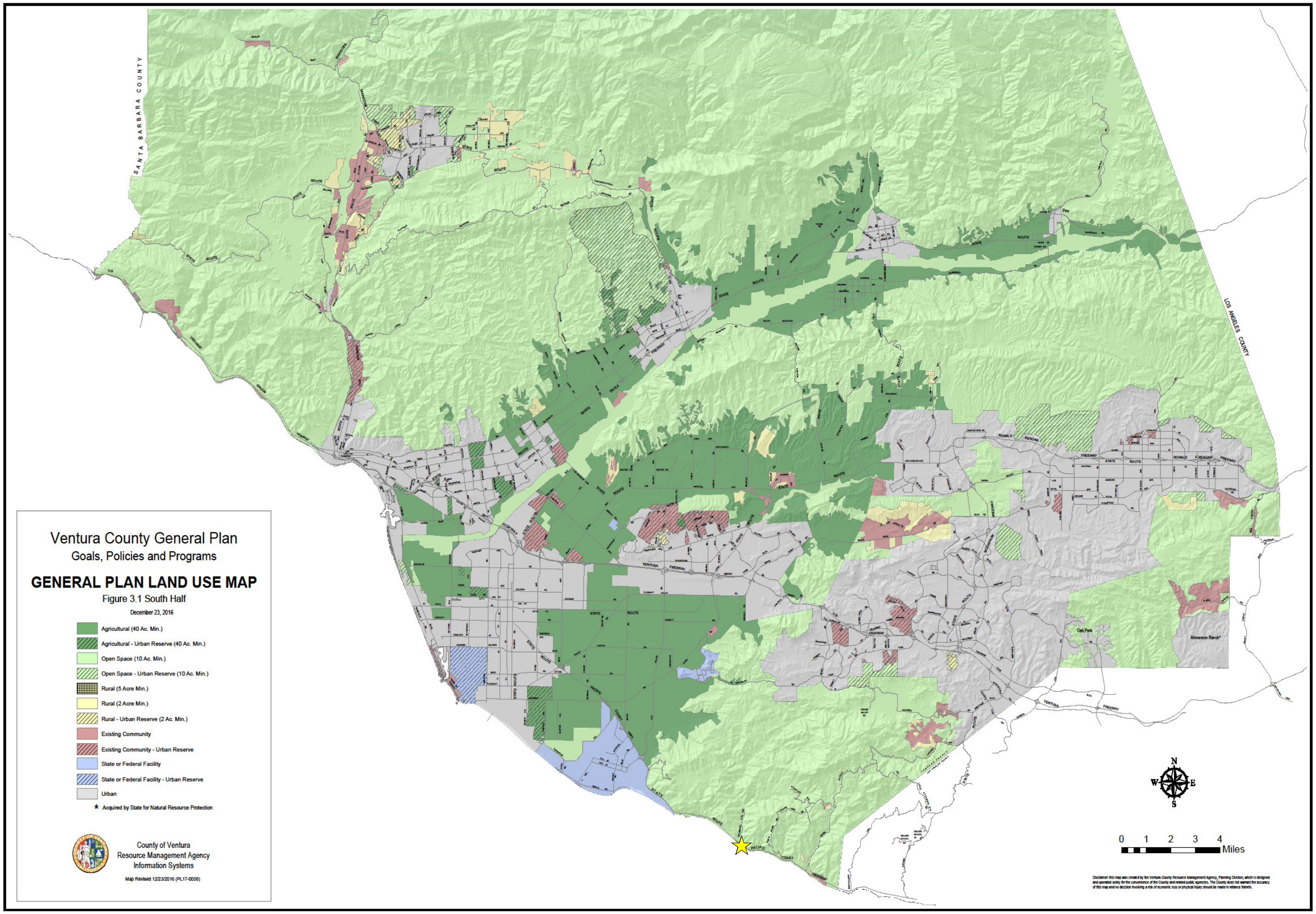

Figure 2-1: General Plan Land Use Map from Ventura County General Plan. The project site is depicted as a yellow star within the map

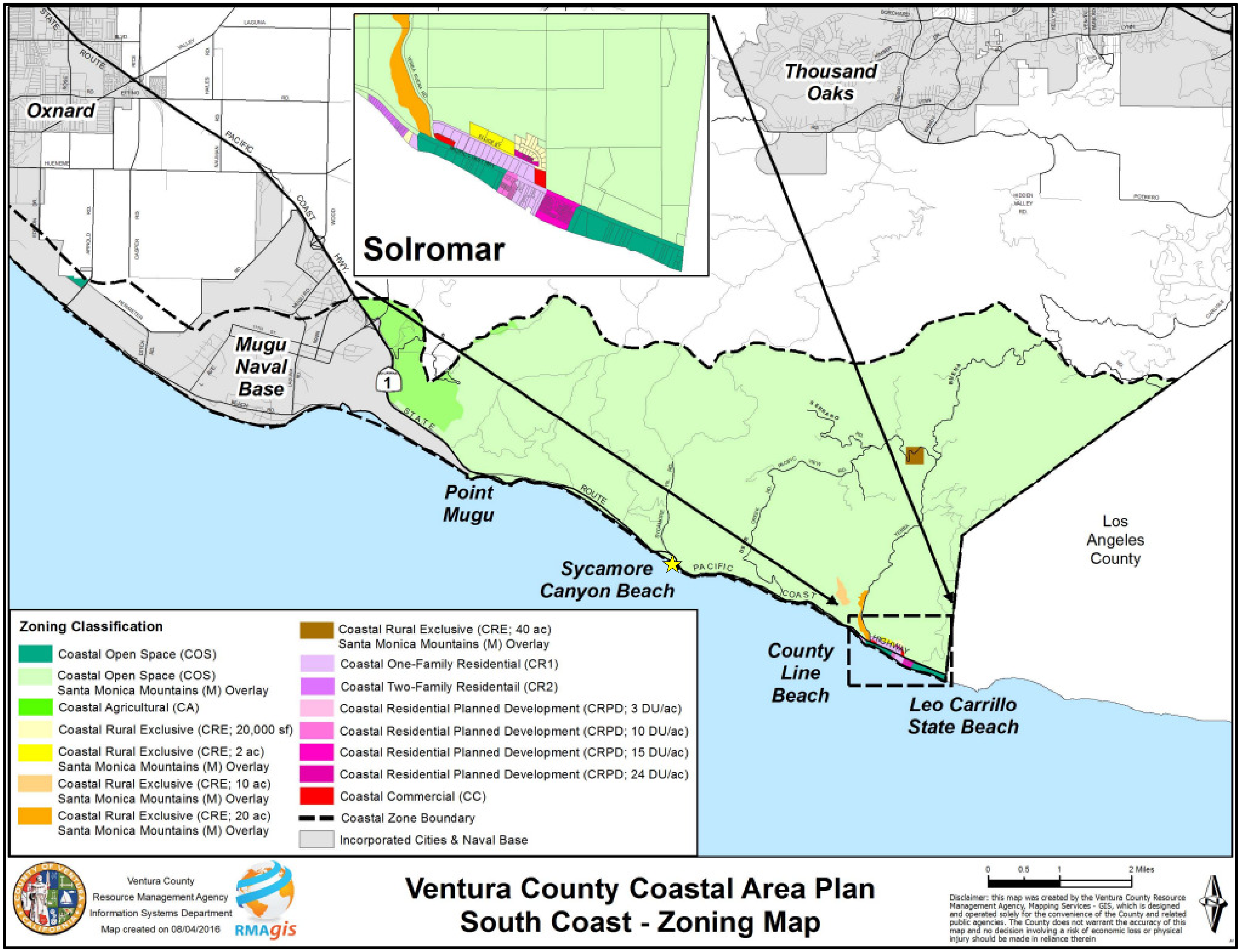

Figure 2-2: South Coast Zoning Map from Ventura County Coastal Area Plan. Project site shown as a yellow star.

Projects Within or Adjacent to the Project Area

The Open Space zoning that covers the project area greatly restricts the type of development permitted for construction. Proposed construction is generally maintenance of the highway or nearby trails Table 2.1 is a list of recent proposed construction within the project area and represents the modest development trends in the project vicinity.

Table 2.1 Recent Proposed Project within the Project Area

Project Location	Project Description	Project Proponent	Project Status
VEN-1 PM 4.2, 4.6, and 4.7	Placement of a 75-linear foot rock revetment of about 8 feet high, consisting of 3-ton stones at PM 4.2 with the base of the revetment on the beach. Placement of additional rip rap on top of an existing 400 linear foot rock revetment, consisting of 6 to 8-ton stones, and shoulder crack repairs at PM 4.6.	Caltrans	Emergency CDP was issued on October 2015. Construction Completed.
VEN-1 PM 1.0 to 10.6, Sycamore Canyon Campground, and Mugu State Park	To remove and clear the mud and debris from the roadway and drainage systems. Repair storm related damage to the highway and roadbed support systems. Remove unstable rocks and boulders from the cliffs located along the north, landward side of PCH. Add soil to the road bed in order to raise PCH to an elevation that would prevent Sycamore Creek from overflowing the roadway and berm across road intersections of side canyons in order to allow future water and debris to flow into the creek rather than depositing on the road.	Caltrans	Emergency CDP was issued on December 2014 and amended on January 2015. Construction Completed.
VEN-1 PM 4.5 to 4.6	Replacement of the existing Rock Slope Protection structure with a new sea wall and construct a secant wall on the west side of the Big Sycamore Bridge. Replacement of the existing bridge railing and associated metal beam guard rail, with Midwest Guardrail System.	Caltrans	Project is undergoing preliminary design.
VEN-1 PM 0.0 to 4.4	Pavement rehabilitation from the Los Angeles County Line through Sycamore Canyon Road by cold planing 0.2 feet of asphalt on the roadway and overlaying with 0.2 feet of rubberized hot mixed asphalt.	Caltrans	RTL planned for March 2018
Sycamore Cove Day Use Beach in Point Mugu State Park	To construct accessibility improvements on the facilities within Point Mugu State Park. The improvements include, but are not limited to, modifications to: restroom shelters, portable restrooms, accessible parking, signage, paths of travel, water stations, showers, and trash receptacles.	California Department of Parks and Recreation	Notice of Exemption completed on August 2017.

Upper Sycamore Canyon Trail in Point Mugu State Park	Repair the Upper Sycamore Canyon Trail after it was severely eroded after rain events following a 2013 fire. The repairs involve constructing a retaining wall from native rock, along the current trail and installing splash stones for energy dissipation at the bottom of the drainage channel at the foot of the trail.	California Department of Parks and Recreation	Notice of Exemption completed on October 2017.

2.1.2 Consistency with State, Regional, and Local Plans and Programs

The Santa Monica Mountains bound the project site to the east with vast undeveloped, open land. The Santa Monica Mountains along PM 4.2 contain portions of Sycamore Canyon Campground that is part of Point Mugu State Park and is open to the public. The Pacific Ocean extends along the western edge of the project site. The beach habitat along the project site varies from rocky cliffs along PM 4.0 that provides no public beach access, to Sycamore Cove Beach at PM 4.2 that provides access to a sandy beach with a large dirt slope and is managed by Point Mugu State Park.

The proposed project site is under jurisdiction of unincorporated Ventura County and is mentioned in Ventura County's General Plan. As designated in the General Plan, the project is also covered in the Coastal Area Plan. The Coastal Area Plan is a planning and management document for coastal communities. In addition, the proposed project is stipulated for federal funding as shown in the FTIP. A description of the planning documents, as well as the planning goals and policies related to the proposed project, are described below.

2.1.3 Environmental Consequences

Federal Transportation Improvement Program (FTIP)

The FTIP is a listing of all transportation projects proposed over a 6 year period that will receive federal funding or are subject to a federally required action. The FTIP identifies the funding sources and fund amounts for each proposed project. The Southern California Association of Governments (SCAG) is the Metropolitan Planning Organization (MPO) that is responsible for preparing the FTIP submittal for the regional transportation planning agencies of Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura Counties. The proposed project is listed in and consistent with the 2017 FTIP (ID VENLS10).

Ventura County General Plan

The Ventura County General Plan fulfills the requirements outlined in Section 65300 of the California Government Code which states, "Each planning agency shall prepare and the legislative body of each county and city shall adopt a comprehensive, long-term general plan for the physical development of the county or city…" The General Plan identifies goals, policies, and programs relating to the preservation, conservation, production, and utilization of resources in Ventura County. Development in the area should remain consistent with the goals detailed in the General Plan, and policies and programs should be implemented in the most applicable manner possible, in order to meet the goals set out in the General Plan. Table 2.2 below shows goals and policies included in the General Plan that are related to the proposed project.

Table 2.2 Goals and Policies mentioned in the General Plan related to the proposed project

Goals/Policy	Build Alternatives	No Build Alternative
Goal 1.1.1 (2). Plan for the *preservation*, *conservation*, efficient use of, enjoyment of, and access to resources, as appropriate, within Ventura County for present and future generations.	**Consistent.** The Build Alternatives would construct 2 seawalls to protect the slope below PCH from further erosion in an effort to preserve usability of PCH for future access to resources within Ventura County.	**Not Consistent.** The slope below PCH is expected to continue to erode due to storm and high tide events, which will eventually cause PCH to become a safety concern and unusable. Thereby restricting future access to resources in Ventura County.
Goal 1.7.1 (2). Protect the visual resources within the *viewshed* of lakes and State and County designated scenic highways, and other scenic areas as may be identified by an area plan.	**Consistent.** The Build Alternatives is not proposing any features that would obstruct the scenic views from PCH. The proposed seawalls would help preserve the Eligible State Scenic Highway for the future.	**Not Consistent.** The No Build Alternative would not improve conditions to protect the life of the Eligible State Scenic Highway for the future.
Goal 2.1.1. Shield public and private property and *essential facilities* from identified hazards and potential disasters.	**Consistent.** The Build Alternatives would protect PCH from further deterioration caused by major storm events.	**Not Consistent.** Under the No Build Alternative, the slope upholding PCH would remain exposed and unprotected from potential disasters.
Goal 2.12.1 (1). Minimize the risk from the damaging effects of coastal wave hazards and beach erosion. (2) Reduce the rate of beach erosion.	**Consistent.** The Build Alternatives would reduce the risk of the roadway becoming unstable and unsafe due to slope erosion. The seawalls would provide protection from damages caused by coastal waves.	**Not Consistent.** The No Build Alternative does not propose any structures to minimize the risk of or reduce the rate of beach erosion on the slope upholding PCH.
Goal 3.2.1 Open Space (4). Retain open space lands for outdoor recreational activities, parks, trails and for scenic lands.	**Consistent.** The Build Alternatives would preserve the usability of PCH, which is the main	**Consistent.** The No Build Alternative would not conflict with activities determined for Open

	access for visitors to enjoy recreational activities at the nearby Open Space lands.	Space but would also not improve accessibility to conduct activities at Open Space lands.
Policies 3.2.2 Open Space (3). Open Space should also include areas within which recreational activities can be pursued, including, but not limited to, use and enjoyment of recreational trails and areas for hunting and fishing. Preservation of open space also serves to protect areas of outstanding scenic, historic, and cultural value; areas particularly suited for park and recreation purposes, including access to lakeshores, beaches, and rivers and streams; and areas which serve as links between major recreation and open space reservations, including utility easements, banks of rivers and streams, trails, and scenic highway corridors.	**Consistent.** The Build Alternatives would help to preserve access on PCH, which is an Eligible State Scenic Highway at the project location with scenic value; as well as a thoroughfare that links areas of recreation and open space.	**Not Consistent.** The No Build Alternative will threaten the preservation of PCH, which qualifies as an Open Space recreational activity described in this policy, by not directly protecting the roadway from the threat of beach erosion.
Goal 4.2.1 (1). Facilitate the safe and efficient movement of persons and goods by encouraging the design, construction, and maintenance of an integrated transportation and circulation system consisting of regional and local roads, bus transit, bike paths, ridesharing, rail transit and freight service, airports and harbors.	**Consistent.** The Build Alternatives would better maintain PCH which is part of the integrated transportation system for Ventura County.	**Not Consistent.** The No Build Alternative would not facilitate the design, construction, or maintenance of the transportation system.

Ventura County Coastal Area Plan

Ventura County's Coastal Area Plan and the Coastal Zoning Ordinance together constitute the "Local Coastal Program" (LCP). The LCP is mandated by the 1976 Coastal Act, which requires coastal counties to prepare a comprehensive planning and regulatory program to manage coastal development and conserve coastal resources. The Ventura County's coastal zone is 43 miles long and the entire project location is found within the South Coast Subarea of the Ventura County's Coastal Area Plan. The Table 2.3 below describes the planning goals and policies in the Coastal Area Plan that are related to the proposed project.

Table 2.3 Goals and Policies mentioned in the Coastal Area Plan related to the proposed project

Goals/Policy	Build Alternatives	No Build Alternative
Coastal Trail Policy 1.2. The County's Coastal Trail includes both Multi-Modal and Single-Mode Routes, and the Multi-Modal Route shall connect to Coastal Trails segments in Santa Barbara County, Los Angeles County, and the cities of Ventura, Oxnard and Port Hueneme. Additional routes may be identified that are parallel to specific segments of the Multi-Modal Route to improve access and connectivity.	**Not Consistent.** The Build Alternatives do not include a multi-modal feature within the project area on PCH.	**Not Consistent.** The project area would not change from current conditions which does not allow incorporation of a multi-modal route. PCH through this area does not have dedicated bicycle lanes or pedestrian access along the shoulders that can connect to other multi-modal routes.
Coastal Trail Policy 2.2. The Multi-Modal Route shall be designed, at a minimum, to provide access to both hikers/walkers and bicyclists, unless equivalent replacement segments are established that, at a minimum, provide the following: A Single-Mode trail segment for hikers/walkers that includes a walkable surface at all times of the day/year as well as a trail alignment that provides a more pleasant trail experience; a Single-Mode trail segment for bicyclists that is a *Class 1 Pathway* or a *Class 2 bike lane*.	**Not Consistent.** The project does not provide designated access to hikers/walkers or bicyclists through the planned multi-modal route within the project limits. However, the project will pave the northbound shoulder which can be used as a multi-modal route in a future project. The Build Alternatives allows for more future multi-modal accommodations than the No Build Alternative.	**Not Consistent.** A Multi-Modal Route is designed through the project area but the No Build Alternative would not incorporate the creation of such a route.
Coastal Trail Policy 2.4. Coastal Trail segments located in areas with high user demand (e.g. near public parking lots, staging areas, popular beaches, or nature viewing areas) should be designed for both active and passive use (e.g. casual walkers, beach cruiser bikes, long-distance hikers or bicyclists) and, where feasible, shall be complaint with the requirements of the Americans with Disabilities Act of 1990 (ADA).	**Not Consistent.** The proposed Coastal Trail through this area does experience high user demand but is not designed for active or passive use. Also, the Build Alternatives do not include active or passive use within the project limits. The project area is not wide enough for such use, but the area does contain 0.3 miles of	**Not Consistent.** The No Build Alternative would retain the shoulders at present conditions which does not accommodate active or passive use, only motored vehicles. Although bicycles can utilize a travel through lane, since no designated bicycle lane is available.

	walking/hiking to Sycamore Cove Beach from Sycamore Canyon campground.	
Coastal Trail Policy 2.8. When the Multi-Modal Route is located within a public road right-of-way, its design features should include the following: a. Walkers/Hikers: Coastal Trail facilities for hikers/walkers should be Class 1 Pathways, sidewalks, or natural surface trails that are separated from vehicular traffic… b. Bicyclists: Coastal Trail facilities for bicyclists should be a trail segment located outside the road travel way on one (or both) sides of the roadway or should be a dedicated bicycle lane, located on both sides of the roadway with striping and signage…	**Not Consistent.** Neither Build Alternative proposes to accommodate for walkers/hikers or bicyclists outside the road travel way. The segment of PCH through the project area is very limited with roadway space. There are safety concerns with falling rocks from the mountain side and with the narrow shoulder on the coastal side, descending into a cliff. However, the northbound shoulder would be paved during construction and can be potentially utilized as a bicycle route in the future.	**Not Consistent.** The current condition of the project area that would remain under the No Build Alternative does not have enough space on the roadway to accommodate Class 1 Pathways or sidewalks or bicycle facilities outside the road travel way.
Coastal Trail Policy 3.7. The County shall not approve a coastal development permit to close, abandon, or render usable by the public any existing coastal accessway that serves as or supports connections to the Coastal Trail network, except where there is no feasible alternative access provided in the interim period, and the accessway reopened once the public safety issue is resolved. Should the closure become permanent, the impact to coastal access shall be mitigated.	**Consistent.** The objective of both Build Alternatives is to preserve PCH in place. PCH is currently a proposed as a planned Coastal Trail component. Without proper protection from wave erosion, PCH will become structurally compromised and eventually usable by the public. The Build Alternatives retain PCH as an option for the Coastal Trail.	**Consistent.** The No Build Alternative would not require a coastal development permit, nor would the alternative propose closure of an existing coastal accessway for the County to approve.
Visual Resource Goal 1. Maintain and enhance the County's scenic and visual resources for the current and future enjoyment of its residents and visitors.	**Consistent.** The Build Alternatives propose infrastructure to preserve PCH, which is an Eligible State Scenic Highway at the proposed project location.	**Not Consistent.** Under the No Build Alternative, no improvements would be made in an effort to maintain visual resources, including PCH.

Recreation Access Goal 1. To maximize public access to coastal recreational areas in the South Coast sub-area consistent with private property rights, natural resources and processes, and the Coastal Act; to maintain existing access, and seek new access as funds become available.	**Consistent.** The purpose of both Build Alternatives is to stabilize the slope below PCH from further erosion, in order to prevent deterioration of the roadway. This action will maintain access to recreational areas around the project site during construction and for future traveling motorists.	**Not Consistent.** The No Build Alternative would not protect the existing coastal access. The slope supporting PCH will continue to erode and access for motorists will eventually be compromised.
Beach Erosion Policy 1. Construction or maintenance of shoreline structures will be limited to only those projects needed to protect existing development, public recreation, and existing roads from beach erosion.	**Consistent.** The Build Alternative proposes the seawall structure in order to protect the existing PCH from beach/slope erosion.	**Consistent.** The No Build Alternative would not construct any shoreline structures, which would make this policy not applicable.

2.1.4 Avoidance, Minimization, and/or Mitigation Measures

Alternatives 1 and 2 – Build Alternatives

The Build Alternatives would be consistent with the stated objectives of these local plans, therefore avoidance, minimization, and/or mitigation measures for land use impacts are not required.

Alternative 3 – No Build Alternative

Avoidance, minimization and/or mitigation measures are not required.

2.2 Coastal Zone

2.2.1 Regulatory Setting

This project has the potential to affect resources protected by the Coastal Zone Management Act (CZMA) of 1972. The CZMA is the primary federal law enacted to preserve and protect coastal resources. The CZMA sets up a program under which coastal states are encouraged to develop coastal management programs. States with an approved coastal management plan are able to review federal permits and activities to determine if they are consistent with the state's management plan. California has developed a coastal zone management plan and has enacted its own law, the California Coastal Act of 1976, to protect the coastline. The policies established by the California Coastal Act are similar to those for the CZMA: They include the protection and expansion of public access and recreation; the protection, enhancement, and restoration of environmentally sensitive areas; the protection of agricultural lands; the protection of scenic beauty; and the protection of property and life from coastal hazards. The California Coastal Commission (Commission) is responsible for implementation and oversight under the California Coastal Act.

Just as the federal CZMA delegates power to coastal states to develop their own coastal management plans, the California Coastal Act delegates power to local governments to enact their own local coastal programs (LCPs). This project is subject to Ventura County's local coastal program. LCPs contain the ground rules for development and protection of coastal resources in their jurisdiction consistent with the California Coastal Act goals. A Federal Consistency Certification will be needed as well. The Federal Consistency Certification process will be initiated prior to FED and will be completed to the maximum extent possible during the NEPA process.

Section 30235 of the Coastal Act reads "Revetments, breakwaters, groins, harbor channels, seawalls, cliff retaining walls, and other such construction that alters natural shoreline process shall be permitted when required to serve coastal-dependent uses or to protect existing structures or public beaches in danger from erosion, and when designed to eliminate or mitigate adverse impacts on local shoreline sand supply." A consolidated CDP from the Commission and Ventura County Planning Division will be required for both Build Alternatives.

Coastal Act Section 30240 provides that only uses dependent on environmentally sensitive habitat areas shall be allowed in those areas. Coastal Act Section 30235 prohibits construction altering the natural shoreline for non-coastal-dependent uses, and Coastal Act Section 30253 requires that development not "contribute significantly to erosion, geologic instability, or destruction of the site or the surrounding area…" In order for the Commission to approve a project that conflicts with these policies, mitigation will be required and the project must be identified as a least environmentally damaging alternative.

2.2.2 Affected Environment

The proposed project site is included in the 2017 Plan for Improved Agency Partnering between Caltrans and the Commission. The report is a result of invested efforts to improve coordination and communication between the two state agencies. The report sets out recommendations for identifying ways to improve planning coordination for two focus areas in order to alleviate common challenges to permitting Caltrans projects in the Coastal Zone. The two focus areas are collaborating on the California Coastal Trail (CCT), which is proposed to be extended through the proposed project site, and sea level rise.

The concept of the CCT is to establish a continuous, interconnected public trail along the California shoreline from the Mexico border to Oregon state line. The Commission has supported the concept of such a trail to foster appreciation and stewardship of the scenic and natural resources of the coast. Establishment of the CCT can be accomplished by combining one of the key missions of the Commission, which is advancing coastal access to the general public, with Caltrans' commitment to multi-modal transportation. Opportunities to combine both of the agencies' missions exist when transportation projects in the coastal zone fall within the State Highway System.

The other focus area from the 2017 Plan for Improved Agency Partnering, and the most challenging, is sea level rise. Planners and engineers need a clearer direction to implement guidelines on analyzing and planning for impacts to Caltrans projects and infrastructure due to sea level rise. Resources available to Caltrans planners in the early project development phase, may not be sufficient to conduct analyses for sea level rise that the Commission would deem appropriate. Therefore the 2017 Plan proposes recommendations to (1) screen for potential impacts from sea level rise on Caltrans projects that are currently undergoing development and (2) develop more robust, long term response guidelines to address sea level rise in the Caltrans planning phase by building upon the results of ongoing vulnerability assessments. The Commission understands that better planning for sea level rise will allow the agency to continue fulfilling its leadership role, as established in the Coastal Act, of protecting public access and recreation along the coast, while simultaneously minimizing risks from coastal hazards. Caltrans must plan for sea level rise in order to protect the vulnerable assets of the statewide transportation network that exists along the coast.

2.2.3 Environmental Consequences

Alternatives 1 and 2 – Build Alternatives

California Coastal Trail

The CCT is proposed to extend as a multi-modal trail along PCH through the project area. PCH within the project site accommodates 1 southbound lane and 2 northbound lanes that converge into one lane just outside the project site. The shoulders on the southbound lane range from 10 feet (at PM 4.2) to 0 feet (at PM 4.0), the northbound shoulder is blocked from vehicle access, and the roadway is along the cliffs of the shoreline (see Figure 2-3). Installing multi-modal options along the highway would be a financial burden and engineering challenge that is beyond the scope of this project. However, construction of either Build Alternative does not prohibit future implementation of multi-modal options for other Caltrans projects. Moreover, the Build Alternatives will protect the roadway from deterioration due to erosion and preserve travel along PCH for the future, including the possibility of constructing multi-modal options.

Figure 2-3: Travel lanes and shoulders of project area by PM 4.0

Wave Run-Up Study

A wave run-up study was prepared, per the request from the Commission. Wave run-up is the maximum vertical height of a wave breaking on a beach or structure, from above the still water level. Wave run-up depends on the local water level, incident wave conditions, and dimensions of the beach or structure the wave breaks against. Wave setup is the increase and decrease of the mean water level due to the breaking waves. Wave setup is of particular concern during storms because the large waves pose a risk of damage to the coast. The wave run-up study analyzed the wave uprush against the coast within the project site and how that structure will impact the wave reflection curve on the coastline from dissipation of wave energy.

The study identified that the shoreline experiences seasonal movement of sand by noticing the rocks at the northwestern end of Sycamore Cove Beach would be exposed during the winter and spring seasons yet during the summer and fall months, the rocks were hidden under sufficient sand cover. Winter storms were responsible for this movement of sediment and wave energy was found to arrive from the west. It was also found that there is a longshore transport through this area based on analysis of the sediments at Sycamore Cove Beach and from Big Sycamore Canyon.

Storm induced beach erosion was modeled in the Wave Run-Up Study. The model utilized sediment grain size, beach slope, berm height, water level increase, duration of storm and the wave conditions to calculate the lateral recession of the top of the berm due to the storm. The results of the maximum scour distance are relatively close to the 50 to 60 feet of erosion associated with Hurricane Marie.

Highly reflective structures on the shore can impact the beach during storms. Structures such as a secant pile wall exposed to a significant wave break can produce a high wave reflection that propagate back onto the shore as a cumulative wave impact. This potential impact can be mitigated by incorporating a dissipative structure at the base of the secant pile walls to protect the toe of the wall and provide dissipation for wave action at the shoreline. The secant wall proposed at PM 4.0 will be constructed behind large boulders that were placed in the area immediately following the storms of 2014/2015. The boulders will not be removed and will serve to dissipate wave energy. The secant wall proposed at PM 4.2 will also be constructed behind a dissipative structure which is a 4-ton barrier at the toe of the slope that is currently in place. In addition, the secant wall installation is buried as far as possible into the existing shoreline under the edge of the highway. The placement of the secant walls minimizes the potential impact on beach processes including effects on sand retention and wave energy dissipation. These design options are included in the plans for this proposed project.

In addition, the wave run-up study will also include the effects of sea level rise. Sea level will rise due to increases of carbon dioxide in the atmosphere. Sea level rise scenarios are required to be analyzed under the *State of California Sea-Level Rise Guidance 2018 Update* (Ocean Protection Council). The wave run-up study combined local flood elevations from FEMA and Army Corps, with various sea level rise scenarios for three future years in the life of the proposed project. The current and future scenarios with sea level rise will be used as the still water level for analyzing the nearshore wave conditions in the SWAN wave modeling program. The results of the SWAN model will be used to obtain the wave conditions, such as wave heights, periods and wave setup at the shoreline, for use in the wave run-up analysis for this project. Therefore, effects of sea level rise will be analyzed in terms of wave dynamics and flooding vulnerability with both Build Alternatives. Chapter 3 of this document discusses sea level rise in the context of climate change under CEQA.

Compliance with Coastal Act Sections

Coastal Act Section 30240 states that impacts to environmentally sensitive habitat areas must be avoided and only uses dependent on such habitat is allowed. As stated in Section 2.14.2 of this document, the Coastal Area Plan shows tidepools at the base of the cliff side on PM 4.0 and is mapped as environmentally sensitive habitat. After coordination with the Ventura County Planning Division however, the tidepools are not believed to be environmentally sensitive habitat area. The maps were made with outdated data and have not been updated with current information. The Ventura County Planning Division does not consider the project area to contain environmentally sensitive habitat. Therefore, neither build alternative would impact environmentally sensitive habitat areas.

Coastal Act Section 30235 prohibits construction altering the natural shoreline for non-coastal-dependent uses. Both build alternatives propose construction of secant walls along the coast. The secant walls are both proposed behind the current dirt slope of the coastline. Alternative 1 – Cantilever Option proposes to drill the piles for the secant walls behind the dirt face of the slope without modifying the natural slope. Alternative 2 – Ground Anchor Option does require excavation of the slope face in order to install the anchors into the slope face, however the slope will be reconfigured to pre-construction conditions by restoring the excavated fill back onto the slope. The natural appearance of the slope is intended to be restored after construction of either build alternative.

Coastal Act Section 30253 requires that development not contribute significantly to erosion, geological instability, or destruction of the site. The purpose of this project is to stabilize the roadway by preventing wave erosion on the cliff upholding the roadway. This project is intended to serve as a physical barrier protecting the cliff side from erosion by constructing secant walls that are underground and discrete enough not to interfere with the natural appearance of the site. Neither build alternative would conflict with Coastal Act Section 30253.

Alternative 3 – No Build Alternative
The No Build Alternative would make no physical changes to the current shoreline. The slope would continue to erode from natural causes which would eventually cause roadway damage to PCH to become unsafe and unsuitable for travelling motorists. The removal of PCH as a thoroughfare would affect access to the coastline, which is contrary to the mission of the Commission and against the 2017 Plan for Improved Agency Partnering. Also, if PCH becomes an unusable roadway, the vision to make CCT along PCH available for multi-modal uses would prove to be a greater challenge than it currently is.

Additionally, the No Build Alternative would not consider the impacts of rising sea levels on the project site or any sea level rise analyses.

2.2.4 Avoidance, Minimization, and/or Mitigation Measures
Alternatives 1 and 2 – Build Alternatives
No avoidance, minimization, and/or mitigation measures would be required.

Alternative 3 – No Build Alternative
No avoidance, minimization, and/or mitigation measures would be required.

2.3 Parks and Recreational Facilities
2.3.1 Affected Environment
Point Mugu State Park is located within the vicinity of the project area. The State park is found within the Santa Monica Mountains and features 5 miles of ocean shoreline with rocky bluffs, sand dunes, sandy beaches, rugged hills, 2 major river canyons, and wide grassy valleys. Sycamore Cove Beach is a public day use area within Point Mugu State Park open to the public from 8:00am to sunset and is located about 300 feet away from the proposed secant wall at PM 4.2.

The project site within the Coastal Area Plan, which in collaboration with the Coastal Zoning Ordinance makes up the local coastal plan, designates the land use of the area to be Open Space with an overlay of the Santa Monica Mountains. The Santa Monica Mountains are valued for their recreation potential and mostly undeveloped habitat. Recreation has taken on national significance with the formation of the Santa Monica Mountains National Recreation Area. The geologically young mountain range contains rugged terrain and diverse habitats supporting a wide number of ecosystems. The landscape includes riparian and oak woodlands, but is dominated by chaparral and coastal sage. Most access to the Santa Monica Mountains is available through PCH[6].

Sycamore Cove Beach is a southwest-facing sandy beach that provides the opportunity for shoreline activities, in addition to picnic tables, lifeguard towers, parking, and restrooms. Across PCH from Sycamore Cove Beach, is a large campground called Sycamore Canyon Campground which features 58 accessible campgrounds, 70 miles of extensive hiking trails within Boney Mountains State Wilderness Area, restrooms with showers, and a nature center (see Figure 2-4). Therefore, many visitors staying in the campground, frequent Sycamore Cove Beach for day use activities such as, swimming and picnicking. Sycamore Cove Beach also contains 3 small parking lots that collectively offer 125 parking spots and can accommodate recreational vehicle (RV) parking. Both Sycamore Cove Beach and Sycamore Canyon Campground help make up a portion of Point Mugu State Park[7].

[6] California State Parks. Website: https://www.parks.ca.gov/?page_id=630, accessed December 2017.
[7] California Beaches. Website: https://www.californiabeaches.com/beach/sycamore-cove-beach, accessed December 2017.

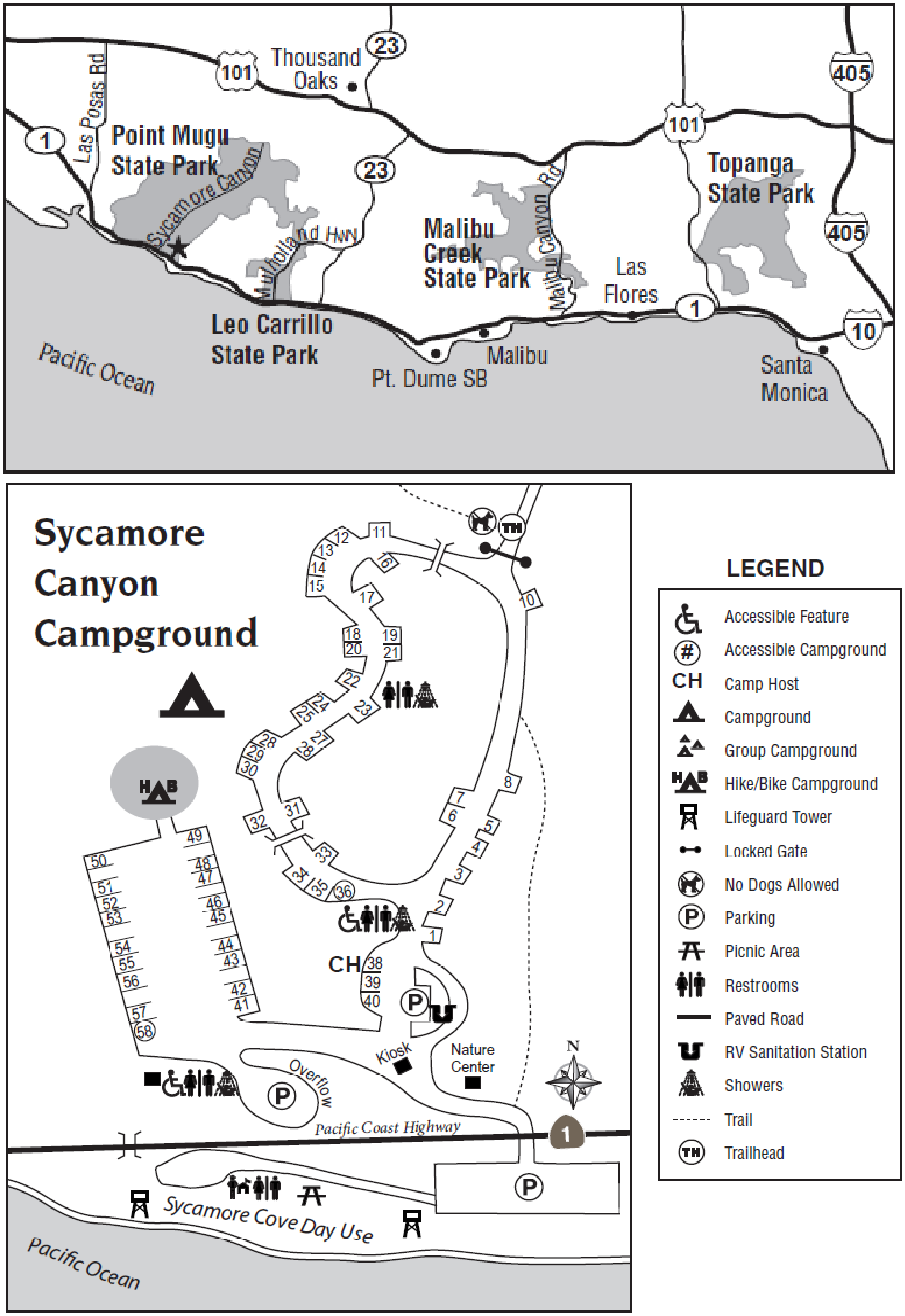

Figure 2-4: Visitor maps of Sycamore Canyon Campground and Sycamore Cove Day Use within Point Mugu State Park.

2.3.2 Environmental Consequences

Alternatives 1 and 2 – Build Alternatives

Point Mugu State Park qualifies as a Section 4(f) resource as defined in the Department of Transportation Act of 1966, under the special provision 23 CFR 774. Section 4(f) stipulates that FHWA and other U.S. Department of Transportation agencies cannot approve the use of land from a significant publicly owned park, recreation area, wildlife or waterfowl refuge, or any significant historic site unless there is no feasible and prudent alternative to the use of the land; and the action includes possible planning to minimize harm to the property resulting from use. The purpose of Section 4(f) is to protect these Section 4(f) resources from being converted into transportation facilities, in an effort to preserve the use of these significant resources. Point Mugu State Park is a publicly owned park and recreation area; therefore, the park is protected under Section 4(f) and is afforded special provisions under Section 4(f).

Temporary construction easements (TCE) within Point Mugu State Park will be required for construction of the two secant walls, under both build alternatives. TCE is proposed at PM 4.0 for 0.206 acres and PM 4.2 for 0.038 acres. The State of California Department of Parks and Recreation is the property owner of the two strips of land, adjacent to the shoulder of southbound PCH proposed for TCE (see Figure 2-5). Because Point Mugu State Park is considered a Section 4(f) resource, the "use" of the park for Caltrans project construction must be analyzed. Section 4(f) defines "use" in three ways: permanent incorporation, temporary occupancy, and constructive use.

The TCE on Point Mugu State Park for the proposed build alternatives would result in a temporary impact on the Section 4(f) resource. Temporary occupancy best fits the use of Point Mugu State Park than the other two uses. Permanent incorporation is used when Section 4(f) land is permanently incorporated into a transportation facility and constructive use occurs when the proximity impacts of the proposed project on an adjacent Section 4(f) property are so severe, that the activities, features, or attributes of the Section 4(f) resource are substantially impaired. TCE does not meet the described use of permanent incorporation or constructive use. Temporary occupancy is applied when property is not permanently incorporated into a transportation facility and is required for construction-related activities. However according to Section 4(f) regulations, if the five conditions listed in 23 CFR 774.13(d) are met, there is no "use" and a temporary occupancy exception applies. Those conditions would be met for Point Mugu State Park, as follows:

- The duration of construction in the area of the TCE is temporary (estimated 1 year) and would be less than the total time needed to construct the entire project. There would be no change in the ownership of the land in the portion of the properties used as TCE.

- The scope of work within Point Mugu State Park proposed for TCE, would be minor. The property would be used for construction/equipment staging, materials stockpiles, and construction fencing. The 4 feet of slope excavation required for Alternative 2 – Ground Anchor Option, would be fully restored after construction. No other substantial construction activities would take place in the property used for TCE.

- The construction activities in the TCEs would not result in any permanent adverse physical impacts in the area and would not interfere with the protected activities, features, or attributes on Point Mugu State Park on a temporary or permanent basis. Public access to the area involving the TCE will be closed during occupancy. However, recreational uses and access to the remaining portions of Point Mugu State Park would continue to be available during construction. Therefore, the protected activities, features, or attributes of the properties would not be substantially affected during construction.

- The area used for TCE would be fully restored prior to returning the area to the State of California Department of Parks and Recreation, so as to return the area to equal or better condition than when the area was used for TCE.

- There must be a documented agreement of the official with jurisdiction over the Section 4(f) resource regarding the above conditions. A documented agreement of the official with jurisdiction is required. Caltrans submitted a coordination letter to the State of California Department of Parks and Recreation on September 7, 2018.

The five conditions listed in 23 CFR 774.13(d) would be met for the proposed TCE, therefore these temporary occupancies would not constitute a use.

The following project feature would ensure that all conditions to qualify for a Section 4(f) temporary occupancy exception.

PAR-1 As required by 1 of the 5 conditions listed in 23 CFR 774.13(d) for temporary occupancy exception, after construction the TCE will be full restored to its original state or better than when the area was acquired for TCE. This shall include installing the appropriate amount of dirt to fill the excavated slope and replanting the slope with native plants. Coordination with the State of California Department of Parks and Recreation will be conducted prior to final design plans in order to ensure the TCE area is fully restored.

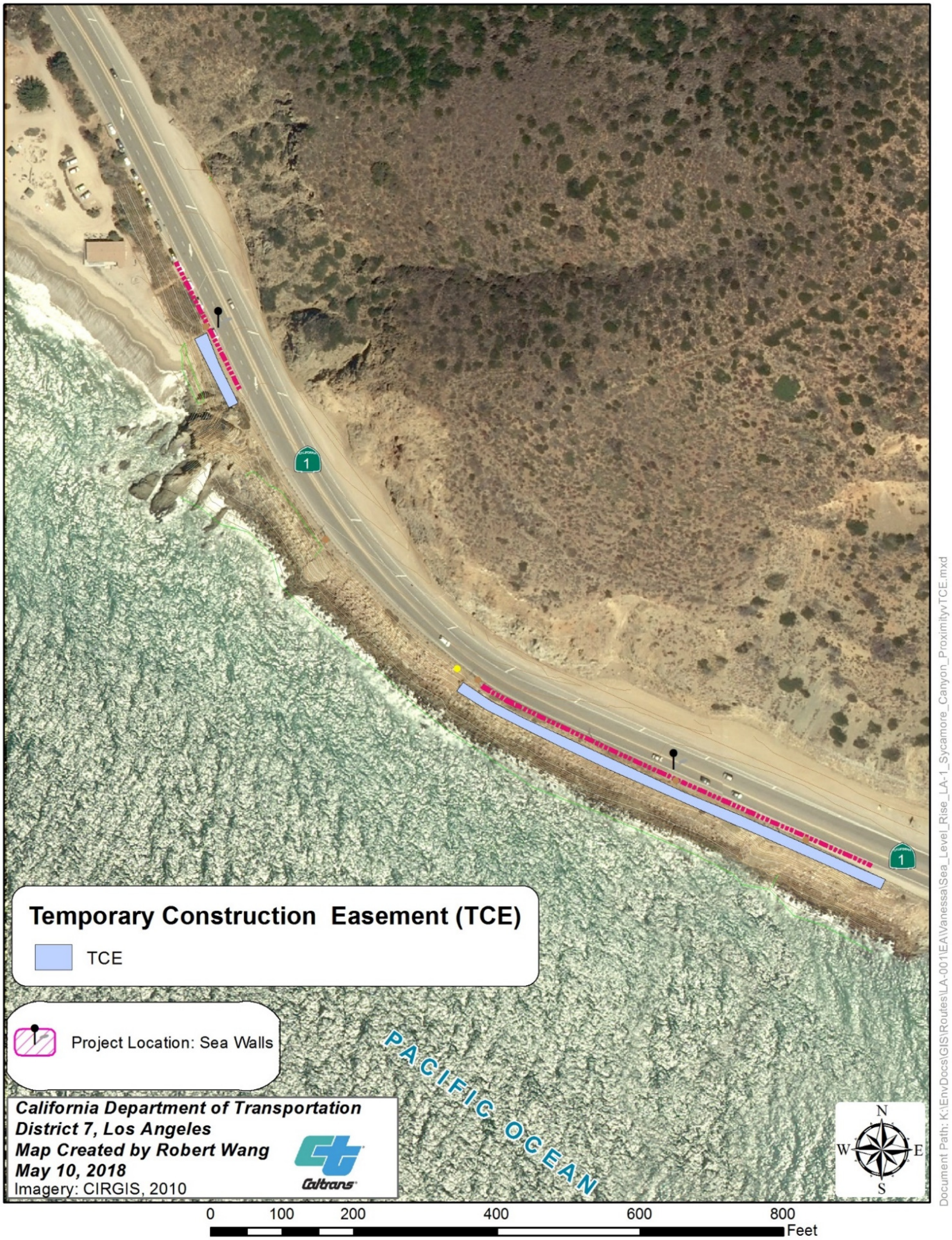

Figure 2-5: Location of temporary construction easements needed for both build alternatives.

Alternative 3 – No Build Alternative
The No Build Alternative would involve no construction within the proximity of Point Mugu State Park. The park would remain at current conditions and unaffected by any physical construction. Additionally, no TCE would be required because there would be no construction along the roadway. There would be no impacts to Point Mugu State Park under the No Build Alternative.

2.3.3 Avoidance, Minimization, and/or Mitigation Measures
Alternatives 1 and 2 – Build Alternatives
No avoidance, minimization, and/or mitigation measures would be required.

Alternative 3 – No Build Alternative
No avoidance, minimization, and/or mitigation measures would be required.

2.4 Utilities
2.4.1 Regulatory Setting
California Code of Regulations Street and Highways Code Sections 700-711 discuss utility relocation policies and procedures. Public Resources Codes 21083, 21087 and CEQA Guidelines Section 15126.2(a) require lead agencies to assess the impact of a proposed project by examining alterations in the human use of the land, including public services. Public Utilities Commission General Order 131-D provides guidance for transportation projects that involve relocation of 50-kilovolt (kV) or higher transmission lines.

2.4.2 Affected Environment
The project study area is within the jurisdiction of several utilities services. Domestic water services are supplied by Calleguas Municipal Water District. Wastewater treatment and sanitation is managed by Ventura Regional Sanitation District. Collection of solid waste is provided by E.J. Harrison & Sons. Electricity is distributed by Southern California Edison and natural gas is supplied by Southern California Gas Company. Emergency services in regards to fire protection and law enforcement, are administered within the project area by the Ventura County Fire Department and Ventura County Sheriff's Office respectably.

2.4.3 Environmental Consequences
Alternatives 1 and 2 – Build Alternatives
Potential impacts on public utilities and services were determined by inventorying those facilities located within the project study area. Power poles owned by Southern California Edison are present through southbound PCH. Both build alternatives would require the relocation of 5 power poles located throughout the project study area on PCH.

Coordination with utility companies is a standard Caltrans procedure during the final design phase. Southern California Edison has been notified that their facilities must be relocated for project construction. Utilities would be relocated using standard engineering practices to avoid service disruption. The location of the reinstated power poles will be determined during the final design phases of the project when coordination with the utility companies is finalized. The power poles have the potential to be relocated to the same location prior to project construction, or elsewhere along PCH.

UT-1 Caltrans will coordinate with all affected private and public service utilities during the design phase to identify any potential conflicts with existing utilities. This process will include seeking approval from utility providers on where to relocate utilities following construction if restoring location in-place is not possible.

The proposed project would not result in temporary or long-term impacts to emergency services with the incorporation of project feature UT-2. As with any freeway or highway construction project, the closure of any lanes during construction needs to be coordinated with local emergency services. Emergency responders will be allowed to utilize PCH through the project area, when responding to crisis calls.

UT-2 Emergency services will be informed of any proposed detour routes to avoid any impacts to their response times. Furthermore, the Traffic Management plan described in the following section (Section 2.5 Traffic and Transportation/Pedestrian and Bicycle Facilities), will provide a circulation traffic plan for access through the project site during construction to avoid impacts.

Alternatives 3 – No Build Alternative
Should the proposed project never undergo construction, there would be no physical alterations to PCH or the surrounding environment. Therefore, there would be no potential to impact utilities or emergency services.

2.4.4 Avoidance, Minimization, and/or Mitigation Measures
Alternatives 1 and 2 – Build Alternatives
No avoidance, minimization, and/or mitigation measures would be required.

Alternative 3 – No Build Alternative
No avoidance, minimization, and/or mitigation measures would be required.

2.5 Traffic and Transportation/Pedestrian and Bicycle Facilities
2.5.1 Regulatory Setting
Caltrans, as assigned by the Federal Highway Administration (FHWA), directs that full consideration should be given to the safe accommodation of pedestrians and bicyclists during the development of Federal-aid highway projects (see 23 Code of Federal Regulations [CFR] 652). It further directs that the special needs of the elderly and the disabled must be considered in all Federal-aid projects that include pedestrian facilities. When current or anticipated pedestrian and/or bicycle traffic presents a potential conflict with motor vehicle traffic, every effort must be made to minimize the detrimental effects on all highway users who share the facility.

In July 1999, the U.S. Department of Transportation (USDOT) issued an Accessibility Policy Statement pledging a fully accessible multimodal transportation system. Accessibility in federally assisted programs is governed by the USDOT regulations (49 CFR 27) implementing Section 504 of the Rehabilitation Act (29 United States Code [USC] 794). The FHWA has enacted regulations for the implementation of the 1990 Americans with Disabilities Act (ADA), including a commitment to build transportation facilities that provide equal access for all persons. These regulations require application of the ADA requirements to federal-aid projects, including Transportation Enhancement Activities.

Assembly Bill No. 1396 was approved by the Governor in 2007 and requires transportation planning agencies such as Caltrans, whose jurisdiction includes property designated for the Coastal Trail, to coordinate with specified agencies regarding development of the trail, and to include provisions for the trail in their regional transportation plans.

2.5.2 Affected Environment

PCH is a major north-south multilane, conventional highway that serves as the only convenient route along the coast connecting Los Angeles County to Ventura County. Through the project area, PCH mostly contains 1 travel lane in each direction, except for a segment near PM 4.2 southbound where the highway transitions from 2 lanes into 1 lane and continues as 1 lane through PM 4.0. The shoulders through this area vary between about 4 feet to 8 feet. No designated bicycle lanes or facilities exist through the project area. However because the highway offers such scenic vistas, the area is a popular and heavily used bicycle route. Bicyclists often utilize the limited shoulder space or occupy one of the travel through lanes, despite the lack of designated bicycle facilities.

Parking is permitted along the shoulder at PM 4.2, except from 10:00pm to 5:00am when parking is restricted. Flat space for a parked vehicle is limited along the shoulder however, parts of the shoulder are obstructed by large bushes and mounds of dirt. Parking on this stretch of PCH is generally used by beachgoers to access the beaches. Parking is prohibited past PM 4.2 as the motorist travels southbound.

2.5.3 Environmental Consequences

Alternatives 1 and 2 – Build Alternatives

Construction of both build alternatives would occur on the existing State highway and shoulders. Drilling for the secant walls will be performed within the State right-of-way just outside the shoulder of southbound PCH, on the other side of the metal beam guardrails for both proposed secant walls. The shoulders on northbound PCH are proposed to be paved, prior to undergoing construction of the secant walls. The northbound shoulder will be used for traffic management during construction but will not increase operational capacity because the shoulder will remain blocked from vehicular access following construction.

PCH is a major artery for Ventura and Los Angeles County and closing access to this area would create a significant impact to traffic. Therefore, a Traffic Management Plan will be prepared to direct traffic operations during construction, as shown in TRA-1. One lane in each direction will remain open during construction, so that traffic and emergency vehicles can maintain regular access through the area. The southbound lane will be closed during construction for construction work, staging, and equipment. Traffic on PCH will be shifted to the right with the original northbound lane used for southbound traffic and the northbound shoulder would be paved for use as the northbound lane for traffic. The lanes would be at minimum 10 feet wide. Cable net mesh will be installed on the mountain adjacent to the northbound shoulder to prevent rock fall onto the roadway. Outside of the construction area, traffic will continue to utilize the original highway configuration. The proposed project would not significantly impact traffic operations during construction.

TRA-1 Traffic operations and access through the project area will remain unrestricted during construction and impacts to motorists would remain minimal to the fullest extent possible through the Traffic Management Plan.

Access to the parking lot at Sycamore Canyon Campground and Sycamore Cove Beach will remain open and not impacted by construction. Parking along the shoulder from about PM 4.15 to PM 4.20 will be unavailable during construction. The removal of parking is considered a less than significant impact because parking on PCH will be removed temporarily for just a short distance and the parking lots of

Sycamore Cove Beach with 125 parking spots can accommodate motorists visiting the beach. Beach access to Sycamore Cove Beach, the only beach within the area, will not be impacted or restricted to public access. Similarly, recreational access to Sycamore Canyon Campground will not be impacted by the project.

Alternative 3 – No Build Alternative
The highway travel lanes and shoulder would remain at current conditions in the No Build Alternative. The number of travel lanes would remain, parking would not be interrupted on the southbound shoulder, and the northbound shoulder would remain blocked from traffic and unpaved without any prospect of reopening. The roadway would continue to be at risk of erosion from impeding waves, with the possibility of eventually becoming so compromised that it would be unsafe for motorists to utilize this stretch of PCH.

2.5.4 Avoidance, Minimization, and/or Mitigation Measures
Alternatives 1 and 2 – Build Alternatives
No avoidance, minimization, and/or mitigation measures would be required.

Alternative 3 – No Build Alternative
No avoidance, minimization, and/or mitigation measures would be required.

2.6 Visual/Aesthetics
2.6.1 Regulatory Setting
The National Environmental Policy Act (NEPA) of 1969, as amended, establishes that the federal government use all practicable means to ensure all Americans safe, healthful, productive, and *aesthetically* (emphasis added) and culturally pleasing surroundings (42 United States Code [USC] 4331[b][2]). To further emphasize this point, the Federal Highway Administration (FHWA), in its implementation of NEPA (23 USC 109[h]), directs that final decisions on projects are to be made in the best overall public interest taking into account adverse environmental impacts, including among others, the destruction or disruption of aesthetic values.

The California Environmental Quality Act (CEQA) establishes that it is the policy of the state to take all action necessary to provide the people of the state "with…enjoyment of *aesthetic*, natural, scenic and historic environmental qualities" (CA Public Resources Code [PRC] Section 21001[b]).

2.6.2 Affected Environment
A *Visual Impact Assessment* was prepared (Caltrans Office of Landscape Architecture) on October 13, 2017 to assess the proposed project's potential to affect visual resources through activities such as excavation for construction of the secant walls, vegetation removal, and shoulder railing removal. The proposed project is on PCH from PM 4.0 to PM 4.2 within unincorporated Ventura County and is within close proximity to Point Mugu State Park, which is heavily used for outdoor recreational purposes.

The area within PM 4.0 does not contain much vegetation, but instead contains the manmade large boulders and geotechnical fabric that was installed in January 2015 to stabilize the slope. The boulders are a dark grey color to resemble a natural rock tone. Also, this site does not offer any beach access. The area within PM 4.2 contains beach access to Sycamore Cove Day Beach, managed by State Parks. The slope between the roadway and the beach is a sandy, natural slope that contains sparse vegetation.

Beside the northern terminus of the proposed secant wall at post mile 4.2, there is a natural large boulder that can be accessed from the roadway shoulder and climbed.

Adjacent to the mountain on the northbound side of PCH, the shoulder is currently dirt and is blocked off by vehicular access as a result of a previous Caltrans project. The previous project required enclosing the shoulder with k-rail and metal fencing of about 6 feet high, which is still deployed at PM 4.0. The k-rail and metal fencing obstructs the motorists' views of the cut mountain.

PCH is not considered a sensitive corridor regarding visual resources because, although the County of Ventura's LCP indicates this segment of the highway as eligible for listing as a State Scenic Highway, the County has not sought designation. The highway does however, offer natural scenic views that are highly valued by travelers and impacts to those scenic views were considered in this project. The key views from PCH within the project area are the Pacific Ocean and beach to the west (Figure 2-6 and Figure 2-7) and mountains to the east (Figure 2-8).

Figure 2-6: Key viewshed of motorists looking to the northwest.


Figure 2-7: Key viewshed of motorists looking to the southwest.


Figure 2-8: Key viewshed of motorists looking to the east.

2.6.3 Environmental Consequences

Alternatives 1 and 2 – Build Alternatives

Secant Walls

The secant walls are proposed to be constructed entirely underground. The project plans indicate that the walls will not be seen above-ground or result in substantial adverse impacts to the visual environment. As a result, the proposed design will not obstruct any ocean, beach or mountain views from the traveling motorist. The secant walls are not a visual impact to the highway's viewsheds.

Shoulder Paving

Both build alternatives propose paving on the shoulder of northbound PCH. The shoulder is currently dirt and will be paved with asphalt concrete. No excavation of the mountain will be required for widening of the shoulder. After the shoulder is paved, the Caltrans project development team considered the possibility of removing the k-rail and metal fencing from the roadway. This action could have improved the visual character of PCH, as the motorists would not have an obstructive view of the mountain and there would be less unnatural objects impairing the natural scenic elements of PCH. However, the risk of rock fall was too great of a public safety risk for Caltrans to open the shoulder for vehicular access. Safety is of the utmost priority and having the double protection of the cable net mesh on the mountain while also restricting access to the shoulder with k-rail and fencing, was the most effective way of ensuring commuters will not be injured from rock fall.

Guardrails

Guardrails along the southbound side of PCH is proposed for both build alternatives. The function of guard railings for transportation purposes, is to retain and safely redirect errant vehicles in order to minimize injury and damage. In addition to this function, Caltrans' Context Sensitive Solutions policy implements a philosophy of integrating the transportation system into the place it serves. A project should be designed so as to fit harmoniously with both community goals and the local environment. The goal is echoed and further implemented by the Commission, which works to integrate projects so as to not impede on the scenic and visual aspects of the coast. The Commission has expressed interest in incorporating barriers that are open to allow views of the ocean from and adjacent to the roadway. As a result, in a collaborative effort between Caltrans and the Commission to ensure the scenic and visual elements of the coast are preserved, and the California Coastal Act of 1976 is admittedly abided by, Caltrans published "Bridge Rails and Barriers – A Reference Guide for Transportation Projects in the Coastal Zone".

Through use of the Reference Guide, the Visual Impact Assessment recommends color staining the concrete mix to match the natural color of the existing rock features and use that concrete for any concrete surface above ground. The concrete color is intended to visually blend these structures into the natural surroundings. The concrete structures that are above ground and proposed in the build alternatives, are guardrails along southbound PCH. The 30" existing metal beam guard railing will be removed for construction of the secant walls and replaced with Midwest Guardrail System at 32". The wooden posts of the guardrail will be replaced in kind to match the visual character prior to construction. The new guardrail will be 2" taller than the previously installed guardrail, however motorists will still be able to clearly see over the guardrail. In addition, the wooden posts will remain the same. Therefore, the guardrails are not considered a significant impact.

Boulders and Plants

Any boulders placed along the slope should closely match the color of the native rocks. Any plants removed during construction shall be replaced to the extent possible. Native plants help restore areas to a more natural state, making it more consistent with the natural aesthetic of the area. Further discussion on native plants will be discussed in Biological Environment- Invasive Plants, of this document.

Alternative 3 – No Build Alternative
If the proposed project were not built, there would be no alterations or stabilization to the existing highway or slope, posing no changes to existing visual resources. The visual impairments and the roadway's vulnerability to erosion would remain. The roadway could possibly become so deteriorated that the highway becomes inaccessible and the viewsheds are not enjoyed by traveling motorists. The current status of the highway would remain.

2.6.4 Avoidance, Minimization, and/or Mitigation Measures

Alternatives 1 and 2 – Build Alternatives
No avoidance, minimization, and/or mitigation measures would be required.

Alternative 3 – No Build Alternative
If the proposed project were not built, there would be no alterations or stabilization to the existing highway or slope, posing no changes to existing visual resources. There would not require any measures to minimize any effects, therefore it would present no potential impacts to existing visual resources.

2.7 Cultural Resources

2.7.1 Regulatory Setting

The term "cultural resources," as used in this document, refers to the "built environment" (e.g., structures, bridges, railroads, water conveyance systems, etc.), places of traditional or cultural importance, and archaeological sites (both prehistoric and historic), regardless of significance. Under federal and state laws, cultural resources that meet certain criteria of significance are referred to by various terms including "historic properties," "historic sites," "historical resources," and "tribal cultural resources." Laws and regulations dealing with cultural resources include:

The National Historic Preservation Act (NHPA) of 1966, as amended, sets forth national policy and procedures for historic properties, defined as districts, sites, buildings, structures, and objects included in or eligible for listing in the National Register of Historic Places (NRHP). Section 106 of the NHPA requires federal agencies to take into account the effects of their undertakings on historic properties and to allow the Advisory Council on Historic Preservation (ACHP) the opportunity to comment on those undertakings, following regulations issued by the ACHP (36 Code of Federal Regulations [CFR] 800). On January 1, 2014, the First Amended Section 106 Programmatic Agreement (PA) among the Federal Highway Administration (FHWA), the ACHP, the California State Historic Preservation Officer (SHPO), and Caltrans went into effect for Caltrans projects, both state and local, with FHWA involvement. The PA implements the ACHP's regulations, 36 CFR 800, streamlining the Section 106 process and delegating certain responsibilities to Caltrans. The FHWA's responsibilities under the PA have been assigned to Caltrans as part of the Surface Transportation Project Delivery Program (23 United States Code [USC] 327).

The California Environmental Quality Act (CEQA) requires the consideration of cultural resources that are historical resources and tribal cultural resources, as well as "unique" archaeological resources. California Public Resources Code (PRC) Section 5024.1 established the California Register of Historical Resources (CRHR) and outlined the necessary criteria for a cultural resource to be considered eligible for listing in the CRHR and, therefore, a historical resource. Historical resources are defined in PRC Section 5020.1(j). In 2014, Assembly Bill 52 (AB 52) added the term “tribal cultural resources” to CEQA, and AB 52 is commonly referenced instead of CEQA when discussing the process to identify tribal cultural resources (as well as identifying measures to avoid, preserve, or mitigate effects to them). Defined in PRC Section 21074(a), a tribal cultural resource is a CRHR or local register eligible site, feature, place, cultural landscape, or object which has a cultural value to a California Native American tribe. Tribal cultural resources must also meet the definition of a historical resource. Unique archaeological resources are referenced in PRC Section 21083.2.

PRC Section 5024 requires state agencies to identify and protect state-owned historical resources that meet the NRHP listing criteria. It further requires Caltrans to inventory state-owned structures in its rights-of-way.

2.7.2 Affected Environment

General Setting

The project area is situated on a marine cut terrace directly above the Pacific Ocean coastline, with Big Sycamore Canyon to the northwest and Deer Canyon to the southeast. The area was abundant in natural resources during prehistoric times because it was located in woodland and coastal habitat zones. Due to these environmental factors, the area and surrounding mountains were immensely utilized by Native Americans. The Chumash Indians occupied the California coastline from San Luis Obispo to Malibu and the project’s Area of Potential Effect (APE) is specifically located in the area occupied by the Ventureño Chumash. The Chumash territory boasted a high indigenous population with multiple villages crosscutting variable ecological zones, exploiting the abundant terrestrial mammals, seeds, and shellfish the area had to offer the hunter-gatherer-fisher populations.

Contact between Spanish explorers and the Chumash Indians was significant in the mid to late 1700’s when Father Juan Crespí, Father Junípero Serra, and Father Francisco Palóu became the founding fathers of Alta California’s missions. The closest mission to the project site is Mission San Buenaventura, located 32 miles northwest of the APE. The Chumash Indians were used as agriculture and cattle laborers for the mission. After the mission system, the establishment of the rancho land grant system occurred, in which Alta California’s vast lands were divided and given to Mexican applicants.

Through this system, Rancho Guadalasca was formed and located in the Santa Monica Mountains about 0.4 miles north of the project site. Rancho Topanga Malibu Sequit was established 3 miles southeast of the project and remained under private ownership until 1925 when Rhonda May Rindge lost a lawsuit against the State of California, in which the judge granted the Department of Highways the right-of-way to construct the Pacific Coast Highway through Rindge’s property. The Pacific Coast Highway eventually extended through the project area, connecting southern California to northern Ventura County.

Studies and Methodologies

The APE delineates all the areas associated with the construction of the proposed secant walls. The APE encompasses the maximum extent of all possible project impacts, which was established to be approximately 12 acres from PM 3.63 to PM 4.35. The project impacts include: proposed locations of the secant walls, possible staging areas along the shoulders to the north and south of the travelled way, locations of the two temporary construction easements, relocation areas for the five existing power poles, and areas where the temporary construction signs may be placed.

The APE is used as the project study area in the Historic Property Survey Report (HPSR) and Archaeological Survey Report (ASR) for records searches, field surveys, and Native American consultation. The HPSR is a summary document used for consultation and decision-making for historic, architectural, or archaeological resources. The ASR is a technical study report that analyzes the archaeological resources in the APE and is used to support the decision in the HPSR.

In order to identify whether the APE may contain the presence of Native American sacred sites, a request for a Sacred Lands File search was made to the Native American Heritage Commission (NAHC). The search indicated that no Native American sacred sites were found within the APE, but the NAHC recommended consulting with six individuals that may have knowledge of cultural resources in or close to the project's APE. The following Native American Tribes, Groups and Individuals were contacted: 4 representatives from the Barbareno/Ventureno Band of Mission Indians, Chumash; 1 representative from the Santa Ynez Band of Chumash Indians; and 1 representative from the Coastal Band of the Chumash Nation.

In addition to the request for a Sacred Lands File search and the invitation to the abovementioned representatives, Caltrans inquired with the archaeologist for the Angeles and Channel Coast Districts from California State Parks about archaeological sensitivity in the Sycamore Cove Beach area. The archaeologist stated there are no recorded sites in the Sycamore Cove Beach, though scattered shell had been observed. The scattered shell is believed to have been redeposited from floods of past mud slides and stems from a nearby site, rather than Sycamore Cove Beach itself because the scattered shell was located in a manufactured berm between the highway and park entrance.

Identification of historic properties within the APE was evaluated using the Caltrans Cultural Resources Database (CCRD). The CCRD is used to review prehistoric and historical archaeological sites, historic-era built environment, and cultural surveys and Caltrans technical reports. In addition to the extensive database, the following additional sources were consulted as part of the records search:

National Register of Historic Places (NRHP)
National Historic Landmark (NHL)
California Register of Historical Resources (CRHR)
California Historical Landmarks (CHL)
Department of Parks and Recreation (DPR) Series 523 Forms
Caltrans Historic Bridge Inventory List
Historic United States Geological Survey (USGS) Topographic Quadrangle Maps
Regional historic maps of Los Angeles County
Caltrans Historical Architectural Survey Report for Big Sycamore Maintenance Station and Las Flores Maintenance Station (Sheid 1993)
General Land Office (GLO) Land Patents
General Land Office (GLO) Historic Survey Plats
Angeles and Channel Coast District Archaeologist correspondence, California State Parks

The consultation of the above-mentioned databases and sources determined there are no historic, architectural, or archaeological resources requiring evaluation located within the APE. An archaeological survey of the project's APE was also conducted on October 3, 2017. The field visit surveyed the 12 acres encompassing the right-of-way, as well as the temporary construction easement. The survey did not show any evidence of archaeological resources within the project's APE and supports the findings made in the HPSR.

2.7.3 Environmental Consequences

Alternatives 1 and 2 – Build Alternatives

No historic, architectural, or archaeological resources are located within the APE. Therefore, neither build alternative would have an impact to sensitive cultural resources and a finding of No Historic Properties Affected has been determined appropriate for the proposed project. Nevertheless, encountering cultural materials is always a possibility when undergoing excavation. The project feature CUL-1 will ensure that should any cultural materials be revealed during construction, Caltrans will respect the discovered materials responsibly by halting construction until a qualified archaeologist can assess the find.

CUL-1 If cultural materials are discovered during construction, all earth-moving activity within and around the immediate discovery area will be diverted until a qualified archaeologist can assess the nature and significance of the find.

Additionally, should human remains be found during construction, Caltrans will adhere to California laws requiring construction activities to be halted so that the County Coroner can be contacted. Also, because this area was used heavily by Native Americans in the past, the NAHC would be contacted if the County Coroner suspects the remains are Native American. Further details on this project feature is described below in CUL-2.

CUL-2 If human remains are discovered, California Health and Safety Code (H&SC) Section 7050.5 states that further disturbances and activities shall stop in any area or nearby area suspected to overlie remains, and the County Coroner contacted. If the remains are thought by the coroner to be Native American, the coroner will notify the Native American Heritage Commission (NAHC), who, pursuant to PRC Section 5097.98, will then notify the Most Likely Descendent (MLD). At this time, the person who discovered the remains will contact Caltrans District 7 Environmental Branch so that they may work with the MLD on the respectful treatment and disposition of the remains. Further provisions of PRC 5097.98 are to be followed as applicable.

Alternatives 3 – No Build Alternative

The proposed ground disturbing actions will not be constructed in the No Build Alternative. The project area will remain at current existing conditions and no impacts to cultural resources would occur.

2.7.4 Avoidance, Minimization, and/or Mitigation Measures

Alternatives 1 and 2 – Build Alternatives

No avoidance, minimization, and/or mitigation measures would be required.

Alternative 3 – No Build Alternative

No avoidance, minimization, and/or mitigation measures would be required.

2.8 Hydrology and Floodplain

2.8.1 Regulatory Setting

Executive Order (EO) 11988 (Floodplain Management) directs all federal agencies to refrain from conducting, supporting, or allowing actions in floodplains unless it is the only practicable alternative. The Federal Highway Administration (FHWA) requirements for compliance are outlined in 23 Code of Federal Regulations (CFR) 650 Subpart A.

To comply, the following must be analyzed:

- The practicability of alternatives to any longitudinal encroachments.
- Risks of the action.
- Impacts on natural and beneficial floodplain values.
- Support of incompatible floodplain development.
- Measures to minimize floodplain impacts and to preserve/restore any beneficial floodplain values affected by the project.

The base floodplain is defined as "the area subject to flooding by the flood or tide having a one percent chance of being exceeded in any given year." An encroachment is defined as "an action within the limits of the base floodplain."

2.8.2 Affected Environment

A *Location Hydraulic Study* was prepared on July 17, 2018 and found no encroachment or impacts to the floodplain. As a result of that finding, a Floodplain Evaluation Report Summary was prepared. Both studies were produced by Caltrans Office of Hydraulics and Stormwater Design. Evaluation is required when projects are anticipated to encroach on a 100-year base floodplain.

The Federal Emergency Management Agency (FEMA) provides information on flood hazards and frequency for cities and counties, based on its Flood Insurance Rate Maps (FIRMs). A FIRM is the official map of a community for which FEMA has delineated Special Flood Hazard Areas (SFHAs). SFHAs are defined as an area that will be inundated by the flood event having a 1% chance of being equaled or exceeded in any given year. The 1% annual change flood is also referred to as the base flood or 100-year flood. Due to their vulnerability, SFHAs must enforce the National Flood Insurance Program's floodplain management regulations and where mandatory purchase of flood insurance applies. Figure 2-9 depicts the flood zone map of the project area relative to the base 100-year floodplain.

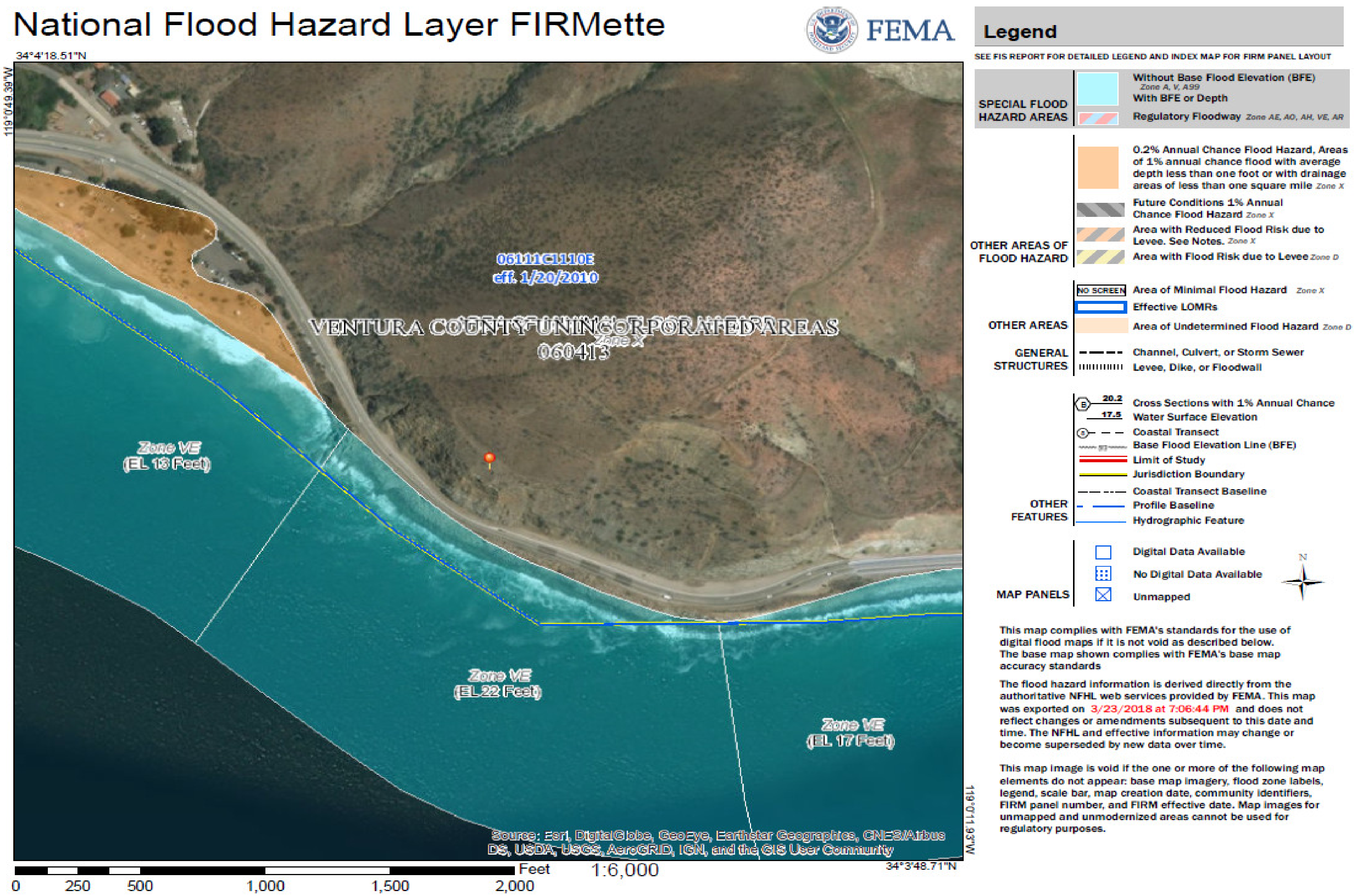

Figure 2-9: The project location shown in FIRM, provided by FEMA. Zone VE is shown as a SFHA and Zone X is not shown as a SFHA.

The SFHAs shown in the FIRM in Figure 2-9 are found in Zone VE. The base flood elevation[8] of this zone is 22 feet and is located adjacent to the ocean. Zone VE represents areas subject to inundation by 1% annual chance flood event with additional hazards due to storm induced velocity wave action. Zone X is also shown in the FIRM but is found in the mountain region and represents an area of minimal flood hazard. The proposed project is located within Zone X and is not a SFHA. Flood insurance is also not necessary within Zone X because it is above the 500-year flood level, thus considered an area at minimal flood risk.

2.8.3 Environmental Consequences

Alternatives 1 and 2 – Build Alternatives

The proposed project is located outside of the base floodplain and will not constitute floodplain encroachment. The project area is prone to mountain runoff during rain events, but the constructed secant walls themselves would not have an effect on hydraulic changes and would not increase runoff volume.

Alternatives 3 – No Build Alternative

The No Build Alternative would not alter or modify the existing environment. No soil disturbance or increase in impervious areas would occur. Therefore, it would present no potential impacts in terms of hydrology and floodplain encroachment.

2.8.4 Avoidance, Minimization, and/or Mitigation Measures

Alternatives 1 and 2 – Build Alternatives

No avoidance, minimization, and/or mitigation measures would be required.

Alternatives 3 – No Build Alternative

No avoidance, minimization, and/or mitigation measures would be required.

2.9 Water Quality and Storm Water Runoff

2.9.1 Regulatory Setting

Federal Requirements: Clean Water Act

In 1972, Congress amended the Federal Water Pollution Control Act, making the addition of pollutants to the waters of the United States (U.S.) from any point source[9] unlawful unless the discharge is in compliance with a National Pollutant Discharge Elimination System (NPDES) permit. This act and its amendments are known today as the Clean Water Act (CWA). Congress has amended the act several times. In the 1987 amendments, Congress directed dischargers of storm water from municipal and industrial/construction point sources to comply with the NPDES permit scheme. The following are important CWA sections:

- Sections 303 and 304 require states to issue water quality standards, criteria, and guidelines.
- Section 401 requires an applicant for a federal license or permit to conduct any activity that may result in a discharge to waters of the U.S. to obtain certification from the state that the discharge

[8] Base flood elevation is the elevation to which floodwater is anticipated to rise during a “100-year flood” or a flood with a 1% chance of occurring any given year.
[9] A point source is any discrete conveyance such as a pipe or a man-made ditch.

will comply with other provisions of the act. This is most frequently required in tandem with a Section 404 permit request (see below).

- Section 402 establishes the NPDES, a permitting system for the discharges (except for dredge or fill material) of any pollutant into waters of the U.S. Regional Water Quality Control Boards (RWQCBs) administer this permitting program in California. Section 402(p) requires permits for discharges of storm water from industrial/construction and municipal separate storm sewer systems (MS4s).
- Section 404 establishes a permit program for the discharge of dredge or fill material into waters of the U.S. This permit program is administered by the U.S. Army Corps of Engineers (USACE).

The goal of the CWA is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters."

The USACE issues two types of 404 permits: General and Individual. There are two types of General permits: Regional and Nationwide. Regional permits are issued for a general category of activities when they are similar in nature and cause minimal environmental effect. Nationwide permits are issued to allow a variety of minor project activities with no more than minimal effects.

Ordinarily, projects that do not meet the criteria for a Regional or Nationwide Permit may be permitted under one of the USACE's Individual permits. There are two types of Individual permits: Standard permits and Letters of Permission. For Individual permits, the USACE decision to approve is based on compliance with U.S. Environmental Protection Agency's (U.S. EPA) Section 404 (b)(1) Guidelines (40 Code of Federal Regulations [CFR] Part 230), and whether the permit approval is in the public interest. The Section 404(b)(1) Guidelines (Guidelines) were developed by the U.S. EPA in conjunction with the USACE, and allow the discharge of dredged or fill material into the aquatic system (waters of the U.S.) only if there is no practicable alternative which would have less adverse effects. The Guidelines state that the USACE may not issue a permit if there is a least environmentally damaging practicable alternative (LEDPA) to the proposed discharge that would have lesser effects on waters of the U.S. and not have any other significant adverse environmental consequences. According to the Guidelines, documentation is needed that a sequence of avoidance, minimization, and compensation measures has been followed, in that order. The Guidelines also restrict permitting activities that violate water quality or toxic effluent[10] standards, jeopardize the continued existence of listed species, violate marine sanctuary protections, or cause "significant degradation" to waters of the U.S. In addition, every permit from the USACE, even if not subject to the Section 404(b)(1) Guidelines, must meet general requirements. See 33 CFR 320.4.

State Requirements: Porter-Cologne Water Quality Control Act
California's Porter-Cologne Act, enacted in 1969, provides the legal basis for water quality regulation within California. This act requires a "Report of Waste Discharge" for any discharge of waste (liquid, solid, or gaseous) to land or surface waters that may impair beneficial uses for surface and/or groundwater of the state. It predates the CWA and regulates discharges to waters of the state. Waters of the state include more than just waters of the U.S., like groundwater and surface waters not considered waters of the U.S. Additionally, it prohibits discharges of "waste" as defined, and this definition is broader than the CWA definition of "pollutant." Discharges under the Porter-Cologne Act

[10] The U.S. EPA defines "effluent" as "wastewater, treated or untreated, that flows out of a treatment plant, sewer, or industrial outfall."

are permitted by Waste Discharge Requirements (WDRs) and may be required even when the discharge is already permitted or exempt under the CWA.

The State Water Resources Control Board (SWRCB) and RWQCBs are responsible for establishing the water quality standards (objectives and beneficial uses) required by the CWA and regulating discharges to ensure compliance with the water quality standards. Details about water quality standards in a project area are included in the applicable RWQCB Basin Plan. In California, RWQCBs designate beneficial uses for all water body segments in their jurisdictions and then set criteria necessary to protect those uses. As a result, the water quality standards developed for particular water segments are based on the designated use and vary depending on that use. In addition, the SWRCB identifies waters failing to meet standards for specific pollutants. These waters are then state-listed in accordance with CWA Section 303(d). If a state determines that waters are impaired for one or more constituents and the standards cannot be met through point source or non-point source controls (NPDES permits or WDRs), the CWA requires the establishment of Total Maximum Daily Loads (TMDLs). TMDLs specify allowable pollutant loads from all sources (point, non-point, and natural) for a given watershed.

State Water Resources Control Board and Regional Water Quality Control Boards
The SWRCB administers water rights, sets water pollution control policy, and issues water board orders on matters of statewide application, and oversees water quality functions throughout the state by approving Basin Plans, TMDLs, and NPDES permits. RWCQBs are responsible for protecting beneficial uses of water resources within their regional jurisdiction using planning, permitting, and enforcement authorities to meet this responsibility.

National Pollutant Discharge Elimination System (NPDES) Program
Municipal Separate Storm Sewer Systems (MS4)
Section 402(p) of the CWA requires the issuance of NPDES permits for five categories of storm water discharges, including Municipal Separate Storm Sewer Systems (MS4s). An MS4 is defined as "any conveyance or system of conveyances (roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, human-made channels, and storm drains) owned or operated by a state, city, town, county, or other public body having jurisdiction over storm water, that is designed or used for collecting or conveying storm water." The SWRCB has identified Caltrans as an owner/operator of an MS4 under federal regulations. Caltrans' MS4 permit covers all Caltrans rights-of-way, properties, facilities, and activities in the state. The SWRCB or the RWQCB issues NPDES permits for five years, and permit requirements remain active until a new permit has been adopted.
Caltrans' MS4 Permit, Order No. 2012-0011-DWQ (adopted on September 19, 2012 and effective on July 1, 2013), as amended by Order No. 2014-0077-DWQ (effective July 1, 2014) and Order No. 2015-0036-EXEC (effective April 7, 2015) has three basic requirements:

1. Caltrans must comply with the requirements of the Construction General Permit (see below);
2. Caltrans must implement a year-round program in all parts of the State to effectively control storm water and non-storm water discharges; and
3. Caltrans storm water discharges must meet water quality standards through implementation of permanent and temporary (construction) Best Management Practices (BMPs), to the maximum extent practicable, and other measures as the SWRCB determines to be necessary to meet the water quality standards.

To comply with the permit, Caltrans developed the Statewide Storm Water Management Plan (SWMP) to address storm water pollution controls related to highway planning, design, construction, and maintenance activities throughout California. The SWMP assigns responsibilities within Caltrans for implementing storm water management procedures and practices as well as training, public education and participation, monitoring and research, program evaluation, and reporting activities. The SWMP describes the minimum procedures and practices Caltrans uses to reduce pollutants in storm water and non-storm water discharges. It outlines procedures and responsibilities for protecting water quality, including the selection and implementation of BMPs. The proposed project will be programmed to follow the guidelines and procedures outlined in the latest SWMP to address storm water runoff.

Construction General Permit

Construction General Permit, Order No. 2009-2009-DWQ (adopted on September 2, 2009 and effective on July 1, 2010), as amended by Order No. 2010-0014-DWQ (effective February 14, 2011) and Order No. 2012-0006-DWQ (effective on July 17, 2012). The permit regulates storm water discharges from construction sites that result in a Disturbed Soil Area (DSA) of one acre or greater, and/or are smaller sites that are part of a larger common plan of development. By law, all storm water discharges associated with construction activity where clearing, grading, and excavation result in soil disturbance of at least one acre must comply with the provisions of the General Construction Permit. Construction activity that results in soil disturbances of less than one acre is subject to this Construction General Permit if there is potential for significant water quality impairment resulting from the activity as determined by the RWQCB. Operators of regulated construction sites are required to develop Storm Water Pollution Prevention Plans (SWPPPs); to implement sediment, erosion, and pollution prevention control measures; and to obtain coverage under the Construction General Permit.

The Construction General Permit separates projects into Risk Levels 1, 2, or 3. Risk levels are determined during the planning and design phases, and are based on potential erosion and transport to receiving waters. Requirements apply according to the Risk Level determined. For example, a Risk Level 3 (highest risk) project would require compulsory storm water runoff pH and turbidity monitoring, and before construction and after construction aquatic biological assessments during specified seasonal windows. For all projects subject to the permit, applicants are required to develop and implement an effective SWPPP. In accordance with Caltrans' SWMP and Standard Specifications, a Water Pollution Control Program (WPCP) is necessary for projects with DSA less than one acre.

Section 401 Permitting

Under Section 401 of the CWA, any project requiring a federal license or permit that may result in a discharge to a water of the U.S. must obtain a 401 Certification, which certifies that the project will be in compliance with state water quality standards. The most common federal permits triggering 401 Certification are CWA Section 404 permits issued by the USACE. The 401 permit certifications are obtained from the appropriate RWQCB, dependent on the project location, and are required before the USACE issues a 404 permit.

In some cases, the RWQCB may have specific concerns with discharges associated with a project. As a result, the RWQCB may issue a set of requirements known as WDRs under the State Water Code (Porter-Cologne Act) that define activities, such as the inclusion of specific features, effluent limitations, monitoring, and plan submittals that are to be implemented for protecting or benefiting water quality. WDRs can be issued to address both permanent and temporary discharges of a project.

2.9.2 Affected Environment

The following discussion regarding water quality and storm water runoff was excerpted from the *Storm Water Data Report – Long Form* prepared by Caltrans Office of Design (2018).

The proposed project is located within the Ventura Coastal Stream Watershed and under the jurisdiction of the Los Angeles Regional Water Quality Control Board. Oxnard is the only sub watershed of the 4 coastal sub watersheds grouped under the Miscellaneous Ventura Coastal Watersheds that has an established TMDL. The closest stream to the project area is Big Sycamore Creek found at approximately PM 4.5, located just north of the project site. However, no pollutant listed on 303(d) water bodies are within the project limits.

2.9.3 Environmental Consequences

Alternatives 1 and 2 – Build Alternatives

The total DSA is calculated by adding the exposed dirt areas impacted by workers and equipment. The DSA for both build alternatives includes construction of the 2 secant walls (including concrete barrier for wall stability) on the shoulder of the coastal side of the highway and roadway paving of the northbound shoulder for traffic management during construction. The amount of DSA that would result from either build alternative is 2 acres.

The proposed project would also result in a small amount of new impervious surfaces due to the proposed secant walls and northbound shoulder paving. The estimated net new impervious (NNI) surfaces is 0.2 acre.

Although 2 acres of DSA is required and would result in 0.2 acre of impervious surface, neither build alternative is expected to increase the volume, velocity, or sediment load of stormwater runoff. The additional 0.2 acre of impervious surface is considered to be a minimal increase in stormwater runoff and not a significant impact. Despite the project area lacking in a waterbody considered a 303(d) waterbody, the following project features would be proposed to reduce impacts from the DSA to the surrounding rural area:

WQ-1 To reduce potential contaminated or sediment-containing runoff from polluting the nearby environment, design BMPs and temporary construction BMPs will be implemented. The types and locations of the design BMPs will be determined in the design plans in the final design phase. The types and locations of the temporary construction BMPs will be described in the Stormwater Pollution Control Plan prior to the start of construction activities.

Alternatives 3 – No Build Alternative

If the proposed project was not to be built, there would be no alterations or improvements to the existing environment. No disturbance of soil would be proposed or increase in impervious areas. Thus, there would be no impacts related to water quality or storm water runoff.

2.9.4 Avoidance, Minimization, and/or Mitigation Measures

Alternatives 1 and 2 – Build Alternatives

No avoidance, minimization, and/or mitigation measures would be required.

Alternatives 3 – No Build Alternative

No avoidance, minimization, and/or mitigation measures would be required.

2.10 Geology and Soils

2.10.1 Regulatory Setting

For geologic and topographic features, the key federal law is the Historic Sites Act of 1935, which establishes a national registry of natural landmarks and protects "outstanding examples of major geological features." Topographic and geologic features are also protected under the California Environmental Quality Act (CEQA).

This section also discusses geology, soils, and seismic concerns as they relate to public safety and project design. Earthquakes are prime considerations in the design and retrofit of structures. Structures are designed using Caltrans' Seismic Design Criteria (SDC). The SDC provides the minimum seismic requirements for highway bridges designed in California. A bridge's category and classification will determine its seismic performance level and which methods are used for estimating the seismic demands and structural capabilities.

2.10.2 Affected Environment

The discussion below was presented in the *Preliminary Foundation Report* prepared by the Caltrans Office of Geotechnical Design South on May 29, 2018 for this project. The recommendations in the report are based on reviews of as-built plans and site geologic information, results of field investigation and laboratory tests, and preliminary General and Foundation Plans prepared by Caltrans Structure Design.

Geotechnical Borings Drilling

A site field investigation to conduct geotechnical borings drilling was initiated in early November 2017 and completed in mid-December 2017. The geotechnical borings were drilled at 6 locations with depths ranging from 64 feet below surface (BGS) to 120 feet BGS. The locations were based on topography, under and above ground utilities, and possible detour routes to keep the highway open to the traveling public (Figure 2-10). The boring locations were also selected to inform Caltrans Design on the strength and properties of the foundation for the proposed structures.

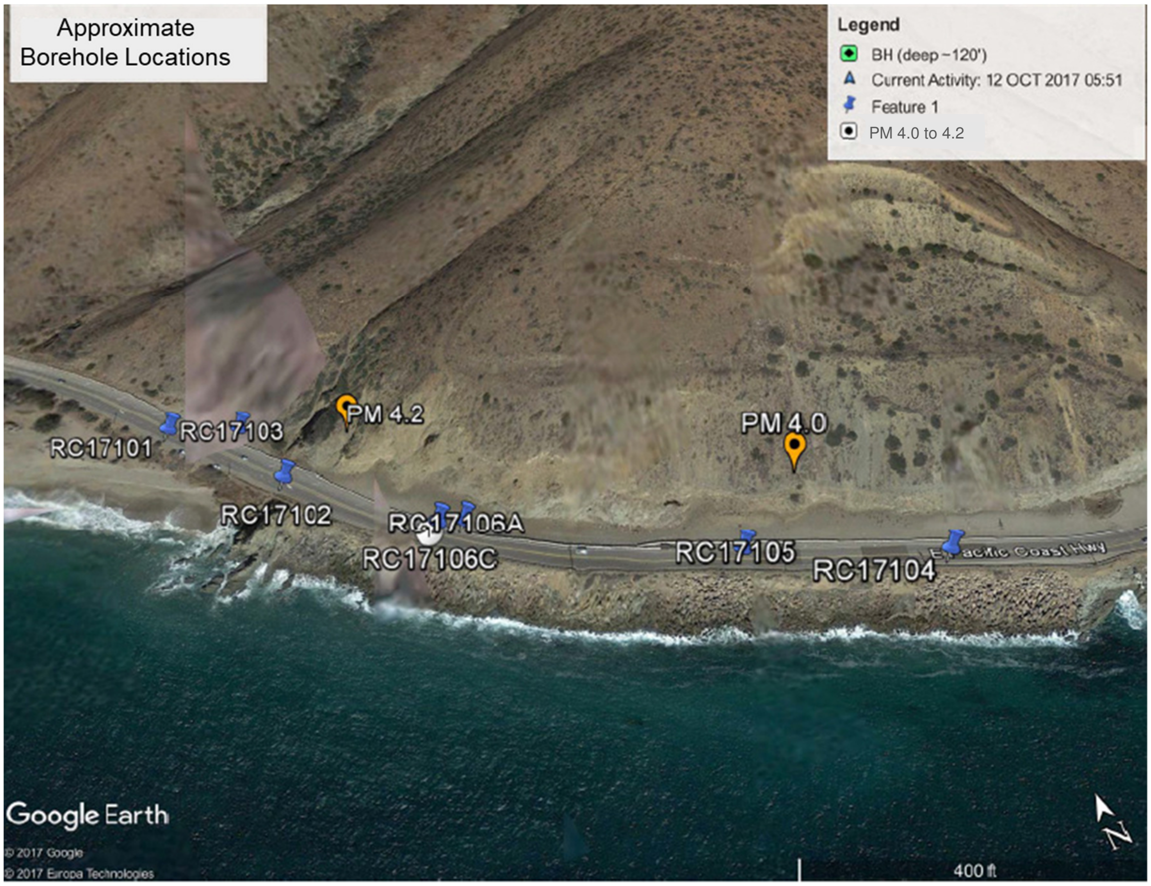

Figure 2-10: Approximate borehole locations for geotechnical borings. The shallow boring RC17106B is not mapped but is located at very close proximity to RC17106A.

The intent of the drillings was to extract a sample of soil within the project area, then conduct testing on the sample to understand its physical characteristics and composition. The boreholes were drilled and logged following the Caltrans Soil and Rock Logging, Classification, and Presentation Manual (2010). The soil and rock samples were sent for laboratory testing to determine corrosion, unit weights, specific gravity, and unconfined compressive strength for rock specimens. The borehole location at RC17106A was planned for excavation but due to boulders and cobbles, Caltrans Geotechnical Design was unable to advanced further underground. As a result, the location at RC 1706B was attempted but crews were faced with similar issues. Finally, the location at RC17106A was found suitable to serve as a borehole. Records of the shallow borings is shown in Table 2.4 along with the depths of borehole and groundwater for all other boreholes that was discovered due to drilling.

Table 2.4 Logistics from Geotechnical Boring Drilling

Borehole Number	Borehole Top Elevation (feet)	Total Depth of Borehole (feet)	Depth of Groundwater (feet)
RC-17-101	37.94	115	32.40
RC-17-103	40.07	64.5	36.20
RC-17-102	41.55	92.4	39.60
RC-17-106C	49.78	85	48.00
RC-17-106B	50.38	21.5	Not measured
RC-17-106A	50.62	25.5	Not measured
RC-17-105	57.81	120	54.20
RC-17-104	59.16	110	34.80

Geologic Setting and Topography

The project is located in the coastal margin where the Santa Monica Mountains meet the Pacific Ocean. The Santa Monica Mountains are a low-rugged, west trending high-relief mountain range that are approximately 50 miles long and 10 miles wide. The Santa Monica Mountain range is the youngest range and lowest in elevation of the series of mountain ranges that comprise the Transverse Range Geomorphic Province. The mountain range is bounded by the Pacific Ocean to the south, the Los Angeles Basin to the east, the San Fernando and Conejo Valleys to the north, and the Oxnard Plain to the west. The natural slopes within the project vicinity exhibit complex profiles of convex and concave upward slopes with interspersed simple planar slopes. The slopes by the ocean have been shaped by erosive action of the ocean and some slopes have manifested localized cliffs with some overhang.

Extending from these mountain ranges within the project vicinity, are branched and anastomosing tributary drainage patterns that feed into Big Sycamore Canyon Creek. During rainstorms, water runs off the mountain through young, short streams and feeds into Big Sycamore Canyon Creek, which is one of the main drainage courses in the Santa Monica Mountains. This channel is southward trending, deeply indented, low gradient and crosses beneath the highway just adjacent to the project area, at Big Sycamore Creek Bridge.

The high-relief rugged mountains in this terrain abruptly change to the low-relief, gently sloping continental shelf at the coastline (Figure 2-11). The continental shelf at this location is deeply formed by steep-sided submarine canyons that abut the coastline, according to literature and aerial images. The dendritic pattern of the continental shelf corresponds to natural drainage courses emanating from the Santa Monica Mountains. Therefore, the water running from the mountains is directly imprinting the continental slope at this location and the ranges are closely linked to the formation of the underwater submarine canyons. These canyons imply that high relief slopes may occur beneath the water adjacent to the project.

Figure 2-11: Panoramic view of project study area

Seismic Hazards

The Santa Monica Mountains lie within terrain that is bounded by the following faults: the Garlock Fault Zone to the north, San Andreas Fault Zone to the west, Raymond Fault Zone to the southeast, and Malibu Coast Fault to the south. This fault bounded terrain is undergoing active compression due to a straining bend, known as the Big Bend, where the Garlock Fault offsets the San Andreas Fault to the west. As a result, the project area is undergoing northwest to south east shortening which is accommodated by the formation of westerly trending folds and faults. This active folding and faulting continues to uplift the Santa Monica Mountains. The region is seismically active.

Geologic Rocks

Bedrock within the project area is comprised of highly deformed and faulted early Miocene to Pliocene aged sedimentary rock and volcanic rock of the Lower Topanga Canyon formation. The sedimentary rock is comprised of very thinly to thickly interbedded fine-grained sandstones, siltstones, mudstones, shales, and slates. They were formed by diagenesis of thick deposits of organic rich, fine grained sand, silts, and clays originally deposited in deep water on the Continental Shelf. The materials occurring in the subsurface are characterized as: non-engineered fill, beach and dune sand, alluvium, sedimentary rock, and igneous rock.

2.10.3 Environmental Consequences

Alternatives 1 and 2 – Build Alternatives

The secant walls for both build alternatives will be constructed by overlapping drilled piles to form a continuous wall. The piles consist of primary piles and secondary piles. The primary piles with low strength concrete are unreinforced concrete piles and designed as lagging between the secondary piles. The secondary piles are reinforced concrete piles designed to provide flexural and shear resistance in the vertical direction. The piles for the secant walls will be embedded into bedrock, therefore global stability for static and seismic conditions are not a concern. In order to strengthen the structural integrity of the secant walls, the following information acquired from the geotechnical boring drilling sample testing will be used to advise the Caltrans Design team of the proposed secant walls for both build alternatives. Big Sycamore Canyon Creek does not extend into the project limits and will not be impacted.

Secant Pile Wall: Either rebar cage, steel beam, or steel pipe/casing can be used as the reinforcement. If steel beam is used, the wall will be designed based on the resistance provided solely by the steel beam. Should pipe/casing be used however, concrete inside the pipe/casing may be considered in the design, and constrained concrete properties may be used. The use of steel beam as the reinforcement for secant pile wall does not require concrete integrity tests during construction, and is preferred to rebar case because of the high potential of cave-in during drilling and concrete placement.

Hard Drilling: The Log of Test Borings with digital photo log of rock cores and photos of in-situ rock, should be carefully reviewed before selecting drilling methods and equipment due to the layers of gravel, cobbles, and boulders with beach sand above bedrock.

Wall Alignment: The wall alignment should be located 2 times the pile diameter from the edge of the slope to facilitate construction.

Design Wall Height: The design wall height should be determined based on the scour/erosion elevation from the recommendations in the hydraulics study.

Pile Diameter and Pile Spacing: The pile diameters of 2-4 feet are typically employed for 50-100 feet deep shoring system. Secondary piles are spaced at less than pile diameter (typically 0.8 times pile diameter), and smaller pile diameter will provide smaller spacing with increased number of piles. The pile diameter should be determined based on required stiffness and strength of the secant pile walls.

Pile Length: Pile length depends on elevation of the bedrock and scour/erosion. The length of the primary pile and secondary pile is typically the same. For this project, the primary pile length may be shorter than the secondary pile length, but the primary pile tip should be lower than one pile diameter into bedrock or scour/erosion elevation, whichever is lower. The length of secondary piles should be determined based on the method described in AASHTO Design Specification.

Alternatives 2 – Ground Anchor Option
In addition to the recommendations made above, the findings from the geotechnical borings drilling also made some recommendations specifically for Alternative 2 – Ground Anchor Option. Alternative 2 – Ground Anchor Option would reduce the size and length of the pile beam and control deflection of the wall. The typical horizontal spacing of the ground anchors vary from 5-10 feet with a minimum spacing of 4 feet, and should be determined based on required anchor loads and capacities. The inclination of the ground anchor can be installed between 10-45 degrees, but 15-30 degrees is more common. The unbonded length of the ground anchor will be determined when the location of the ground anchor, inclination of the ground anchor, and design wall height is known because the length is dependent on these factors.

Alternatives 3 – No Build Alternative
No changes to the geologic setting within the project area would occur under the No Build Alternatives. Therefore no recommendations for structural design is needed since no construction would take place. The area would not be modified in any way and no impacts to the environment would occur.

2.10.4 Avoidance, Minimization, and/or Mitigation Measures

Alternatives 1 and 2 – Build Alternatives

No avoidance, minimization, and/or mitigation measures would be required.

Alternatives 3 – No Build Alternative

No avoidance, minimization, and/or mitigation measures would be required.

2.11 Hazardous Waste/Materials

2.11.1 Regulatory Setting

Hazardous materials, including hazardous substances and wastes, are regulated by many state and federal laws. Statutes govern the generation, treatment, storage and disposal of hazardous materials, substances, and waste, and also the investigation and mitigation of waste releases, air and water quality, human health, and land use.

The primary federal laws regulating hazardous wastes/materials are the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, and the Resource Conservation and Recovery Act (RCRA) of 1976. The purpose of CERCLA, often referred to as "Superfund," is to identify and cleanup abandoned contaminated sites so that public health and welfare are not compromised. The RCRA provides for "cradle to grave" regulation of hazardous waste generated by operating entities. Other federal laws include:

- Community Environmental Response Facilitation Act (CERFA) of 1992
- Clean Water Act
- Clean Air Act
- Safe Drinking Water Act
- Occupational Safety and Health Act (OSHA)
- Atomic Energy Act
- Toxic Substances Control Act (TSCA)
- Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

In addition to the acts listed above, Executive Order (EO) 12088, *Federal Compliance with Pollution Control Standards*, mandates that necessary actions be taken to prevent and control environmental pollution when federal activities or federal facilities are involved.

California regulates hazardous materials, waste, and substances under the authority of the CA Health and Safety Code and is also authorized by the federal government to implement RCRA in the state. California law also addresses specific handling, storage, transportation, disposal, treatment, reduction, cleanup, and emergency planning of hazardous waste. The Porter-Cologne Water Quality Control Act also restricts disposal of wastes and requires cleanup of wastes that are below hazardous waste concentrations but could impact ground and surface water quality. California regulations that address waste management and prevention and cleanup of contamination include Title 22 Division 4.5 Environmental Health Standards for the Management of Hazardous Waste, Title 23 Waters, and Title 27 Environmental Protection.

Worker and public health and safety are key issues when addressing hazardous materials that may affect human health and the environment. Proper management and disposal of hazardous material is vital if it is found, disturbed, or generated during project construction.

2.11.2 Affected Environment

During the preliminary design phase, a general screening was performed to determine the potential to encounter hazardous waste, hazardous materials, and contamination within the project area. The information presented in this section is based on the *Hazardous Waste Assessment for IS/EA Preparation* (Caltrans Office of Environmental Engineering) prepared in October 2017. However, after informational data was discovered from a Site Investigation Report for Aerially Deposited Lead (ADL) and Asbestos Survey prepared by Stantec on March 30, 2018, a memorandum from Caltrans Office of Environment Engineering was prepared in June 2018 entitled *Hazardous Waste Assessment for PAED* (Project Approval and Environmental Document) to capture those findings and reevaluate the hazardous waste concerns within the project area.

Both assessments screened for potential hazardous waste concerns by project evaluation, Caltrans record review, and oil field maps. The most updated assessment (June 2018) showed the potential for the presence of the following hazardous waste/materials: aerially deposited lead, treated wood waste, existing yellow traffic striping, existing white traffic striping, and electrical equipment. Table 2.5 below summarizes the hazardous waste concerns, as described in the assessment.

Table 2.5 General Hazardous Waste/Materials of Concern in the Project Study Area

Hazardous Waste/Materials of Concern	Occurrence
Aerially Deposited Lead	Particulate emissions in engine exhaust contained lead from leaded gasoline which was deposited in unpaved areas adjacent to roadways. Therefore the soil adjacent to roadways and freeways are susceptible to elevated lead and other heavy metals concentrations that exceed the California hazardous waste threshold limits. The ADL and Asbestos Survey prepared on March 30, 2018 showed the unpaved, shallow soils within the project vicinity were found to be non-hazardous with detected concentrations of lead lower than the total threshold limit concentration.
Treated Wood Waste	The removal of the metal beam guard rails and wood poles, present the opportunity for contamination. The associated wood posts are assumed to be treated with preservation chemicals that protect the wood against insect attack and fungal decay. These chemicals may be hazardous (carcinogenic) and include, but not limited to, arsenic, chromium, copper, creosote, and pentachlorophenol.
Existing Yellow Traffic Striping	Removal of existing yellow traffic striping may contain hazardous concentrations of lead (Pb) and chromium (Cr) based on the California Hazardous Waste Regulations.

Existing White Traffic Striping	Residue from removal of white traffic striping will not contain hazardous levels of lead.
Electrical Equipment	Electrical equipment such as florescent lamps, mercury lamps, ballast, and transformers, may need to be removed for construction. These materials may contain the hazardous material: polychlorinated biphenyl (PCB) and mercury.
Groundwater	Groundwater is estimated to be within 10 feet bgs along PCH. Based on oil field maps, provided by the Division of Oil, Gas, and Geothermal Resources, no oil or gas wells/fields exist near the project vicinity. A review of the California State Water Resources Control Board (SWRCB) Geotracker database did identify 2 properties located about 800 – 1000 feet northwest of the proposed secant wall at PM 4.2 to be Leaking Underground Storage Tank (LUST) sites. Both sites have received case closure status from the RWQCB Closure Policy that allows contamination to remain in soil and groundwater. This could be an issue if dewatering is needed for the project because of the potential for groundwater contamination.

2.11.3 Environmental Consequences

Alternatives 1 and 2 – Build Alternatives

There is potential for exposure to the above mentioned hazardous materials during construction for both build alternatives. Removal of features within the project area has the potential to expose workers to TWW, existing yellow traffic striping, existing white traffic striping, and electrical equipment.

Precautions to avoid fully or minimize exposure to each hazardous material will be implemented into project construction. Exposure to contaminants associated with TWW, yellow traffic striping, and electrical equipment can be managed to minimal exposure or full avoidance by adhering to protocols for the removal, handling, and disposal of such materials. Although white traffic striping is non-hazardous, a project specific Lead Compliance Plan (LCP) will be required for removal per Cal-OSHA Title 8 requirements. Similarly, although the soils within the project vicinity are non-hazardous and can be relinquished or disposed of without restriction or regulation, a task-specific LCP will be required to prevent or minimize worker exposure to lead when handling soil that contains even minor traces of lead. Potential impacts will be minimized and hazardous waste regulations will be abided with the incorporation of the project features HAZ-1 through HAZ-4 described below.

Aerially Deposited Lead Contaminated Soil

HAZ-1 A task-specific LCP to prevent or minimize worker exposure to lead while handing soil containing lead will be required. The LCP should be prepared, reviewed, approved, stamped, and signed by a Certified Industrial Hygienist (CIH).

Treated Wood Waste

HAZ-2 Removal and disposal of metal beam guardrail wood posts shall be managed under CCR Title 22, Division 4.5, Chapter 34, which specifies guidelines for storage, accumulation, shipment/transport, and disposal at approved treated wood facilities. Project funding would be allocated for the management (including handling, storing, transportation, and disposal) of TWW and the Board of Equalization fee.

Yellow and White Traffic Striping

HAZ-3 A project-specific Lead Compliance Plan and Debris Containment and Disposal Work Plan will be prepared to address the removal, containment, storage, sampling, and disposal of yellow/white thermoplastic and lead-based painted traffic stripe and/or pavement markings, and to prevent or minimize worker exposure to lead while handling the debris/residue (California Code of Regulations [CCR], Title 8, Section 1532.1, "Lead," and California Occupational Safety and Health Administration [Cal/OSHA] Construction Safety Order).

Electrical Equipment

HAZ-4 Prior to starting construction, the contractor shall inspect the existing electrical components to determine if any hazardous materials are present. All electrical equipment requiring disposal shall be handled and transported to an appropriate permitted electrical disposal facility as required by local and state regulatory procedures.

Construction of the secant walls are likely to encounter groundwater. If dewatering is required for project construction, a site investigation of groundwater will be needed in the final design phase to determine water quality because of possible groundwater contamination. The groundwater site investigation would determine the extent of the groundwater contamination, which is needed for consideration of discharge/disposal options.

HAZ-5 If dewatering of groundwater is required, a site investigation of groundwater will be conducted to determine water quality for discharge/disposal options. As a result of the findings from the site investigation, any proposed construction provisions necessary for dewatering will be included in the final design package prior to project bid.

Alternatives 3 – No Build Alternative

The No Build Alternative would not construct any of the proposed slope restoration work, therefore the project area would not experience permanent impacts in relation to hazardous waste. The project area would remain at current standards because there would be no disturbance of soils, with no addition of hazardous materials but also with no hazardous materials to be removed off-site, such as ADL soil. Although ADL is continuously deposited on the roadway through regular traffic, roadway projects that involve excavation of soils serve as an opportunity to remove some ADL soils off-site and/or use some of the soil within the project area when permissible. At this project location however, ADL also has the potential to be removed from the right-of-way by washing down the slope into the ocean or adjacent to the ocean, due to precipitation events or heavy storms and little infiltration. However this is not ideal for water quality purposes, but a possibility due to the topography of the area.

2.11.4 Avoidance, Minimization, and/or Mitigation Measures

Alternatives 1 and 2 – Build Alternatives

No avoidance, minimization, and/or mitigation measures would be required.

Alternative 3 – No Build Alternative
No avoidance, minimization, and/or mitigation measures would be required.

2.12 Air Quality

2.12.1 Regulatory Setting

The Federal Clean Air Act (FCAA), as amended, is the primary federal law that governs air quality while the California Clean Air Act (CCAA) is its companion state law. These laws, and related regulations by the United States Environmental Protection Agency (U.S. EPA) and the California Air Resources Board (ARB), set standards for the concentration of pollutants in the air. At the federal level, these standards are called National Ambient Air Quality Standards (NAAQS). NAAQS and state ambient air quality standards have been established for six transportation-related criteria pollutants that have been linked to potential health concerns: carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM)—which is broken down for regulatory purposes into particles of 10 micrometers or smaller (PM_{10}) and particles of 2.5 micrometers and smaller ($PM_{2.5}$)—and sulfur dioxide (SO_2). In addition, national and state standards exist for lead (PB), and state standards exist for visibility reducing particles, sulfates, hydrogen sulfide (H_2S), and vinyl chloride. The NAAQS and state standards are set at levels that protect public health with a margin of safety, and are subject to periodic review and revision. Both state and federal regulatory schemes also cover toxic air contaminants (air toxics); some criteria pollutants are also air toxics or may include certain air toxics in their general definition.

Federal air quality standards and regulations provide the basic scheme for project-level air quality analysis under the National Environmental Policy Act (NEPA). In addition to this environmental analysis, a parallel “Conformity” requirement under the FCAA also applies.

Conformity
The conformity requirement is based on FCAA Section 176(c), which prohibits the U.S. Department of Transportation (USDOT) and other federal agencies from funding, authorizing, or approving plans, programs, or projects that do not conform to State Implementation Plan (SIP) for attaining the NAAQS. “Transportation Conformity” applies to highway and transit projects and takes place on two levels: the regional (or planning and programming) level and the project level. The proposed project must conform at both levels to be approved.

Conformity requirements apply only in nonattainment and “maintenance” (former nonattainment) areas for the NAAQS, and only for the specific NAAQS that are or were violated. U.S. EPA regulations at 40 Code of Federal Regulations (CFR) 93 govern the conformity process. Conformity requirements do not apply in unclassifiable/attainment areas for NAAQS and do not apply at all for state standards regardless of the status of the area.

Regional conformity is concerned with how well the regional transportation system supports plans for attaining the NAAQS for carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM_{10} and $PM_{2.5}$), and in some areas (although not in California), sulfur dioxide (SO_2). California has nonattainment or maintenance areas for all of these transportation-related “criteria pollutants” except $SO_{2,}$ and also has a nonattainment area for lead (Pb); however, lead is not currently required by the FCAA to be covered in transportation conformity analysis. Regional conformity is based on emission analysis of Regional Transportation Plans (RTPs) and Federal Transportation Improvement Programs (FTIPs) that include all transportation projects planned for a region over a period of at least 20 years (for the RTP) and 4 years (for the FTIP). RTP and FTIP conformity uses travel demand and emission models to determine whether or not the implementation of those projects would conform to emission budgets or other tests at various analysis years showing that requirements of the FCAA and the SIP are met. If the conformity analysis is successful, the Metropolitan Planning Organization (MPO), Federal Highway Administration (FHWA), and Federal Transit Administration (FTA) make the determinations that the RTP and FTIP are in conformity with the SIP for achieving the goals of the FCAA. Otherwise, the projects in the RTP and/or FTIP must be modified until conformity is attained. If the design concept and scope and the "open-to-traffic" schedule of a proposed transportation project are the same as described in the RTP and FTIP, then the proposed project meets regional conformity requirements for purposes of project-level analysis.

Project-level conformity is achieved by demonstrating that the project comes from a conforming RTP and TIP; the project has a design concept and scope[11] that has not changed significantly from those in the RTP and TIP; project analyses have used the latest planning assumptions and EPA-approved emissions models; and in PM areas, the project complies with any control measures in the SIP. Furthermore, additional analyses (known as hot-spot analyses) may be required for projects located in CO and PM nonattainment or maintenance areas to examine localized air quality impacts.

2.12.2 Affected Environment

The following air quality discussion was obtained by the project specific *Air Quality Review Memorandum* prepared by Caltrans Office of Environmental Engineering, Air Quality unit.

Local Climate and Meteorological Condition

The proposed project is within the boundary of the South Central Coast Air Basin (SCCAB) in the county of Ventura. The SCCAB is comprised of San Luis Obispo, Santa Barbara, and Ventura Counties. The SCCAB's diverse topography is characterized by mountain ranges to the north, two major river valleys (the Santa Clara, which trends east-west, and the Ventura, which trends roughly north-south), and the Oxnard Plain to the south and west. Figure 2-12 shows the topography for Ventura County, which is one of the counties that make up the SCCAB[12].

[11] "Design concept" means the type of facility that is proposed, such as a freeway or arterial highway. "Design scope" refers to those aspects of the project that would clearly affect capacity and thus any regional emissions analysis, such as the number of lanes and the length of the project.
[12] Southeast Regional Climate Center, accessed April 17, 2018. http://www.sercc.com/perspectivesmap?region=wrcc

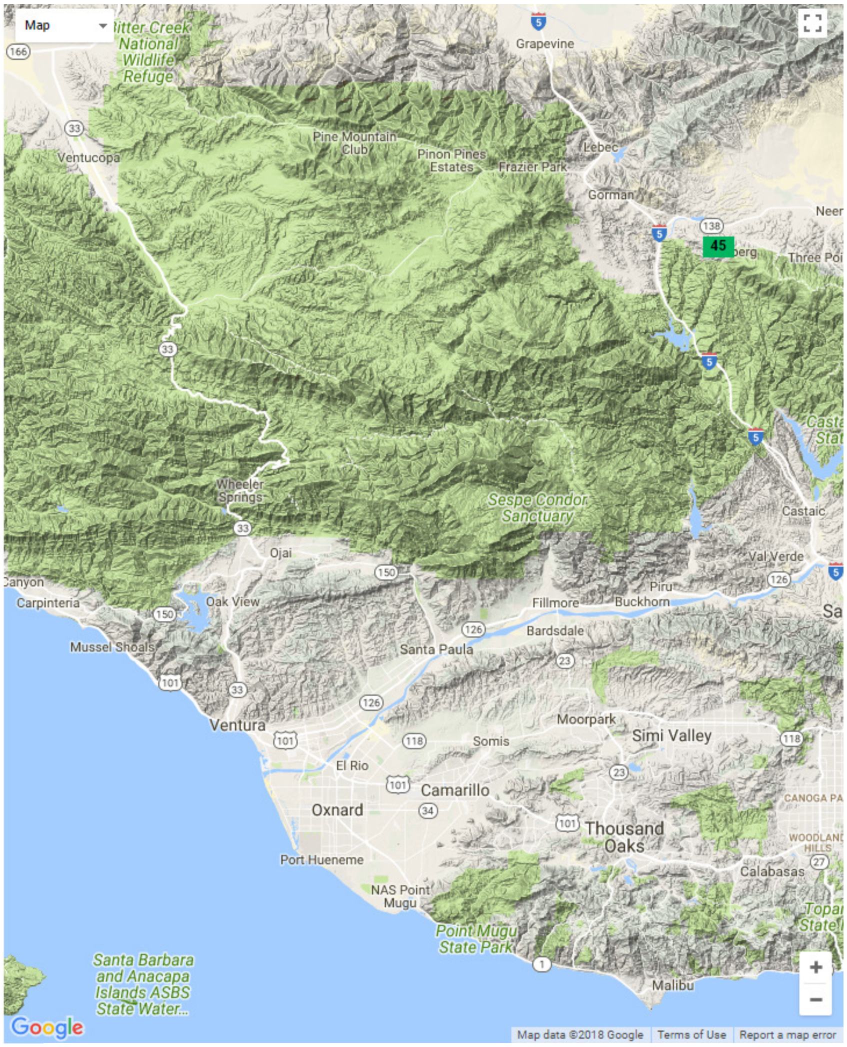

Figure 2-12: Topography of the general Ventura County.

The unique topography and meteorological conditions within Ventura County, heavily influence the dispersion of air pollutants. The air within Ventura County is often unable to move freely without barriers, which can be an issue for dispersion of emissions. Mountain ranges act as physical barriers that inhibit horizontal dispersion of air pollutants and can keep air stagnant within valleys. Temperature patterns can limit pollutants from rising and dispersing away from the County. Cool air is denser than warm air, therefore when a layer of cool air is trapped under a layer of warm air, the cool layer serves as a “ceiling” that prevents air pollutants from rising to disperse above the dense cool layer. This effect is known as inversion and is common to California’s coastal areas. Inversion can affect vertical mixing and dispersion of pollutants. Ventura County commonly experiences a land/sea breeze that flows between the Pacific Ocean and land mass. The land/sea breeze can recirculate air contaminants that flow away from the County during the early morning through differential air pressure and bring the pollutants back into the County in the afternoon when the land mass has been warmed by the sun.

This recirculation system causes pollutants to remain in the area for several days and occurs most predominantly from May to October. Air temperatures are usually higher and sunlight more intense during these months, which contributes to increased levels of ground-level O_3. Based on 1981-2010 data from the Oxnard meteorological station located about 18 miles north-west of the project site, the average maximum temperature for the area is 74 degrees Fahrenheit (°F) during the months of August and September. This temperature is comparably higher than the average minimum temperature of 46.0 °F during the month of January. Therefore the warm temperature and more intense sunlight during the months of May to October, serves as the ideal environment for emissions from previous days to accumulate and chemically react with new emissions. As a result, ambient air pollution levels increase so often during these 6 months that this period is referred to as the "smog" season (Ventura County Air Pollution District).

Federal and State Air Quality Attainment Status

As mentioned above, the proposed project is located within Ventura County, which is part of the SCCAB. The air quality standards within Ventura County are regulated by the Ventura County Air Pollution Control District (VCAPCD). The project area is in a state and federal attainment area for CO, as well as in a federal attainment area for PM_{10} and $PM_{2.5}$. Attainment area refers to an area that meets or is below the federal threshold for air quality pollutants as established in the NAAQS. Conversely, non-attainment areas are those areas that do not meet, but instead surpass federal thresholds established by NAAQS. Table 2.6 lists the attainment statuses for all criteria pollutants for Ventura County, as well as health effects and typical sources of the pollutants.

Per 40 CFR 93.126 in the Federal Register, Table 2 – Exempt Projects allows certain projects to be exempt from all emissions analysis. Based on the project description, the proposed project is deemed listed in Table 2 under the subtitle "Other" and classification "Repair of damage caused by natural disasters, civil unrest, or terrorist attacks, except projects involving substantial functional, locational, or capacity changes". Therefore pursuant to 40 CFR 93.126, this proposed project is deemed classified and is exempt from the requirement to determine conformity.

For CEQA, the VCAPCD does not have construction air significance thresholds as construction-related emissions (including portable engines and portable engine-driven equipment subject to ARB's PERP and used for construction, operation or repair and maintenance activities) of reactive organic compounds and nitrogen oxides are not counted towards the two significance thresholds, since these emissions are temporary.

Table 2.6 State and Federal Criteria Air Pollutant Standards, Effects, and Sources

Pollutant	Averaging Time	State[13] Standard	Federal[14] Standard	Principal Health and Atmospheric Effects	Typical Sources	State Project Area Attainment Status	Federal Project Area Attainment Status
Ozone (O_3)	1 hour	0.09 ppm[15]	--- [16]	High concentrations irritate lungs. Long-term exposure may cause lung tissue damage and cancer. Long-term exposure damages plant	Low-altitude ozone is almost entirely formed from reactive organic gases/volatile organic compounds (ROG or VOC) and nitrogen oxides (NOx) in the	Non-attainment	Non-attainment Serious
	8 hours	0.070 ppm	0.070 ppm (4th highest in 3 years)				

[13] State standards are "not to exceed" or "not to be equaled or exceeded" unless stated otherwise.

[14] Federal standards are "not to exceed more than once a year" or as described above

[15] ppm = parts per million

[16] Prior to 6/2005, the 1-hour ozone NAAQS was 0.12 ppm. Emission budgets for 1-hour ozone are still be in use in some areas where 8-hour ozone emission budgets have not been developed, such as the S.F. Bay Area.

				materials and reduces crop productivity. Precursor organic compounds include many known toxic air contaminants. Biogenic VOC may also contribute.	presence of sunlight and heat. Common precursor emitters include motor vehicles and other internal combustion engines, solvent evaporation, boilers, furnaces, and industrial processes.		
Carbon Monoxide (CO)	1 hour	20 ppm	35 ppm	CO interferes with the transfer of oxygen to the blood and deprives sensitive tissues of oxygen. CO also is a minor precursor for photochemical ozone. Colorless, odorless.	Combustion sources, especially gasoline-powered engines and motor vehicles. CO is the traditional signature pollutant for on-road mobile sources at the local and neighborhood scale.	Attainment	Attainment
	8 hours	9.0 ppm [1]	9 ppm				
	8 hours (Lake Tahoe)	6 ppm	---				
Respirable Particulate Matter (PM_{10})[17]	24 hours	50 $\mu g/m^3$ [18]	150 $\mu g/m^3$ (expected number of days above standard < or equal to 1)	Irritates eyes and respiratory tract. Decreases lung capacity. Associated with increased cancer and mortality. Contributes to haze and reduced visibility. Includes some toxic air contaminants. Many toxic & other aerosol and solid compounds are part of PM_{10}.	Dust- and fume-producing industrial and agricultural operations; combustion smoke & vehicle exhaust; atmospheric chemical reactions; construction and other dust-producing activities; unpaved road dust and re-entrained paved road dust; natural sources.	Non-attainment	Attainment
	Annual	20 $\mu g/m^3$	--- [5]				
Fine Particulate Matter ($PM_{2.5}$)[5]	24 hours	---	35 $\mu g/m^3$	Increases respiratory disease, lung damage, cancer, and premature death. Reduces visibility and produces surface soiling. Most diesel exhaust particulate matter – a toxic air contaminant – is in the $PM_{2.5}$ size range. Many toxic & other aerosol and solid compounds are part of $PM_{2.5}$.	Combustion including motor vehicles, other mobile sources, and industrial activities; residential and agricultural burning; also formed through atmospheric chemical and photochemical reactions involving other pollutants including NOx, sulfur oxides (SOx), ammonia, and ROG.	Attainment	Attainment
	Annual	12 $\mu g/m^3$	12.0 $\mu g/m^3$				
	24 hours (conformity process[19])	---	65 $\mu g/m^3$				
	Secondary Standard (annual; also for	---	15 $\mu g/m^3$				

[17] Annual PM_{10} NAAQS revoked October 2006; was 50 $\mu g/m^3$. 24-hr. $PM_{2.5}$ NAAQS tightened October 2006; was 65 $\mu g/m^3$. Annual $PM_{2.5}$ NAAQS tightened from 15 $\mu g/m^3$ to 12 $\mu g/m^3$ December 2012 and secondary annual standard set at 15 $\mu g/m^3$.

[18] $\mu g/m^3$ = micrograms per cubic meter

[19] The 65 $\mu g/m^3$ $PM_{2.5}$ (24-hr) NAAQS was not revoked when the 35 $\mu g/m^3$ NAAQS was promulgated in 2006. The 15 $\mu g/m^3$ annual $PM_{2.5}$ standard was not revoked when the 12 $\mu g/m^3$ standard was promulgated in 2012. The 0.08 ppm 1997 ozone standard is revoked FOR CONFORMITY PURPOSES ONLY when area designations for the 2008 0.75 ppm standard become effective for conformity use (7/20/2013). Conformity requirements apply for all NAAQS, including revoked NAAQS, until emission budgets for newer NAAQS are found adequate, SIP amendments for the newer NAAQS are approved with a emission budget, EPA specifically revokes conformity requirements for an older standard, or the area becomes attainment/unclassified. SIP-approved emission budgets remain in force indefinitely unless explicitly replaced or eliminated by a subsequent approved SIP amendment. During the "Interim" period prior to availability of emission budgets, conformity tests may include some combination of build vs. no build, build vs. baseline, or compliance with prior emission budgets for the same pollutant.

	conformity process[5])		(98th percentile over 3 years)				
Nitrogen Dioxide (NO_2)	1 hour	0.18 ppm	0.100 ppm[20]	Irritating to eyes and respiratory tract. Colors atmosphere reddish-brown. Contributes to acid rain & nitrate contamination of stormwater. Part of the "NOx" group of ozone precursors.	Motor vehicles and other mobile or portable engines, especially diesel; refineries; industrial operations.	Attainment	Attainment
	Annual	0.030 ppm	0.053 ppm				
Sulfur Dioxide (SO_2)	1 hour	0.25 ppm	0.075 ppm[21] (99th percentile over 3 years)	Irritates respiratory tract; injures lung tissue. Can yellow plant leaves. Destructive to marble, iron, steel. Contributes to acid rain. Limits visibility.	Fuel combustion (especially coal and high-sulfur oil), chemical plants, sulfur recovery plants, metal processing; some natural sources like active volcanoes. Limited contribution possible from heavy-duty diesel vehicles if ultra-low sulfur fuel not used.	Attainment	Attainment
	3 hours	---	0.5 ppm[22]				
	24 hours	0.04 ppm	0.14 ppm (for certain areas)				
	Annual	---	0.030 ppm (for certain areas)				
Lead (Pb)[23]	Monthly	1.5 µg/m³	---	Disturbs gastrointestinal system. Causes anemia, kidney disease, and neuromuscular and neurological dysfunction. Also a toxic air contaminant and water pollutant.	Lead-based industrial processes like battery production and smelters. Lead paint, leaded gasoline. Aerially deposited lead from older gasoline use may exist in soils along major roads.	Attainment	Attainment
	Calendar Quarter	---	1.5 µg/m³ (for certain areas)				
	Rolling 3-month average	---	0.15 µg/m³ [24]				
Sulfate	24 hours	25 µg/m³	---	Premature mortality and respiratory effects. Contributes to acid rain. Some toxic air contaminants attach to sulfate aerosol particles.	Industrial processes, refineries and oil fields, mines, natural sources like volcanic areas, salt-covered dry lakes, and large sulfide rock areas.	Attainment	N/A
Hydrogen Sulfide (H_2S)	1 hour	0.03 ppm	---	Colorless, flammable, poisonous. Respiratory irritant. Neurological	Industrial processes such as: refineries and oil fields, asphalt	Attainment	N/A

[20] Final 1-hour NO_2 NAAQS published in the Federal Register on 2/9/2010, effective 3/9/2010. Initial area designation for California (2012) was attainment/unclassifiable throughout. Project-level hot spot analysis requirements do not currently exist. Near-road monitoring starting in 2013 may cause re-designation to nonattainment in some areas after 2016.

[21] EPA finalized a 1-hour SO_2 standard of 75 ppb (parts per billion [thousand million]) in June 2010. Nonattainment areas have not yet been designated as of 9/2012.

[22] Secondary standard, set to protect public welfare rather than health. Conformity and environmental analysis address both primary and secondary NAAQS.

[23] The ARB has identified vinyl chloride and the particulate matter fraction of diesel exhaust as toxic air contaminants. Diesel exhaust particulate matter is part of PM_{10} and, in larger proportion, $PM_{2.5}$. Both the ARB and U.S. EPA have identified lead and various organic compounds that are precursors to ozone and $PM_{2.5}$ as toxic air contaminants. There are no exposure criteria for adverse health effect due to toxic air contaminants, and control requirements may apply at ambient concentrations below any criteria levels specified above for these pollutants or the general categories of pollutants to which they belong.

[24] Lead NAAQS are not considered in Transportation Conformity analysis.

				damage and premature death. Headache, nausea. Strong odor.	plants, livestock operations, sewage treatment plants, and mines. Some natural sources like volcanic areas and hot springs.		
Visibility Reducing Particles (VRP)	8 hours	Visibility of 10 miles or more (Tahoe: 30 miles) at relative humidity less than 70%	---	Reduces visibility. Produces haze. NOTE: not directly related to the Regional Haze program under the Federal Clean Air Act, which is oriented primarily toward visibility issues in National Parks and other "Class I" areas. However, some issues and measurement methods are similar.	See particulate matter above. May be related more to aerosols than to solid particles.	Attainment	N/A

2.12.3 Environmental Consequences

Alternatives 1 and 2 – Build Alternatives

As mentioned above, the proposed project is exempt under 40 CFR 93.126 from requiring to determine conformity. Projects exempt pursuant to 40 CFR 93.126 are also not required to undergo project-level air quality analysis per the Transportation Project-Level Carbon Monoxide Protocol (published by Institute of Transportation Studies, University of California, Davis, Revised December 1977). Exempt projects are expected to not have an adverse impact to ambient CO and have a neutral influence on PM_{10} and $PM_{2.5}$ emissions.

In addition, pursuant to the FHWA's Interim Guidance Update on Mobile Air Toxic Analysis in NEPA documents dated September 30, 2009, projects that are exempt under 40 CFR 93.126 under the Clean Air Act, do not require an analysis of Mobile Source Air Toxics (MSAT). MSAT are 9 primary air toxics identified by US EPA as carcinogenic risks. This project will not cause a change in traffic volumes, vehicle mix, or any other factor that would result in a meaningful increase in MSAT and is exempt from MSAT analysis.

Therefore, since the construction work of the secant walls proposed in Alternatives 1 and 2 qualifies for this exemption, neither build alternative is expected to have impacts to air quality pollutants: CO, PM_{10} and $PM_{2.5}$ emissions, and MSAT. Furthermore, the Environmental Protection Agency (EPA) regulations for vehicle engines and fuels will cause overall MSAT emissions to decline significantly over the next several decades. Based on regulations now in effect, an analysis of national trends with EPA's MOVES2014 model forecasts a combined reduction of over 90% in the total annual emissions rate for the priority MSAT from 2010 – 2050 while vehicle-miles of travel are projected to increase by over 45% (*Updated Interim Guidance on MSAT in NEPA Documents, FHWA, October 12, 2016*). This will both reduce the background level of MSAT as well as the possibility of even minor MSAT emissions from this project. Consequently neither build alternative is expected to have air quality impacts of CO, PM10 and PM2.5 emissions, and MSAT.

Asbestos can be released from serpentinite and ultramafic rocks when the rocks are broken or crushed. At the point of release, the asbestos fibers may become airborne, causing air quality and human health hazards. Natural weathering and erosion processes can act on asbestos bearing rock and make it easier for asbestos fibers to become airborne if such rock is disturbed. Serpentinite and/or ultramafic rock are known to naturally occur in 44 of California's 58 counties. While Ventura County is one of the counties listed, only the Catalina Island portion of the county has been found to contain such rocks. The project site and area surrounding the site are not identified to contain serpentinite or ultramafic rock. As a result, no potential impacts from naturally occurring asbestos during project construction is expected to occur.

While unlikely, should naturally occurring asbestos, serpentinite, or ultramafic rock be discovered the following project feature will be implemented:

AQ-1 If naturally occurring asbestos, serpentinite, or ultramafic rock is discovered during grading operations Section 93105, Title 17 of the California Code of Regulations requires notification to the Ventura County Air Pollution Control District by the next business day and implementation of dust control measures described in Section 93105 (d)(B).

Construction Emissions

During construction, short-term degradation of air quality may occur due to the release of particulate emissions (airborne dust) generated by excavation, grading, hauling, and various other construction-related activities. Construction equipment in itself is expected to release emissions, including: CO, NO_x, PM_{10} and $PM_{2.5}$, volatile organic compounds (VOCs), directly emitted and toxic air contaminants such as diesel exhaust particulate matter. Ozone is a regional pollutant that is derived from NO_x and VOCs in the presence of heat and sunlight.

The project is within the boundary of SCCAB and must comply with the VAPCD Fugitive Dust Rule 55 to minimize temporary emissions during construction of the project as applicable and appropriate. Although emissions from the construction activities are considered temporary pursuant to 40 CFR 93.123 (c)(5), construction-related effects on air quality from most highway projects would be greatest during the site preparation phase because most engine emissions are associated with the excavation, handling, and transport of soils to and from the site. These activities could temporarily generate enough emissions to be of concern. Therefore an estimation of the construction emissions expected for each build alternative is provided using the latest Sacramento Metropolitan Air Quality Management District's Road Construction Model version 8.1.0. While the model was developed for Sacramento conditions in terms of fleet emission factors, silt loading, and other modeling assumptions, it is considered adequate for estimating road construction emissions in the SCCAB. Table 2.7 shows the estimated construction emissions for both alternatives and explained on the next page. In addition, the values inputted into the construction emissions model and the resulting outputs for each build alternative is shown in Appendix D.

Table 2.7 Construction emissions for both build alternatives: Alternative 1 and Alternative 2

	Emission Estimates	ROG	CO	NO_x	PM_{10} (Total)	$PM_{2.5}$ (Total)	CO_{2e}
Alternative 1 – Cantilever Option	Daily Maximum (lbs/day)	10.61	79.03	120.52	25.50	8.94	21,945.73
	Total (tons/project)	0.95	7.29	10.53	2.74	0.90	1,965.57

Alternative 2 – Ground Anchor Option	Daily Maximum (lbs/day)	13.13	92.82	175.49	29.36	10.45	81,556.24
	Total (tons/project)	1.08	8.03	13.46	2.94	0.98	5,142.10

ROG = Reactive organic gas, CO = carbon monoxide, NO_x = nitrogen oxides, PM_{10} = total particulate matter of 10 micrometers or smaller, $PM_{2.5}$ = total particulate matter of 2.5 micrometers or smaller, and CO_{2e} = carbon dioxide equivalent. Note that CO_{2e} is comprised of carbon dioxide (CO_2), methane (CH_4), and Nitrous Oxide (N_2O) GHG emissions.

Both build alternatives are expected to release emissions through construction activities and equipment, as shown above. More excavation is required with Alternative 2 – Ground Anchor Option which will cause more particulates to become airborne and will require more construction equipment to be utilized. As a result, Alternative 2 is found to emit more construction emissions than Alternative 1 – Cantilever Option during construction. Table 2.7 shows that for each pollutant analyzed, Alternative 2 will emit the pollutants at greater concentrations than Alternative 1. These emissions however are common with ordinary construction projects and the project will be in construction for 1 year, which is considered minimal. Construction activities will not last for more than 5 years at one general location, so construction-related emissions do not need to be included in regional and project-level conformity analysis (40 CFR 93.123(c)(5)). Measures to reduce construction emissions during the year of construction, will be incorporated into the project features for a less than significant impact to air quality.

An effort to minimize the impacts from construction activities and equipment will be incorporated into the project scope. The following project features will require the General Contractor to abide by:

AQ-2 In order to minimize dust, the use of watering should be sufficient to confine dust plumes to the project work areas, in addition to covering trucks when hauling dirt. The surface of dirt piles will be stabilized if they are not removed immediately.

AQ-3 On Caltrans projects, appropriate Caltrans Standard Specifications 10-Dust Control, 14-Air Quality, and 18-Dust Palliative shall be incorporated into project specifications. The resident engineer shall ensure that all construction equipment is properly tuned and maintained.

AQ-4 Construction equipment idling time will be minimized to 5 minutes, in an effort to save fuel and reduce emissions.

Alternative 3 – No Build Alternative
Under the No Build Alternative, existing conditions would remain as is and no air quality impacts would occur.

2.12.4 Avoidance, Minimization, and/or Mitigation Measures
Alternatives 1 and 2 – Build Alternatives
No avoidance, minimization, and/or mitigation measures would be required.

Alternative 3 – No Build Alternative
No avoidance, minimization, and/or mitigation measures would be required.

2.13 Climate Change

Neither the United States Environmental Protection Agency (U.S. EPA) nor the Federal Highway Administration (FHWA) has issued explicit guidance or methods to conduct project-level greenhouse gas analysis. FHWA emphasizes concepts of resilience and sustainability in highway planning, project development, design, operations, and maintenance. Because there have been requirements set forth in California legislation and executive orders on climate change, the issue is addressed in the California Environmental Quality Act (CEQA) chapter of this document. The CEQA analysis may be used to inform the National Environmental Policy Act (NEPA) determination for the project.

BIOLOGICAL ENVIRONMENT

2.14 Natural Communities

2.14.1 Regulatory Environment

This section of the document discusses natural communities of concern. The focus of this section is on biological communities, not individual plant or animal species. This section also includes information on wildlife corridors and habitat fragmentation. Wildlife corridors are areas of habitat used by wildlife for seasonal or daily migration. Habitat fragmentation involves the potential for dividing sensitive habitat and thereby lessening its biological value.

Habitat areas that have been designated as critical habitat under the Federal Endangered Species Act are discussed below in the Threatened and Endangered Species Section 2.18. Wetlands and other waters are also discussed below Section 2.15.

2.14.2 Affected Environment

The following information is presented in the *Natural Environment Study* (NES) (Caltrans Division of Environmental Planning) prepared on February 2018. The findings in the NES are supported in part by investigations conducted by an in-person general field survey on October 19, 2017 and general drone overview on January 30, 2018. The drone was used to survey habitat conditions within the intertidal zone. In addition to surveys, reviews of literature relevant to biological resources in the project study area and review of biological databases was used to support the findings in the NES. In October 2018 a *Natural Environment Study (Amended)* was completed to capture changes made after the February 2018 NES was delivered, including: interagency consultation, black abalone surveys, bat surveys, and California grunion surveys.

Database searches of the CDFW's California Natural Diversity Database (CNDDB), USFWS Information for Planning and Consulting (IPAC) Resource List, and NOAA Fisheries Service West Coast Region California Species list was conducted for the Point Mugu USGS quadrangle on October 1, 2017 and re-reviewed on August 31, 2018. The natural communities that are classified as critical habitat for an endangered or threatened species or Essential Fish habitat under the Magnuson-Stevens Fishery Conservation and Management Act of 1976 are discussed in Section 2.18 Threatened and Endangered Species. The remaining 4 natural communities revealed in the database search are listed in the following page.

Table 2.8: Natural Communities listed in CDFW's CNDDB

Natural Communities				
Common Name	**Status**	**General Habitat Description**	**Habitat Present/ Absent**	**Rationale**
Southern Coastal Salt Marsh	S2.1 (Imperiled)	Halophytes adapted to high saline and low oxygen content	Absent	The project impact area does not occur within or adjacent to this natural community
Southern Sycamore Alder Riparian Woodland	S4 (Apparently Secure)	Upland on rocky slopes. Biotic community alone mesic soil created by small streams	Absent	The project impact area does not occur within or adjacent to this natural community
Valley Needlegrass Grassland	S3.1 (Vulnerable and very threatened)	Upland herbaceous vegetation in California's Central Valley	Absent	The project impact area does not occur within or adjacent to this natural community
Southern Coast Live Oak Riparian Forest	S4 (Apparently Secure)	Uplands, slopes often very steep, raised stream banks & terraces	Absent	The project impact area does not occur within or adjacent to this natural community

The statuses are delineated with a number and letter score that reflect the rarity, threat, and trend factors of the natural community with more weight given to the rarity factor. S2= imperiled in the state because of rarity due to a restricted range, very few populations, steep declines, or other factors making it very vulnerable to extirpation from the nation or state. S3= vulnerable in the state due to a restricted range, relatively few populations, recent and widespread declines, or other factors making it vulnerable to extirpation. S4= uncommon but not rare, some cause for long-term concern due to declines or other factors. Older ranks may contain a decimal "threat" rank, such as ".1" which indicates very threatened status.[25]

As shown in Table 2.8, the listed natural communities were not found present within the project impact area. The natural communities are not expected to be impacted by any of the proposed alternatives because they do not occur within the project area.

California Essential Habitat Connectivity Mapping

CDFW and Caltrans commissioned a team of consultants to develop the California Essential Habitat Connectivity (CEHC) Project to produce a statewide assessment of essential habitat connectivity.[26] The team used data sets, spatial analysis, and modeling techniques to identify large expansions of intact habitat or natural landscape. With this data, the team modeled linkages between these spaces so they

[25] https://map.dfg.ca.gov/rarefind/view/RF_FieldDescriptions.htm

[26] https://www.wildlife.ca.gov/conservation/planning/connectivity/CEHC. Accessed on July 25, 2018.

can be maintained and serve as corridors for wildlife. From the completed Project, a statewide wildlife habitat connectivity map was created in 2010.

The project location was examined within the CEHC map and found to exist within an area that is considered a critical linkage. The project however, would not disrupt habitat connectivity within the body of the classified CEHC because the project impact area occurs at the very edge of the CEHC (Figure 2-13). The classified CEHC is a large natural landscape block that encompasses the mountains within the project area. The project area lies at the very edge of this natural landscape block and would not prevent wildlife movement within the CEHC. None of the alternatives would serve as an obstacle for movement within the corridor.

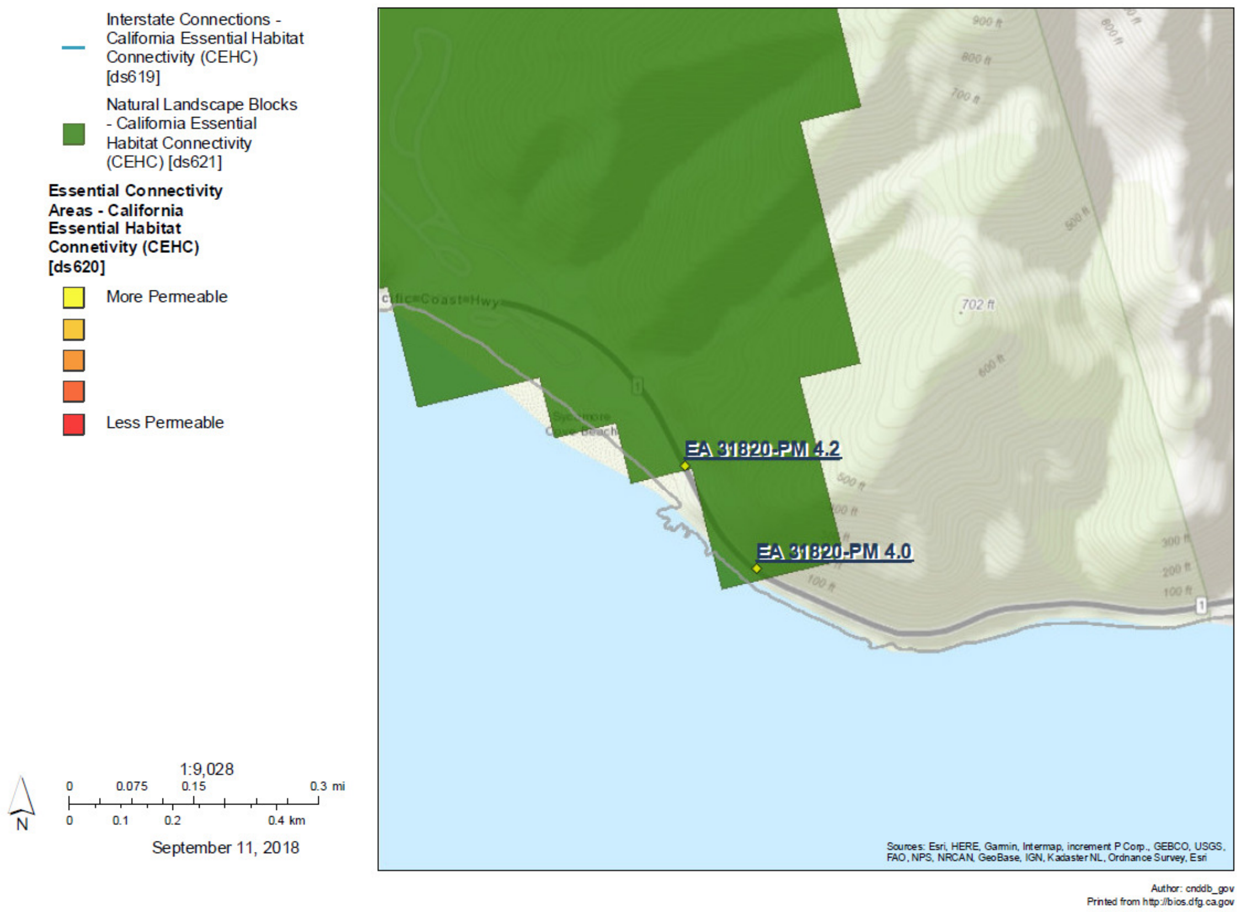

Figure 2-13: California Essential Habitat Connectivity map with proposed project limits

Ventura County Coastal Area Plan

The Coastal Area Plan, as part of the Ventura County General Plan, shows numerous environmentally sensitive habitat areas (ESHA) in the South Coast sub-area of the county where the proposed project is located (FIGURE). The Coastal Act in Section 30107.5 defines an "environmentally sensitive area" 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". Tidepools are distinguished as ESHA in Ventura County's Coastal Area Plan (2017) and ESHA Goal 2 in the plan is "to support the State in the protection of the tidepools." According to Figure 2-13, tidepools are mapped adjacent to where the 2 secant walls are proposed. Tidepools exist in intertidal zones and serve as habitat for an often-rich variety of organisms.

A coordination site meeting was held on March 15, 2018 for which Ventura County Planning Division attended. The Ventura County Planning Division noted that although the Coastal Area Plan depicts tide pools adjacent to the proposed secant walls, tide pools are not a concern in this area. The map was created with outdated data and does not depict accurate information. An updated map from the Ventura County Planning Division has not yet been made available. Therefore, per the direction of the Ventura County Planning Division, ESHA is not a concern within the project area because it is not considered present.

2.14.3 Environmental Consequences

Alternatives 1 and 2 – Build Alternatives

No ESHA was found to occur within or adjacent to the project area. Thus, either build alternative would not impact any ESHA.

Alternative 3 – No Build Alternative

The No Build Alternative would maintain the area at current standards, with no changes to any habitat within the project area.

2.14.4 Avoidance, Minimization, and/or Mitigation Measures

Alternatives 1 and 2 – Build Alternatives

No avoidance, minimization, and/or mitigation measures would be required.

Alternative 3 – No Build Alternative

No avoidance, minimization, and/or mitigation measures would be required.

2.15 Wetlands and Other Waters

2.15.1 Regulatory Environment

Wetlands and other waters are protected under a number of laws and regulations. At the federal level, the Federal Water Pollution Control Act, more commonly referred to as the Clean Water Act (CWA) (33 United States Code [USC] 1344), is the primary law regulating wetlands and surface waters. One purpose of the CWA is to regulate the discharge of dredged or fill material into waters of the U.S., including wetlands. Waters of the U.S. include navigable waters, interstate waters, territorial seas, and other waters that may be used in interstate or foreign commerce. The lateral limits of jurisdiction over non-tidal water bodies extend to the ordinary high water mark (OHWM), in the absence of adjacent wetlands. When adjacent wetlands are present, CWA jurisdiction extends beyond the OHWM to the limits of the adjacent wetlands. To classify wetlands for the purposes of the CWA, a three-parameter approach is used that includes the presence of hydrophytic (water-loving) vegetation, wetland hydrology, and hydric soils (soils formed during saturation/inundation). All three parameters must be present, under normal circumstances, for an area to be designated as a jurisdictional wetland under the CWA.

For open waters such as the Pacific Ocean, the USACE geographical jurisdictional limits are defined by the highest astronomical tide elevation under Section 404 of the Clean Water Act and mean high tide level under Section 10 of the Rivers and Harbors Act.

Section 404 of the CWA establishes a regulatory program that provides that discharge of dredged or fill material cannot be permitted if a practicable alternative exists that is less damaging to the aquatic environment or if the nation's waters would be significantly degraded. The Section 404 permit program is run by the U.S. Army Corps of Engineers (USACE) with oversight by the U.S. Environmental Protection Agency (U.S. EPA).

The USACE issues two types of 404 permits: General and Individual. There are two types of General permits: Regional and Nationwide. Regional permits are issued for a general category of activities when they are similar in nature and cause minimal environmental effect. Nationwide permits are issued to allow a variety of minor project activities with no more than minimal effects.

Ordinarily, projects that do not meet the criteria for a Regional or Nationwide Permit may be permitted under one of USACE's Individual permits. There are two types of Individual permits: Standard permits and Letters of Permission. For Individual permits, the USACE decision to approve is based on compliance with U.S. EPA's Section 404(b)(1) Guidelines (40 Code of Federal Regulations [CFR] 230), and whether permit approval is in the public interest. The Section 404 (b)(1) Guidelines (Guidelines) were developed by the U.S. EPA in conjunction with the USACE, and allow the discharge of dredged or fill material into the aquatic system (waters of the U.S.) only if there is no practicable alternative which would have less adverse effects. The Guidelines state that the USACE may not issue a permit if there is a "least environmentally damaging practicable alternative" (LEDPA) to the proposed discharge that would have lesser effects on waters of the U.S., and not have any other significant adverse environmental consequences.

The Executive Order for the Protection of Wetlands (EO 11990) also regulates the activities of federal agencies with regard to wetlands. Essentially, EO 11990 states that a federal agency, such as FHWA and/or Caltrans, as assigned, cannot undertake or provide assistance for new construction located in wetlands unless the head of the agency finds: (1) that there is no practicable alternative to the construction and (2) the proposed project includes all practicable measures to minimize harm. A Wetlands Only Practicable Finding must be made.

At the state level, wetlands and waters for freshwater systems are regulated primarily by the State Water Resources Control Board (SWRCB), the RWQCBs and the California Department of Fish and Wildlife (CDFW). In certain circumstances, the Commission (or Bay Conservation and Development Commission or the Tahoe Regional Planning Agency) may also be involved. Sections 1600-1607 of the California Fish and Game Code require any agency that proposes a project that will substantially divert or obstruct the natural flow of or substantially change the bed or bank of a river, stream, or lake to notify CDFW before beginning construction. If CDFW determines that the project may substantially and adversely affect fish or wildlife resources, a Lake or Streambed Alteration Agreement will be required. CDFW jurisdictional limits are usually defined by the tops of the stream or lake banks, or the outer edge of riparian vegetation, whichever is wider. Wetlands under jurisdiction of the USACE may or may not be included in the area covered by a Streambed Alteration Agreement obtained from the CDFW.

The RWQCBs were established under the Porter-Cologne Water Quality Control Act to oversee water quality. Discharges under the Porter-Cologne Act are permitted by Waste Discharge Requirements (WDRs) and may be required even when the discharge is already permitted or exempt under the CWA. In compliance with Section 401 of the CWA, the RWQCBs also issue water quality certifications for activities which may result in a discharge to waters of the U.S. This is most frequently required in tandem with a Section 404 permit request. A 401 permit certification is also required when a Rivers and

Harbors Act section 10 permit application is processed by USACE. Please see Section 2.9 Water Quality and Stormwater Runoff for more details.

2.15.2 Affected Environment

The following information is presented in the NES (Caltrans Division of Environmental Planning) prepared on February 2018 and the NES (Amended) completed on October 2018.

Based on information provided by the Wave Run-Up Study, the proposed secant walls are located at a minimum of 50 feet from the high astronomical tide line at locations. At PM 4.0, the edge of the roadway terminates to a cliff. Along the slope of the cliff are large boulders, which were placed as temporary slope restoration measures from January 2015. The area at PM 4.0 contains few native plants due to the placement of the boulders. The ground cover along the associated right of way and encroaching onto the weathered cliff face on the ocean side is primarily bare ground (60% ground cover), purple fountain grass (*Pennisetum setaceum*; 35 % ground cover), and scattered individuals of laurel sumac (*Malosma laurina*) and lemonadeberry (*Rhus integrifolia*; <5%). At PM 4.2, the shoulder of the roadway is the start of the sandy beach slope that terminates onto the sandy beach of Sycamore Cove Beach. The slope is inhabited with primarily laurel sumac (30%), lemonadeberry (30%), and invasive species (40%) such as toluaca (*Datura wrightii*), purple fountain grass, and tree tobacco (*Nicotiana glauca*).

The Pacific Ocean is considered “navigable waters” and regulated as a Water of the US under the CWA 33 USC 1344. The Pacific Ocean is vulnerable to construction impacts from the proposed project. Airborne construction debris and rain runoff from the construction site have the potential to flow into the Pacific Ocean due to the close proximity of the project area from the navigable waterway. The project does not propose however the direct fill of sedimentation into the Pacific Ocean. The possibility of construction debris entering the navigable waterway is considered “incidental fallback” which is not regulated. The minimal discharge of construction debris into the Pacific Ocean would be unintentional and minor.

After circulation of the draft environmental document for this project, Caltrans provided USACE with detailed maps of the project plans (as shown in Figure 3-6 through Figure 3-9) to aid in coordination for permits. USACE determined that the proposed project is not subject to regulation under Section 404 of the CWA. Section 404 gives USACE jurisdiction over fill materials in essentially all water bodies, including wetlands. USACE administers a permit program that regulates the discharge of dredged or fill material into the mean high-water level of the Waters of the US. The USACE is also responsible for implementing Section 10 of the Rivers and Harbors Act of 1899, which establishes permit requirements to prevent unauthorized obstruction or discharge into the median high-water level of any navigable Water of the US. The proposed project was also found not subject to regulation under Section 10. Additionally, because the project does not require a Section 404 permit, a Section 401 permit from RWQCB is also not needed nor does the project meet the criteria of a Section 401 permit.

Wetlands as protected under Section 404, are identified based on vegetation, visible hydrology, and geography. The definition of wetlands under Section 404 of the CWA is: “areas that are inundated or saturated by surface or ground water 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 U.S. Fish and Wildlife Service (USFWS) is the principal federal agency that provides information on the status and extent of wetlands in the U.S. through the National Wetlands Inventory (NWI). Wetlands are identified through the CWA criteria and mapped to be made accessible through the NWI.

The area of the proposed project does not meet the criteria identified through the Section 404 of the CWA to be classified as wetlands. The project area is a rocky cliff-face and not wetland habitat. Additionally, Caltrans district biologists conducted a field survey on October 19, 2017 to assess the erosion conditions, identify vegetation, and analyze the habitat of the area. The biologists concluded that the project area is not considered wetland habitat.

2.15.3 Environmental Consequences

Alternative 1 – Cantilever Option

As mentioned above, the proposed project is not subject to USACE jurisdiction. Coordination with USACE led to Caltrans' determination that any construction work in the area will not require a Section 404 permit, Section 10 permit, and Section 401 permit. Alternative 1 – Cantilever Option involves drilling the piles of the wall from the shoulder of the roadway, without any slope excavation. The construction requires drilling primary boreholes for the length of the wall, filling them with cement to create piles, then drilling the secondary boreholes and filling them with cement. This construction style is referred to as CIDH piles.

The only proposed excavation of dirt on the coastal side of PCH, is the amount required for removal to withhold the wall and minor excavation of about 20 inches to place the concrete barrier on top of the piles. CIDH piles are constructed with the addition of water and a hose to remove the excess mixture of water and dirt. This allows for better control of the excavated dirt, so that the particles do not become airborne. Through this construction method, dirt is not expected to spread extensively through the air or from careless dumping. To further reduce impacts however, a debris blanket and silt fencing will be proposed as a project feature to hold loosened sedimentation onto the slope and avoid discharge into the waterway. Therefore, the amount of fill material entering a U.S. navigable waterway, namely the Pacific Ocean, is expected to be minimal and a less than significant impact.

BIO-1 A debris blanket with slit fencing will be deployed along the side of the cliff of both secant wall locations to hold sedimentation on the cliff and prevent loading onto the ocean or beach below.

Alternative 2 – Ground Anchor Option

Similar to the Alternative 1 – Cantilever Option, Alternative 2 – Ground Anchor Option will require drilling and pouring cement for both primary piles first, followed by secondary piles. However, the main difference between the two build alternatives is the placement of the ground anchor in Alternative 2, which is not proposed in Alternative 1. The design of Alternative 2 is cement piles running vertically into the ground and metal anchors extending perpendicularly from the piles, into the slope. The anchors will be placed about 4 feet below the ground surface and a series of anchors will be placed throughout the entire length of the wall. Each individual anchor will extend into the slope, ultimately lying underneath the roadway. A Section 404 permit, Section 10 permit, and a Section 401 permit is not required for construction of this alternative.

In order to install the anchor, a width of about 24 feet for the entire length of the walls will need to be excavated from the face of the slope in order to gain access to the face of the piles. A considerable amount of dirt will be excavated from the face of the slope for installation of the anchors and vertical drilling of the piles. The dirt removed from drilling will be handled according to proper Caltrans handling procedures and best management practices. Fill from this construction activity is expected to be minimal and is considered less than significant.

However, the amount of excavated dirt from installation of the anchor is expected to be considerable if no measures are implemented to reduce the excavated slope from entering the ocean. In order to reduce sediment from dislodging from the cliff during construction and entering the waterway, the debris blanket with slit fencing described in Alternative 1 – Cantilever Option (BIO-1) will also be deployed to reduce impacts. The debris blanket BMP is expected to severely reduce discharge of debris and rocks into the waterway and reduce this impact to less than significant.

2.15.4 Avoidance, Minimization, and/or Mitigation Measures

Alternatives 1 and 2 – Build Alternatives

No avoidance, minimization, and/or mitigation measures are proposed for either Build Alternative.

Alternative 3 – No Build Alternative

Because no ground disturbance or construction would occur under the No Build Alternative, there would be no impacts to wetlands and Waters of the United States.

2.16 Plant Species

2.16.1 Regulatory Setting

The U.S. Fish and Wildlife Service (USFWS) and California Department of Fish and Wildlife (CDFW) have regulatory responsibility for the protection of special-status plant species. "Special-status" species are selected for protection because they are rare and/or subject to population and habitat declines. Special status is a general term for species that are provided varying levels of regulatory protection. The highest level of protection is given to threatened and endangered species; these are species that are formally listed or proposed for listing as endangered or threatened under the Federal Endangered Species Act (FESA) and/or the California Endangered Species Act (CESA). Please see Section 2.18 Threatened and Endangered Species in this document for detailed information about these species.

This section of the document discusses all other special-status plant species, including CDFW species of special concern, USFWS candidate species, and California Native Plant Society (CNPS) rare and endangered plants.

The regulatory requirements for FESA can be found at 16 United States Code (USC) Section 1531, et seq. See also 50 Code of Federal Regulations (CFR) Part 402. The regulatory requirements for CESA can be found at California Fish and Game Code, Section 2050, et seq. Caltrans projects are also subject to the Native Plant Protection Act, found at California Fish and Game Code, Section 1900-1913, and the California Environmental Quality Act (CEQA), found at California Public Resources Code, Sections 21000-21177.

2.16.2 Affected Environment

The following information is presented in the NES (Caltrans Division of Environmental Planning) prepared on February 2018 and the NES (Amended) completed on October 2018.

A search of the CDFW's California Natural Diversity Database (CNDDB), California Invasive Plant Council (Cal IPC) inventory, California Native Plant Society (CNPS), and Calflora was conducted for the Point Mugu USGS quadrangle on which the project is situated. The literature review and database search yielded a total of 7 plant species given a status (listed, Species of Special Concern, CNPS listing, etc.)

Special-status plant species are either listed as endangered or threatened under FESA or CESA, or rare under the California Native Plant Protection Act. Of these 7 species identified, 5 species are federally and/or State-listed as endangered or threatened and are discussed in Section 2.18 Threatened and Endangered Species. Within this section, the remaining 2 species will be discussed and are summarized in the Table 2.9.

A general field survey was conducted on October 19, 2017 and a general drone overview was conducted on January 30, 2018. The surveys were done to observe the habitat of the area for suitability of the plant species of special concern.

Table 2.9 Special Species Plants enlisted as rare under the California Native Plant Protection Act

Common Name	Scientific Name	Status	General Habitat Description	Habitat Present/Absent	Rationale
Coulter's goldfields	*Lasthenia glabrata*	CNDDB 1B.1	Coastal salt marshes, playas, and vernal pools. Usually found on alkaline soils in playas, sinks, and grasslands of 1-1,375 meter elevation	Absent	The project impact area occurs on a rocky cliff-face that is not suitable for the plant
Estuary seablite	*Suaeda esteroa*	CNDDB 1B.2	Salt-marsh coastal wetlands, occasionally in non-wetlands of 0-120 meter elevation	Absent	The project impact area occurs on a rock cliff-face that is not suitable for the plant

List of rare special-status plant species maintained by the CNPS. The status reflects the ranking of the California rare plant in the CNDDB Special Vascular Plants, Bryophytes, and Lichens List. The statuses are represented as follows: 1B.1 = Plants Rare, Threatened, or Endangered in California and Elsewhere with a threat code of Seriously Threatened in California (over 80% of occurrences threatened); and 1.B.2 = Plants Rare, Threatened, or Endangered in California and Elsewhere with a threat code of Moderately Threatened in California (20-80% of occurrences threatened).

Tree Protection in the Ventura County Local Coastal Plan

Section 4.1.5 in the LCP grants certain protections to trees classified as *protected trees* when the trees are located within the coastal zone of Ventura County. The following trees are not to be removed unless under specified conditions described in the LCP: trees that contribute to the function and habitat value of an Environmentally Sensitive Habitat Area, Native Trees, Historical Trees, and Heritage Trees. The Protected Trees Policy is set to fulfill the Tree Protection Goal of "protect trees that function as important biological, watershed, visual and historic resources within coastal areas of Ventura County." Trees contribute to the visual beauty, provide historic landmarks to recall important events in Ventura County's history, reduce runoff and erosion, and are part of our living heritage. The multiple benefits of trees are lost when unnecessary tree removal takes place. The Protect Trees Policy and Tree Protection Goal are designed to retain the important functions of trees and avoid adverse effects resulting from tree removal.[27]

[27] Ventura County Coastal Zoning Ordinance. 2017. Ventura County Planning Division

2.16.3 Environmental Consequences

Alternatives 1 and 2 – Build Alternatives

The preceding table shows that the habitat associated with the CNPS listed sensitive plant species are absent within the BSA, therefore the presence of all listed species in the project site are not anticipated. Based on these conclusions, the proposed project is not anticipated to have an adverse effect on any sensitive plant species.

Clearing will be required for the build alternatives, with more removal anticipated for Alternative 2 – Ground Anchor Option than Alternative 1 – Cantilever Option. However, the proposed clearing will not impact the sensitive plant species described above, because they are not present in the BSA. Impacts to coastal sage scrub habitat is anticipated from clearing activities and a description of the impacts can be found in Section 2.14 Natural Communities of this document.

In addition, neither build alternative includes removal of any tree that is classified as a *protected tree* under the Ventura County LCP. The only vegetation removal proposed is minor clearing for installation of the piles and anchor. The plant community that would be impacted is sparse vegetation without special status plants or *protected trees*.

2.16.4 Avoidance, Minimization, and/or Mitigation Measures

Alternatives 1 and 2 – Build Alternatives

No avoidance, minimization and/or mitigation measures are required because no sensitive plant species are present within the project area.

Alternative 3 – No Build Alternative

The No Build Alternative would pose no changes to the existing environment, therefore would not have an adverse effect on any sensitive plant species.

2.17 Animal Species

2.17.1 Regulatory Setting

Many state and federal laws regulate impacts to wildlife. The U.S. Fish and Wildlife Service (USFWS), the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA Fisheries Service), and the California Department of Fish and Wildlife (CDFW) are responsible for implementing these laws. This section discusses potential impacts and permit requirements associated with animals not listed or proposed for listing under the federal or state Endangered Species Act. Species listed or proposed for listing as threatened or endangered are discussed in Section 2.18 Threatened and Endangered Species below. All other special-status animal species are discussed here, including CDFW fully protected species and species of special concern, and USFWS or NOAA Fisheries Service candidate species.

Federal laws and regulations relevant to wildlife include the following:

- National Environmental Policy Act
- Migratory Bird Treaty Act
- Fish and Wildlife Coordination Act

State laws and regulations relevant to wildlife include the following:

- California Environmental Quality Act
- Sections 1600 – 1603 of the California Fish and Game Code

- Sections 4150 and 4152 of the California Fish and Game Code

2.17.2 Affected Environment

Species of Special Concern

Database searches of CDFW's CNDDB, USFWS iPAC Resource List, and NOAA Fisheries Service's West Coast Region California Species List Tool was conducted for the Point Mugu USGS 7.5 topographic quadrangle in which the project area is situated. The literature review and database searches yielded a total of 34 animal species with a special-status that have the potential to occur or known to occur within the BSA. The special-status animal species revealed in the database searches are enlisted as endangered or threatened under FESA or CESA, and CDFW's fully protected species or species of special concern. Of these 34 animal species identified, 28 species are federally and/or State-listed as endangered or threatened and are discussed in Section 2.18 Threatened and Endangered Species. Within this section, the remaining 6 animal species will be discussed in this section and are summarized in the Table 2.10.

Table 2.10 Special-Status Animal Species enlisted as a CDFW Species of Special Concern

Common Name	Scientific Name	Status	General Habitat Description	Habitat Present/ Absent	Rationale
South Coast Marsh Vole	*Microtus californicus stephensi*	SSC	Tidal areas in Los Angeles, Orange, and Southern Ventura counties	Absent	Habitat for this species does not exist within the project area. The project impact area occurs on a rocky cliff-face, not a wetland.
Southern California Saltmarsh Shrew	*Sorex ornatus salicornicus*	SSC	Dense vegetation and woody debris in coastal marshes of Los Angeles, Orange, and Ventura Counties	Absent	Habitat for this species does not exist within the project area.
Burrowing Owl	*Athene cunicularia*	SSC	Open, dry annual or perennial grasslands, deserts, and scrublands (low growing vegetation)	Absent	Habitat for this species does not present within the project area.
California Brown Pelican	*Pelecanus occidentalis californicus*	F/S delisted FP	Colonial nester on coastal islands just outside surf line	Absent	Only breeding colonies are within Channel Islands National Park. Habitat not found within project area.
Coastal Whiptail	*Aspidoscelis tigris stejnegeri*	SSC	Multiple habitats. Found in deserts and semi-arid areas with sparse vegetation and open areas. Also found in	Absent	Habitat for this species does not exist within the project area.

			woodland and riparian areas		
Arroyo chub	*Gila orcuttii*	SSC	Slow water stream section with mud or sand bottoms. Feeds heavily on aquatic vegetation and invertebrates	Absent	Habitat for this species does not exist within the project area.

The status of the species is stated as: SSC = Species of Special Concern, F/S delisted = Federal and State delisted from the endangered species list, and FP = Federally Protected.

All of the species mentioned in the table above are not expected to be found within the project area because the habitat for these species does not exist within the project area. Therefore, none of the project alternatives would directly or indirectly impact the above-mentioned species because they are not expected to be found within the project impact area.

California Grunion

CDFW expressed concern for project impacts on California grunion during early consultation. California grunion are found along the Pacific Coast from Point Conception, California to Punta Abreojos, Baja California Sur. California grunion utilize beach habitats for spawning events by leaving the water and swimming up on to the beach to spawn. Spawning occurs for 2 to 6 nights after the full and new moon, beginning soon after high tide and continuing for several hours. The peak of spawning season is from March to June, but can extend from February until September. The project site is adjacent to Sycamore Cove Beach which is a sandy beach and is potential spawning habitat for California grunion.

On August 28, 2018 Caltrans biologists conducted a California grunion survey to determine if the grunion habitat is actively being used for spawning. The survey was done from 10:30 p.m. and 12:45 a.m. to serve as the ideal time for spawning. During the survey, about 30 individuals were observed with some exuding spawning behavior. The area surveyed is immediately below the proposed secant wall at PM 4.2, therefore construction activities have the potential to impact California grunion if night work is required and a considerable amount of dirt is deposited on the spawning habitat.

Mexican Free-tailed Bat

Bats, along with other migratory wildlife species, are afforded protection by state law from take and/or harassment (Fish and Game Code Section 4150, California Code of Regulations, Section 251.1). If bats may be present within the project location, impacts to the species must be considered. Many species of bats commonly use rock crevices and tree foliage for roosting. Since the project is adjacent to rocky cliffs, cliff faces, and crevices, bats could be using the suitable habitat for roosting.

Caltrans biologists conducted bat surveys at both proposed secant wall locations on August 21, 2018. Bat calls were recorded using a Peterson Ultrasound Detector and the calls were used as an identifier of the bat species within the area. The bat species was identified to be *Tadarida brasiliensis* (Mexican Free-tailed bat). Construction activities can impact bats and their pups because they are sensitive to noise, vibration, and bright lights.

Bioacoustics

Wildlife can be impacted by human-made noises, especially during construction when the noise volumes are typically much louder than the regular environment. Loud construction noises can compete with wildlife communications and make it difficult for species to communicate with each other. Wildlife communication is important for mating, predation protection, social coordination like group hunts, and sharing about information in the environment.[28] In order to analyze bioacoustics within the project area, a Bioacoustics Study Report (April 18, 2018) was prepared for this project by Caltrans Office of Environmental Engineering, Noise and Vibration Branch. The study was prepared to analyze potential construction impacts on wildlife species by comparing the construction noise with the current traffic noise volumes the area already experiences.

A site investigation was conducted on November 8, 2017 to identify land uses that have the potential to be subject to traffic and construction noise impacts from the proposed alternatives. No sound barriers exist within the project limits. Short-term monitoring was conducted at 4 locations, using Larson Davis Model 831 sound meter. The measurements were taken over a 20-minute period at each site. The locations were selected to represent each local small area within the project area and serve as representative modeling locations. The short-term measurements compute the real traffic noise level at these locations, which is then used to model the peak traffic noise levels. The FHWA Traffic Noise Model Version 2.5 (TNM 2.5) was used to model peak traffic noise levels.

In order to validate the accuracy of the model, TNM 2.5 was used to compare the field measured traffic noise levels to modeled noise levels at the short-term monitoring locations (Table 2.11). Calibration of the model was done as needed.

Table 2.11 Monitoring Locations for the Bioacoustics Study Report with Measured Traffic Noise and Modeled Peak Traffic Noise from TNM 2.5

Monitoring Locations	Measured Traffic Noise	Modeled Peak Traffic Noise
Site 1 (Southbound shoulder by PM 4.2)	72.1	80.1
Site 2 (Northbound shoulder by PM 4.2)	64.3	72.3
Site 3 (Southbound shoulder by PM 4.0)	72.8	80.8
Site 4 (Northbound shoulder by PM 4.0)	66.3	74.3

2.17.3 Environmental Consequences

Alternatives 1 and 2 – Build Alternatives

Species of Special Concern

None of the species listed in Table 2.10 contain habitat within the project area. The previously mentioned species are not expected to be found within the project impact area because the habitat needed for survival does not exist within the constraints of the project area. Thus, the build alternatives have No Effect on all the above-mentioned special status species in Table 2.10.

California Grunion

The construction of the secant wall at PM 4.2 will require excavation for both alternatives. Alternative 1 – Cantilever Option will require no slope excavation, only drilling for CIDH piles which utilizes a hose to contain the excavation dirt for the piles. Alternative 2 – Ground Anchor Option will require drilling CIDH piles, similarly to Alternative 1 – Cantilever Option but will also include metal anchors extending

[28] https://acousticstoday.org/wp-content/uploads/2017/05/Erbe.pdf

perpendicularly from the piles, into the slope. The anchors will be placed about 4 feet deep from the ground surface and a series of anchors will be placed throughout the entire length of the wall. Each individual anchor will be planted into the face of the slope, ultimately lying underneath the roadway.

Adjacent to PM 4.2, California grunion spawning habitat on Sycamore Cove Beach. No construction equipment is proposed to be staged on the beach. No construction equipment, staging, and activities will be placed on or occur on the beach during any time of the construction period. After circulation of the draft environmental document and further analysis of the design for Alternative 1 – Cantilever Option, the construction activities were found not to have the potential to impact the California grunion due to the lack of potential for incidental sedimentation landing on the beach during spawning events. The amount of excavation for Alternative 1 – Cantilever Option is minimal and although the California grunion would be out of the water and on the sandy beach during spawning events, construction activities will not impact the species. The project features below are applicable for only Alternative 2 – Ground Anchor Option because it requires excavation of slope and the features are intended to keep the area clear during spawning events as to not disturb the grunion:

No construction work shall commence on full moon or high tide nights to avoid impacting California grunion.

Full-time biological monitoring will occur during project construction.

The above-mentioned project features will ensure that construction activities do not interfere with spawning events for California grunion and will result in a less than significant impact to the species. Table 2.13 in Section 2.18 compares impacts to the California grunion for each alternative. Because Alternative 1 – Cantilever Option has been selected for project construction, the above-mentioned project features will not be required.

Mexican Free-tailed Bat
Bat surveys revealed that the Mexican free-tailed bat was present within the project area. Bats could be utilizing the rock cliffs and crevices within the project area and potentially roosting in close proximity to the project during construction. Construction will last 1 year and may require night work. The proposed project involves paving of the northbound shoulder and after circulation of the draft environmental document, it is now proposed to place a cable net mesh on the mountain. Construction work is proposed directly on the upslope side of PCH. The construction noise, vibration, and bright lights for both project alternatives have the potential to impact the nearby roosting bats. Consequently, the following project features will be implemented to avoid incidental impacts to bats:

BIO-2 The cable net mesh shall be installed between October and end of March which is the time period outside of the breed/pup season.

BIO-3 No construction work or equipment shall directly impact the rock formation adjacent to PM 4.2 on the southbound shoulder of PCH.

BIO-4 Biological monitoring during installation of the cable net mesh will be required to ensure no direct impacts or encroachment upon the aforementioned bat habitat.

BIO-5 Prior to project construction, a Caltrans biologist shall conduct bat surveys within and immediately adjacent to the project impact areas to identify the presence of bats and/or bat pups. If bat pups are confirmed, work shall be delayed until the bat pups are able to fly or forage.

BIO-6 Should night work be needed, work shall commence 1 hour after sunset after all the bats have vacated the project impact areas to forage and cease 2 hours before dawn when bats return to roost.

BIO-7 The cable net mesh shall be installed over a series of nights starting from 1 hour after sunset after all the bats have vacated the project impact areas to forage and cease 2 hours before dawn when bats return to roost.

BIO-8 The cable net mesh shall have a square weave with 6-inch or large opening size.

Bioacoustics
The measurement and modeling results indicate that existing peak hour traffic noise levels for the area typically range between 75 and 82 dBA-Leq(h). The peak traffic noise levels modeled by TNM 2.5 were compared to predicted construction noise, in order to determine if there is a significant construction noise impact. The loudest construction activity proposed by both build alternatives is drilling for construction of the secant walls. The anticipated construction noise from the build alternatives will be the same because the drilling activity will involve the same equipment. Construction noise for both build alternatives was then modeled using the FHWA's Roadway Construction Noise Model version 1.00 (RCNM). In order to develop the analytical model, all relevant parameters including construction equipment, receiver locations, and existing terrain within the project area, were inputted into RCNM to predict the expected construction noise levels.

The layout maps in Table 2.11 and Table 2.12 show construction noise contour lines with the peak traffic noise values modeled at the 4 monitoring locations. The contour line closest to the monitoring site represents the degree of noise that the site is anticipated to experience from construction activities. At sites 2, 3, and 4 the contour line representing the project construction noise is higher than the modeled peak traffic noise for the location. Conversely, at site 1 the anticipated project construction noise was found lower than the modeled peak traffic noise. This means that at site 1, the construction activities would not cause a significant noise impact to the area because the area experiences more noise from the peak traffic than modeled construction activities.

Construction noise is expected to be higher than the peak traffic noise at the other 3 locations. However, the construction noise at the 3 locations was not found significantly higher than the peak traffic noise. At each location, the construction noise is only slightly higher than the peak traffic noise (site 2: peak is 72 dBA and construction is 75 dBA; site 3: peak is 81 dBA and construction 84 dBA; site 4: peak is 74 dBA and construction is 78 dBA). The difference ranges between 3 – 4 dBA which is not a substantial increase according to Caltrans' Traffic Noise Analysis Protocol for New Highway Construction and Reconstruction Projects (May 2011), that states 12dBA as a substantial increase. Therefore, the anticipated construction noise is not considered a significant impact.

Furthermore, since the construction noise is not significantly different from the peak traffic noise, wildlife will not experience a great change in noise during construction of the project. Wildlife will experience similar noise levels to current conditions. Wildlife is not expected to experience significant bioacoustics impacts.

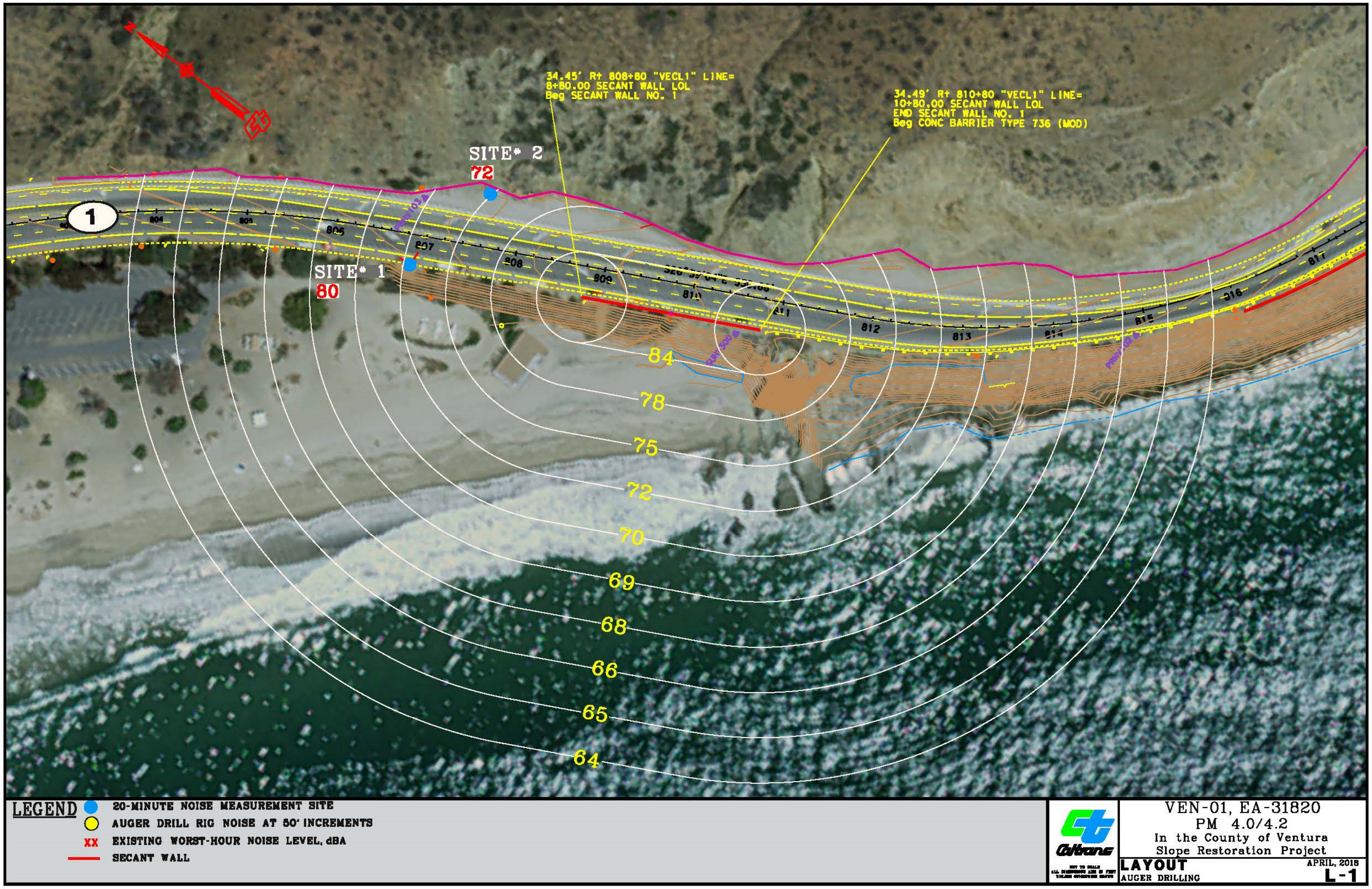

Figure 2-14: Construction noise contour lines with the peak traffic noise values modeled at PM 4.2.

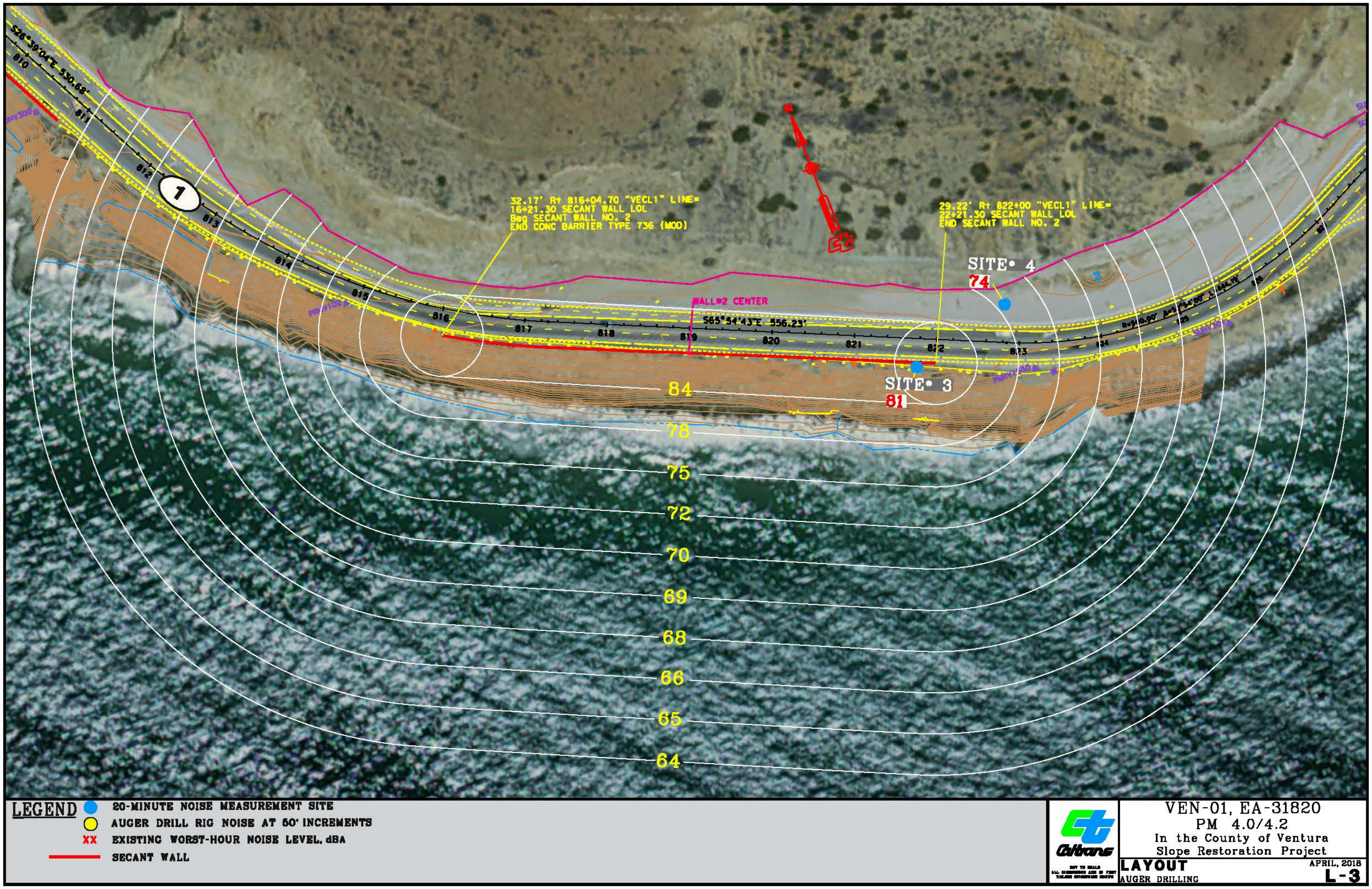

Figure 2-15: Construction noise contour lines with the peak traffic noise values modeled at PM 4.0.

The build alternatives would not produce significant adverse noise impacts from construction because construction would be conducted in accordance with Caltrans standard specifications and would be short-term and intermittent. The temporary construction noise impacts would be minimized with the following project features:

BIO-9 Equipment noise control should be applied to revising old equipment and designing new equipment to meet specified noise levels.

BIO-10 In-Use Noise Control should be applied where existing equipment is not permitted to produce noise levels in excess for specified limits.

BIO-11 Site restrictions should be applied as an attempt to achieve noise reduction through modifying the time, place, or method of operation of a particular source.

BIO-12 Personal training of operators and supervisors is needed to become more aware of the construction site noise problems.

Alternative 3 – No Build Alternative
Species of Special Concern
Because no special status animal species exist within the project area, there would be no impacts to the species.

California Grunion
No construction work is proposed along Sycamore Cove Beach to potentially affect the California grunion spawning events. The sandy beach habitat would remain as is and the California grunion would be able to utilize the beach as currently.

Mexican Free-tailed Bat
The rocky crevice areas in which bats can potentially use to roost would not be impacted by construction noise, vibration, or bright lights. The bats would remain unaffected and endure no impacts.

Bioacoustics
No construction work is proposed that could potentially impact wildlife species for Alternative 3 – No Build Alternative. Noise conditions would remain as is, with no increase in noise emissions.

2.17.4 Avoidance, Minimization, and/or Mitigation Measures
Alternatives 1 and 2 – Build Alternatives
No avoidance, minimization, and/or mitigation measures would be required.

Alternative 3 – No Build Alternative
No avoidance, minimization, and/or mitigation measures would be required.

2.18 Threatened and Endangered Species
2.18.1 Regulatory Setting
The primary federal law protecting threatened and endangered species is the Federal Endangered Species Act (FESA): 16 United States Code (USC) Section 1531, et seq. See also 50 Code of Federal Regulations (CFR) Part 402. This act and later amendments provide for the conservation of endangered

and threatened species and the ecosystems upon which they depend. Under Section 7 of this act, federal agencies, such as the Federal Highway Administration (FHWA) (and Caltrans, as assigned), are required to consult with the U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA Fisheries Service) to ensure that they are not undertaking, funding, permitting, or authorizing actions likely to jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat. Critical habitat is defined as geographic locations critical to the existence of a threatened or endangered species. The outcome of consultation under Section 7 may include a Biological Opinion with an Incidental Take statement or a Letter of Concurrence. Section 3 of FESA defines take as "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect or any attempt at such conduct."

California has enacted a similar law at the state level, the California Endangered Species Act (CESA), California Fish and Game Code Section 2050, et seq. CESA emphasizes early consultation to avoid potential impacts to rare, endangered, and threatened species and to develop appropriate planning to offset project-caused losses of listed species populations and their essential habitats. The California Department of Fish and Wildlife (CDFW) is the agency responsible for implementing CESA. Section 2080 of the California Fish and Game Code prohibits "take" of any species determined to be an endangered species or a threatened species. Take is defined in Section 86 of the California Fish and Game Code as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill." CESA allows for take incidental to otherwise lawful development projects; for these actions an incidental take permit is issued by CDFW. For species listed under both FESA and CESA requiring a Biological Opinion under Section 7 of FESA, the CDFW may also authorize impacts to CESA species by issuing a Consistency Determination under Section 2080.1 of the California Fish and Game Code.

Another federal law, the Magnuson-Stevens Fishery Conservation and Management Act of 1976, was established to conserve and manage fishery resources found off the coast, as well as anadromous species and Continental Shelf fishery resources of the United States, by exercising (A) sovereign rights for the purposes of exploring, exploiting, conserving, and managing all fish within the exclusive economic zone established by Presidential Proclamation 5030, dated March 10, 1983, and (B) exclusive fishery management authority beyond the exclusive economic zone over such anadromous species, Continental Shelf fishery resources, and fishery resources in special areas.

The 1996 amendments to the Act established the requirement to identify and describe Essential Fish Habitat (EFH), which are defined as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity." Federal agencies are required to consult with the NOAA Fisheries Service when their actions or activities may adversely affect EFH.

2.18.2 Affected Environment

Under Section 7 of FESA, federal agencies, such as FHWA, are required to consult with the USFWS and NOAA Fisheries Service to ensure federal actions are not likely to jeopardize the continued existence of listed species or destroy/adversely modify designated critical habitat. Under the 1996 amendments of the Magnuson-Stevens Fishery Conservation and Management Act of 1976, consultation with NOAA Fisheries is required by all federal agencies when there is a potential for impacts to EFH. Caltrans has initiated early coordinated with both USFWS and NOAA Fisheries Service, under its delegated authority from FHWA.

Similarly, California enacted the CESA which requires state agencies to consult with CDFW to avoid potential impacts to California listed endangered and threatened species. Caltrans has initiated early coordination with CDFW.

As mentioned in Section 2.14 Natural Communities, Section 2.16 Plant Species, and Section 2.17 Animal Species, the CNDDB search yielded federally and state protected species enlisted as threatened and endangered that have the potential to occur within the BSA. Table 2.12 shown below, lists the 35 state and federal threatened and endangered species the CNDDB search yield. The USFWS Species List from the IPAC Trust Report was accessed on October 1, 2017 and re-generated on August 30, 2018. The official CNNDB Species list was accessed on October 1, 2017 and updated on August 31, 2018. The NOAA Fisheries Service West Coast Region California Species list was accessed on October 1, 2017 and re-reviewed on August 31, 2018.

Table 2.12 Threatened and Endangered Species enlisted under FESA and CESA

Common Name	Scientific Name	Status	General Habitat Description	Habitat Present/ Absent	Rationale
Mammal Species					
Guadelupe Fur Seal	*Arctocephalus townsendi*	Federally Threatened, State Threatened	Primarily on Isla de Guadalupe, in sheltered crevices and sea caves. Rarely observed at sea	Absent	Project impact area outside of species range
Sperm whale	*Physeter microcephalus*	Federally Endangered	Open ocean	Absent	Project impact area is not in open ocean
Sei whale	*Balaenoptera borealis*	Federally Endangered	Open ocean	Absent	Project impact area is not in open ocean
North Pacific Right Whale	*Eubalaena japonica*	Federally Endangered	Open ocean	Absent	Project impact area is not in open ocean
Southern Resident Killer Whale	*Orcinus orca*	Federally Endangered	Open ocean	Absent	Project impact area is not in open ocean
Humpback Whale	*Megaptera novaeangliae*	Federally Endangered	Open ocean	Absent	Project impact area is not in open ocean
Fin Whale	*Baelaenoptera physalus*	Federally Endangered	Open ocean	Absent	Project impact area is not in open ocean
Blue Whale	*Balaenoptera physalus*	Federally Endangered	Open ocean	Absent	Project impact area is not in open ocean
Bird Species					

Common Name	Scientific Name	Status	General Habitat Description	Habitat Present/ Absent	Rationale
Least Bell's Vireo	*Vireo bellii pusilus*	Federally Endangered, State Endangered	Riparian forest, riparian scrub, riparian woodland	Absent	Habitat for this species does not exist within the project impact area
Western Snowy Plovers	*Charadrius alexandrines nivosus*	Federally Threatened, State Threatened	Sandy beaches, salt pond levees, and shores of large alkali lakes	Present	Habitat for this species is present on the underlying sandy beach at location PM 4.2
Belding's Savannah Sparrow	*Passerculus sanwichensis beldingi*	State Endangered	Coastal salt marshes; nests in salicornia on and about margins of tidal flats	Absent	Habitat for this species does not exist within the project impact area
Marbled Murrlet	*Brachyramphus marmoratus*	Federally Threatened, State Threatened	Feeds near shore; nests inland along coast; calm water	Absent	Habitat for this species does not exist within the project impact area
Light-Footed Ridgway's Rail	*Rallus obsoletus levipes*	Federally Endangered, State Endangered	Coastal salt marshes, lagoons, maritime environments	Absent	Habitat is not a marsh or lagoon
California Least Tern	*Sterna antillarum browni*	Federally Endangered, State Endangered	Nests along the coast; open beaches	Present	Habitat for this species is present on the underlying sandy beach at location PM 4.2
Coastal California Gnatcatcher	*Polioptila californica californica*	Federally Threatened, State Threatened	Coastal bluff scrub, coastal scrub	Absent	No coastal scrub within project impact area
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	Federally Endangered, State Endangered	Riparian woodland, slow moving waters with multiple canopy layers	Absent	Habitat for this species does not exist within the project impact area
Reptile Species					

Common Name	Scientific Name	Status	General Habitat Description	Habitat Present/ Absent	Rationale
East Pacific Green Sea Turtle	*Chelonian mydas*	Federally Threatened	Marine	Absent	Species range does not occur within project impact area
North Pacific Loggerhead Sea Turtle	*Caretta caretta*	Federally Endangered	Marine	Absent	Species range is not present within the project impact area
Leatherback Sea Turtle	*Dermochelys coriacea*	Federally Endangered	Marine	Absent	Species range is not present within the project impact area
Olive Ridley Sea Turtle	*Lepidochelys olivacea*	Federally Endangered	Marine; pelagic	Absent	Species range is not present within the project impact area
Amphibian Species					
California Red-Legged Frog	*Rana draytonii*	Federally Threatened, State Endangered	Lowlands and foothill in or near permanent sources of deep water with dense, shrubby, or emergent riparian vegetation	Absent	Habitat is not freshwater
Fish Species					
Tidewater Goby	*Eucyclobius newberryi*	Federally Endangered, State Endangered	Brackish water habitats along the coast	Absent	Habitat for this species does not exist within the project impact area
Green Sturgeon	*Acipenser medirostris*	Federally Threatened	Rivers, estuaries, bays/harbors from Monterey and North	Absent	Project is further south than species range extends
Steelhead Southern California DPS	*Oncorhynchus mykiss irideus*	Federally Endangered	Aquatic, south coast flowing waters	Absent	Habitat for this species does not exist within the project impact area
Invertebrate Species					
Riverside Fairy Shrimp	*Streptocepha-lus woottoni*	Federally Endangered,	Swales/earth slump basins in grassland and coastal sage scrub	Absent	Habitat for this species does not exist within the project impact area

Common Name	Scientific Name	Status	General Habitat Description	Habitat Present/ Absent	Rationale
		State Endangered			
White Abalone	*Haliotis sorenseni*	Federally Endangered	Rocky substrates alongside sand channels, which tend to accumulate with the algae they eat. Found at depths of 50-180 feet.	Absent	Habitat for this species does not exist within the project impact area
Black Abalone	*Haliotis cracherodii*	Federally Endangered	Rocky substrates in intertidal and shallow subtidal reefs (~18 feet deep) along the coast. The species occurs in complex surfaces and crevices; and can withstand extreme variations in temperature, salinity, moisture, and waves.	Present	Habitat present within project impact area. Surveys concluded that species were absent from project impact area
Vernal Pool Fairy Shrimp	*Branchinecta lynchi*	Federally Threatened, State Threatened	Endemic to grasslands	Absent	Habitat for this species does not exist within the project impact area
Plant Species					
California Orcutt Grass	*Orcuttia californica*	Federally Endangered, State Endangered	Vernal pools, valley grassland, freshwater wetlands, wetland-riparian	Absent	Habitat for this species does not exist within the project impact area
Salt Marsh Bird's Beak	*Chloropyron maritimum ssp. Maritimum*	Federally Endangered, State Endangered	Coastal dunes and wetland limited to the higher zones of salt marsh habitat	Absent	Habitat for this species does not exist within the project impact area
Gambel's Watercress	*Rorippa gambellii*	Federally Endangered, State Threatened	Interior wetlands	Absent	Habitat for this species does not exist within the project impact area

Common Name	Scientific Name	Status	General Habitat Description	Habitat Present/ Absent	Rationale
Marsh sandwort	*Arenaria paludicola*	Federally Endangered	Marshes and swamps; growing through dense mats of typha, juncus, scirpus, etc. in freshwater marsh. Sandy soil at about 3 to 172 meter elevation	Absent	The project impact area occurs on a rock cliff-face that is not suitable for the plant
Spreading Navarretia	*Navarretia fossalis*	Federally Threatened	Vernal pools, chenopod scrub, marshes, swamps, and playas	Absent	Habitat for this species does not exist within the project impact area
Natural Communities					
Groundfish Essential Fish Habitat	N/A	S2.1	Designated area to prevent damaging fishing methods, such as bottom trawling. Offers protection to habitats including kelp forest, sea grass, and estuaries	Present	Classified habitat present within project impact area at PM 4.0
Coastal Pelagic Essential Fish Habitat	N/A	S2.1	Designated area to prevent damaging fishing methods, such as bottom trawling. Offers protection to habitats including kelp forest, sea grass, and corals	Present	Classified habitat present within project impact area at PM 4.0
Highly Migratory Species Essential Fish Habitat	N/A	S2.1	Designated areas to prevent damages to, and protect habitat critical for fish migration, including kelp forests	Present	Classified habitat present within project impact area at PM 4.0

List of federally and state threatened and endangered species recovered from species lists from CNNDB, and USFWS.

The project has no effect on all the species listed in Table 2.12 except for the species and critical habitats described below. The following discussions describe each species and critical habitat that the database searches found present within the project area and can therefore be impacted by the proposed project activities.

Black Abalone

Black abalone are large marine gastropod mollusks found in rocky intertidal and subtidal habitats. During low tides, these mollusks can typically be found wedged into crevices, cracks, and rock depressions from the high intertidal zone to approximately 19.5 feet deep. When they immerse, they have been observed using their “feet” to move freely over rock surfaces. Because the species is known to inhabit rocky intertidal areas, NOAA Fisheries Service is concerned about potential impacts to black abalone at PM 4.0. The intertidal zone is an area that is underwater at high tide and exposed at low tide. The intertidal zone within the project location is not included in official designated critical habitat maps for black abalone. However, Black abalone mapping is incomplete in within the project area and the lack of data does not conclusively confirm the absence of black abalone. Drone surveys from January 30, 2018 revealed that the intertidal rocks, crevices, and pools within PM 4.0 was potential habitat for black abalone. Therefore, this area does contain suitable black abalone habitat and the species has the potential to be present within the project impact area.

During early coordination, NOAA Fisheries Service expressed specific concerns of debris dislodging from the cliff side during project construction and landing into the black abalone habitat below. Black abalone can be dislodged from the rocky substrate by being struck by debris moving at a high velocity down the cliff side. The size of the debris that can impact the black abalone can be as small as a rock that is about the size of cobble or larger. Increased sedimentation can smother the habitat and reduce the quality of the habitat. Debris loosened during project construction, has the potential to impact the black abalone habitat within the intertidal zone and the black abalone themselves, if they are found to be present.

In order to determine if black abalone are using the suitable habitat at PM 4.0, black abalone surveys were conducted from March 27 to 29, 2018. The surveys were conducted by biologists from Caltrans, private consulting, and NOAA Fisheries Service. The duration of the surveys was about 3 hours and surveys were initiated an hour before the peak low tide of the day so that the intertidal rocks, crevices, and pools could be surveyed at the average lowest tide. The intertidal zone within the project location stretches approximately 50 feet on the rocky cliffside at PM 4.0 and borders the kelp forest at the base of the slope. The surveys found the rocky substrate to be covered approximately 50% by bacteria/diatom film. The intertidal zone was dominated by California mussel (*Mytilus californianus*) and gooseneck barnacle (*Pollicipes polymerus*); and occasionally sea stars (*Pisaster ochraceous*), sea anemones (*Anthopleura sola*), and drift kelp (*Macrocystis pyrifera*) were observed. Dolphins and sea lions were also observed swimming nearby. The habitat was found suitable for black abalone, however the surveys determined no black abalone were present at the project location.

Essential Fish Habitat

As mentioned previously in this section, EFH is a habitat designation protected under the 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act of 1976. The designation is an effort to identify and protect the healthy habitats fish need to survive and reproduce. The 3 protected habitat types classified and managed by NOAA Fisheries Service occurring within the project area are: Groundfish Essential Fish Habitat, Coastal Pelagic Essential Fish Habitat, and Highly Migratory Essential Fish Habitat.

These 3 underwater habitats are designated as EFH because kelp forest that borders the intertidal zone is protected and falls under these 3 EFH classifications. For this reason, the 3 EFHs appeared in the NOAA Fisheries Service search query because kelp forest is found at PM 4.0, the location of the proposed secant walls. To prevent redundancy, further discussion will address the kelp forest specifically, as all three protected habitat types within the context of this project refer to the adjacent kelp forest. The kelp forest within the project area is located south of the direct project impact area and extends into the ocean.

Kelp forests harbor a greater variety and higher diversity of plants and animals, than almost any other ocean community. Kelp are large brown algae that live in cool, relatively shallow waters close to the shore and grow in dense groupings much like a forest on land. These underwater towers provide food and shelter for thousands of fish, invertebrates, birds, and marine mammals. They are also used by organisms as safe shelter during rough storms and to protect their young from predators.

Kelp forests generally form in shallow open waters due to their dependency upon light for photosynthesis and are rarely found deeper than 49-131 feet below the water surface. Their close proximity to the surface makes them susceptible and vulnerable to impacts from above water activities. The largest threat to kelp forests includes trawling, recreational boating activities, and overharvesting. NOAA Fisheries Service scientists monitor kelp forests to identify causes of any changes in the abundance or variety of organisms the forest may experience. During early coordination with Caltrans, NOAA Fisheries Service expressed concern in the EFH because it can be inhabited by various federally managed fish species that are included within the Pacific Coast Groundfish and Coastal Pelagic Species Fishery Management Plan. The kelp forest is not located within the potential area of direct project impacts because of its location south of the slope side, but it is possible to experience indirect impacts from construction activities.

California Least Tern and Western Snowy Plover

The California least tern and Western snowy plover nest on open sandy beaches along the coast of California from about March through September. The birds spend most of their time by the coastline since nesting is done on beaches and foraging is conducted near the ocean shoreline. For both species, eggs are camouflaged to look like sand and laid in a small depression on the sandy beach to serve as a nest. Human activities done on a beach that is used for nesting can disturb the birds and keep them away from their nests or even abandon them. Beach activities also have the potential to ruin nests or crush eggs since the nests are designed to be conspicuous and sandy beaches are heavily used by humans during summer, which is during the nesting season for both species.

Sycamore Cove Beach is a sandy beach located at PM 4.2 that fits the habitat description used by both California Least Terns and Western Snowy Plovers. Although neither alternative proposes construction activities on the beach itself and USFWS has confirmed that the two species are not known to occur at this small beach for nesting or roosting, the habitat is present at PM 4.2 and possible impacts to the protected species will be assessed below.

2.18.3 Environmental Consequences

Alternative 1 – Cantilever Option

Black Abalone and Essential Fish Habitat

Alternative 1 – Cantilever Option will involve constructing the wall by drilling CIDH piles from the shoulder of the roadway, without any slope excavation. The only proposed excavation for the CIDH piles, is the amount of dirt required for removal to install the piles to withhold the wall and minor excavation of about 20 inches to place the concrete barrier on top of the piles. CIDH piles are constructed with the addition of water and a hose to remove the excess mixture of water and dirt. This allows for better control of the excavated dirt. Through this construction method, dirt is not expected to loosen and freefall from the cliff side, into the Black abalone habitat/EFH at the intertidal zone or onto Sycamore Cove Beach if California least terns or Western snowy plovers are present. Additionally, the intertidal zone is not critical habitat for the Black abalone species. Nonetheless in order to further preserve the environmental condition of the project area, Caltrans proposes a debris blanket with slit fencing BMP to hold sedimentation on the dirt slope, as described in BIO-1 in Section 2.15 Wetlands and Other Waters. Both rock fall and sedimentation would be contained in the debris blanket. A qualified biologist will be on site to ensure a debris blanket BMP is installed correctly and fully functional to minimize or prevent sedimentation from entering the rocky intertidal zone and adjacent kelp forest.

Because excavation will be minimal, the catchment device is expected to successfully prevent incidental debris from entering the roadway below. Alternative 1 – Cantilever Option would result in none to potentially minimal incidental sedimentation, which is not expected to significantly impact neither the black abalone species, EFH, California least terns, nor Western snowy plovers. A No Effect Determination has been established for the Black abalone species. Project impacts for this alternative are summarized in Table 2.13.

California Least Tern and Western Snowy Plover

As mentioned previously, California least terns and Western snowy plovers utilize sandy beaches as habitat for nesting and foraging. The 2 bird species are not known to inhabit Sycamore Cove Beach regularly, but because suitable habitat is present, the following project feature will be incorporated to determine presence of endangered bird species:

BIO-13 Preconstruction bird surveys for the California least tern and Western snowy plovers will be performed by a qualified biologist on Sycamore Cove Beach to determine whether the species are present.

Although the likelihood of encountering the endangered bird species is low, Caltrans will exhibit due diligence to ensure the species will not be impacted during project construction. Therefore, through use of the debris blanket BMP and the bird surveys, impacts to the California least tern and Western snowy plovers are expected to be less than significant.

Alternative 2 – Ground Anchor Option

Black Abalone and Essential Fish Habitat

Alternative 2 – Ground Anchor Option will require drilling CIDH piles, similarly to Alternative 1 – Cantilever Option. However, in addition to vertical cement piles running into the ground, Alternative 2 – Ground Anchor Option also involves metal anchors extending perpendicularly from the piles, into the slope. The anchors will be placed about 4 feet deep from the ground surface and a series of anchors will be placed throughout the entire length of the wall. Each individual anchor will be planted into the face of the slope, ultimately lying underneath the roadway.

In order to install the anchor, the face of the slope will need to be excavated in order to gain access to the face of the piles. An area of 4 feet deep and 24 feet wide, will be excavated from the face of the slope for installation of the anchors and vertical drilling of the piles. CDFW and NOAA Fisheries Service are concerned about the possibility of debris from this excavation work, dislodging from the cliff side and impacting the EFH and black abalone habitat below during construction.

The amount of dirt required for removal is expected to be considerable. Should all the dirt removed during construction freely enter the waterway, considerable direct impacts to the black abalone habitat would be experienced. Debris can strike the black abalone causing both severe physical damage to the species and knocking them off their placement on the rocky substrate. Similarly, the input of dirt into the waterway can have indirect and temporary impacts to the kelp forest. The turbidity plume and physical impact of debris burying the kelp forest, can hinder kelp-growth as a short-term effect.

In order to reduce the amount of dirt entering sensitive habitat, BMPs will be implemented to reduce impacts. It is Caltrans' objective to reduce direct and indirect impacts to both the black abalone habitat and EFH. A debris blanket with a silt fence to stop sediment is proposed to contain the loosened dirt on the slope side and avoid entering the ocean. The rock fall catchment device would be designed to stand structurally on the side of the vertical slope and hold small granulated debris onto the slope during construction until crews can remove the loosened debris with a crane and discard the debris according to Caltrans standard practices. Through this measure, impacts to black abalone and EFH are expected to be reduced to less than significant with a No Effect determination established for black abalone.

California Least Tern and Western Snowy Plover
Aside from debris entering the roadway and impacting black abalone and EFH, loosened debris that lands on Sycamore Cove Beach from construction activities at PM 4.2 could potentially affect nesting California Least Terns and Western Snowy Plovers if they are present. Both bird species have not been known to use Sycamore Cove Beach for either nesting or roosting according to USFWS. As such, construction activities are not expected to impact either bird species despite the habitat for the birds to be present. However, the bird surveys described in BIO-13 will also be performed for this alternative in order to confirm that neither species is present on the beach. The impacts for each alternative is summed up in Table 2.13 below.

Table 2.13: Summary Table of Biological Impacts for Each Alternative

	Habitat at location PM 4.0			Habitat location at PM 4.2		
	Underlying Rocky Intertidal/Abalone Habitat	**Kelp Forest and Essential Fish Habitat**	**CA Grunion Habitat**	**Rocky Intertidal/ Abalone Habitat**	**Kelp Forest and Essential Fish Habitat**	**CA Grunion Habitat**
Alt 1*	Minimal indirect sedimentation/rock fall impact if debris blanket BMP fails. Biological monitoring during debris blanket installation required. Mitigation: None proposed.	Minimal indirect sedimentation impact if debris blanket BMP fails. Biological monitoring during debris blanket installation required. Mitigation: None proposed.	No impact due to absence of habitat.	No impact due to absence of habitat.	No impact due to absence of habitat.	No work is proposed on the beach and no direct or indirect sedimentation impacts would occur on the beach due to debris blanket BMP.
Alt 2	Potentially considerable direct sedimentation impact if debris blanket BMP fails. Biological monitoring during excavation activities required Mitigation: Applicable only if post-construction surveys reveal considerable impacts.	Indirect/temporary sedimentation impact if debris blanket BMP fails. Biological monitoring during excavation activities required. Mitigation: None proposed.	No impact due to absence of habitat.	No impact due to absence of habitat.	No impact due to absence of habitat.	No work is proposed on the beach and no direct or indirect sedimentation impacts would occur on the beach due to debris blanket BMP.
Alt 3	No impact (No Build)	No impact (No Build)	No impact (No Build)	No impact (No Build)	No impact (No Build)	No impact (No Build)

*Alt is abbreviated for "alternative"

Alternative 3 – No Build Alternative

Existing conditions would remain, causing no impacts to threatened or endangered species and EFH. Erosion would continue to naturally occur and the species would instinctively adapt to the changes in the environment. The natural changes would not abnormally impact black abalone or kelp forests.

2.18.4 Avoidance, Minimization, and/or Mitigation Measures

Alternative 1 – Cantilever Option

In the early development of this project, Caltrans was unsure of the exact impacts to the kelp forest and intertidal zone. As good stewards of the environment, Caltrans assumed worst-case scenario to take on the most conservative approach to potential project impacts. When considering the worst-case scenario, the indirect impacts to the kelp forest are expected to be minimal. If the debris blanket BMP were to fail under the worst-case scenario, the kelp forest would experience minimal introduced sedimentation and temporary increased turbidity. Since these impacts are minimal, no mitigation is proposed for the kelp forest habitat.

When considering impacts to the black abalone habitat in the rocky intertidal zone, excavation of the slope face is not proposed and as such, less sedimentation is at risk for entering the habitat. Considering the worst-case scenario, the direct impacts to the black abalone habitat are expected to be minimal if the debris blanket BMP fails. Although impacts are considered minimal should the debris blanket fail, the draft environmental document proposed mitigation for the black abalone habitat. Upon further analysis of the selected alternative, the amount of loose sedimentation that may enter the habitat is negligible. The manner in which the CIDH piles will be constructed ensures that the excavated soil will be contained in a hose attached to the drill. The slope will not be excavated either. The intertidal zone will not experience an abundance of introduced sedimentation that would impact the species. Furthermore, the intertidal zone is located in an area that is constantly interacting with dynamic wave energy and any dirt that did fall into the habitat would be washed away quickly. The USACE expressed concern about beach nourishment and the importance of preserving sedimentation on the coastline. It was found that restoring the intertidal zone to pre-construction conditions may remove valuable sedimentation from the malnourished California coastline and cause more harm than simply allowing the waves to wash sedimentation during normal wave processes. As a result, Caltrans will not be removing any dirt from the intertidal zone moreover, minimal sedimentation is expected to enter the habitat under Alternative 1 – Cantilever Option.

Alternative 2 – Ground Anchor Option

The kelp forest would only be indirectly and temporarily impacted by increased turbidity from incidental sedimentation during construction, if the debris blanket BMP fails. Therefore, no mitigation is proposed for the kelp forest because if the debris blanket was to fail, impacts to the kelp forest would be temporary and less than significant. Impacts to the rocky intertidal zone, where the black abalone habitat exists, would be direct and considerable should the debris blanket BMP fail. The direct impact from increased sedimentation and loosened debris would require mitigation in the unlikely event that the debris blanket BMP fails.

Caltrans biologists shall conduct a post construction survey of the rocky intertidal zone, as described in BIO-14. If direct impacts are identified, Caltrans in coordination with NOAA Fisheries Service, will mitigate the impacts by restoring the rocky intertidal zone with a 1:1 acreage ratio as explained in BIO-15. Compensatory mitigation is proposed if Caltrans is unable to perform the mitigation activities. These mitigation measures are intended to alleviate any impacts to the rocky intertidal zone that were created by project construction activities. The implementation of the mitigation measures would restore the habitat to pre-construction conditions and reduce impacts to the rocky intertidal zone to less than significant with mitigation.

Alternative 3 – No Build Alternative
The No Build Alternative would not change or introduce any new material into the habitats or individual species enlisted as threatened or endangered. The alternative will not impact EFH either, but rather maintain the same conditions as present. Therefore, no avoidance, minimization, and/or mitigation measures will be necessary.

2.19 Invasive Species

2.19.1 Regulatory Setting

On February 3, 1999, President William J. Clinton signed Executive Order (EO) 13112 requiring federal agencies to combat the introduction or spread of invasive species in the United States. The order defines invasive species as "any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem whose introduction does or is likely to cause economic or environmental harm or harm to human health." Federal Highway Administration (FHWA) guidance issued August 10, 1999 directs the use of the State's invasive species list, maintained by the California Invasive Species Council to define the invasive species that must be considered as part of the National Environmental Policy Act (NEPA) analysis for a proposed project.

2.19.2 Affected Environment

The Cal IPC inventory was reviewed to determine the invasive plants present in the project area. In addition to the inventory search, Caltrans biologists surveyed the project area in order to investigate the presence of invasive species, as summarized in both the NES (Caltrans Division of Environmental Planning) prepared on February 2018 and the NES (Amended) on October 2018. The project area at PM 4.0 was found to consist of primarily bare ground (60% ground cover), purple fountain grass (*Pennisetum setaceum*, 35% ground cover), and a mixture of laurel sumac (*Malosma laurina*) and lemonadeberry (*Rhus integrifolia*, 5% ground cover). The project area at PM 4.2 is made up of laurel sumac (*Malosma laurina*, 30%), lemonadeberry (*Rhus integrifolia*, 30% ground cover, and a mixture of purple fountain grass (*Pennisetum setaceum rubrum*) and tree tobacco (*Nicotiana glauca*, 40% ground cover). Purple fountain grass and tree tobacco are classified as invasive species by the California Invasive Species Advisory Committee.

The California Invasive Species Advisory Committee is a State-sponsored entity that was established in 2009 to inform and advise the Invasive Species Council of California on matters related to invasive species in the state. One of its tasks is to create a list of "invasive species [both plants and animals] that have a reasonable likelihood of entering or have entered California for which an exclusion, detection, eradication, control or management action by the state might be taken." [29]

The Cal-IPC is a 501(c)(3) nonprofit organization established in 1992 to protect California's lands and waters from ecologically damaging invasive plants. Cal-IPC maintains the California Invasive Plant Inventory,[30] which is a comprehensive list of invasive plants based on their ecological impacts. The

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[29] State of California. The California Invasive Species List. Website: http://www.iscc.ca.gov/species.html, accessed July 25, 2018.
[30] California Invasive Plant Council. California Invasive Plant Inventory. Website: http://cal-ipc.org/paf/, accessed on July 25, 2018.

plants on the list are also given a rating of “high”, “moderate”, “limited”, or “alert” to each species depending on the degree of threat it poses to natural plant and animal communities in California. Purple fountain grass and tree tobacco both contain Cal-IPC ratings of moderate.

2.19.3 Environmental Consequences

Alternative 1 – Cantilever Option

Construction of the secant wall with Alternative 1 – Cantilever Option will require minimal plant removal. If plants are growing in an area where the piles will be drilled, the plant will need to be removed. Based on the ground coverage percentages however, bare ground is more likely to be encountered at PM 4.0 and native plants are more likely to be encountered at PM 4.2. Invasive plants are less likely to be encountered. But if invasive plants are encountered, they will be removed which will inhibit the spread of invasive plants. Native plants will be planted when appropriate.

Invasive plants have the potential to be spread via entering and exiting construction vehicles and equipment that may have been contaminated by invasive plant species. Therefore, the following measures will be used to prevent the spread of invasive species:

BIO-14 All equipment and materials will be inspected for the presence of invasive species prior to use. In compliance with the EO 13112 and guidance from FHWA, replanting for landscaping and erosion control will not be done with any species listed as invasive. Furthermore, the area will be replanted with natives when appropriate, in order to promote healthy coastal sage scrub habitat.

BIO-15 All construction equipment shall be thoroughly washed at the construction yard before being transported to the project site to avoid spreading invasive to the project site.

Alternative 2 – Ground Anchor Option

Alternative 2 – Ground Anchor Option will require 4 feet of excavation for an area of about 25 feet wide and for the length of each wall (200 feet and 600 feet). This will cause invasive plants to be removed if they are encountered within the project excavation area. This alternative will be able to remove more invasive plants than Alternative 1 – Cantilever Option and further inhibit the spread of invasive plants.

Like Alternative 1 – Cantilever Option, invasive plants have the potential to be spread via entering and exiting construction vehicles and equipment that may have been contaminated by invasive plant species. The same project features INV-1 and INV-2 proposed for Alternative 1 – Cantilever Option are also proposed for Alternative 2 – Ground Anchor Option.

Alternative 3 – No Build Alternative

All existing conditions will remain and no impacts or improvements to invasive species would occur.

2.19.4 Avoidance, Minimization, and/or Mitigation Measures

Alternatives 1 and 2 – Build Alternatives

No avoidance, minimization, and/or mitigation measures would be required.

Alternative 3 – No Build Alternative

No avoidance, minimization, and/or mitigation measures would be required.

2.20 Cumulative Impacts

2.20.1 Regulatory Setting

Cumulative impacts are those that result from past, present, and reasonably foreseeable future actions, combined with the potential impacts of the proposed project. A cumulative effect assessment looks at the collective impacts posed by individual land use plans and projects. Cumulative impacts can result from individually minor but collectively substantial impacts taking place over a period of time.

Cumulative impacts to resources in the project area may result from residential, commercial, industrial, and highway development, as well as from agricultural development and the conversion to more intensive agricultural cultivation. These land use activities can degrade habitat and species diversity through consequences such as displacement and fragmentation of habitats and populations, alteration of hydrology, contamination, erosion, sedimentation, disruption of migration corridors, changes in water quality, and introduction or promotion of predators. They can also contribute to potential community impacts identified for the project, such as changes in community character, traffic patterns, housing availability, and employment.

The California Environmental Quality Act (CEQA) Guidelines Section 15130 describes when a cumulative impact analysis is necessary and what elements are necessary for an adequate discussion of cumulative impacts. The definition of cumulative impacts under CEQA can be found in Section 15355 of the CEQA Guidelines. A definition of cumulative impacts under the National Environmental Policy Act (NEPA) can be found in 40 Code of Federal Regulations (CFR) Section 1508.7.

2.20.2 Affected Environment

The proposed project involves the construction of two secant walls to protect PCH from slope erosion due to storm damage. The project would not pose any potential to influence growth or development into the surrounding undeveloped lands because it is not capacity increasing by design. In addition, the general project area along the roadway is spatially restricting with the Pacific Ocean to the west and the Santa Monica Mountains to the east. Projects are limited by the lack of space for construction due to the physical features within the area.

The land use designation of the proposed project also limits significant growth and development due to the Ventura County General Plan. The proposed project is located within an area zoned as open space in the Ventura County General Plan. The Ventura County Planning Division places heavy restrictions on new development within lands designated as Open Space to protect natural resources and maintain the rural character of the county's open lands. Development and population density is zoned to areas designated as cities within the county. Due to the land use restrictions and geographic setting within the area, few development projects are proposed in the area. As a result, agency websites for Ventura County Public Works and Ventura County Planning Division were reviewed on September 4, 2018 and no projects were found to be proposed within the area.

Proposed projects that are located within the general project area are: 6 projects by California Department of Parks and Recreation and 3 projects by Caltrans (Table 2.14). The 3 Caltrans improvement projects were identified to have the potential to contribute to localized cumulative impacts if the appropriate planning and implementation strategies are not deployed. Of the 3 projects, 2 are likely to commence construction after completion of this document's proposed project. The remaining project (EA 30330) would require close coordination to minimize short-term, cumulative effects that may result from consecutive work and construction activities.

2.20.3 Environmental Consequences

Selection of the project-specific resources to consider for cumulative effects analyses is based on the degree of impact. The resources that could potentially be directly or indirectly impacted by the proposed project are included in the following discussion. Resources that have little to no potential to be impacted by the proposed project either directly or indirectly, will not contribute to cumulative impacts and as such, are not evaluated or included in the following discussion.

Table 2.14 Projects within the Vicinity of the Proposed Project

Name of Development	Lead Agency	Proposed Use	Status	Distance from Project Area
Sycamore Canyon Entrance Improvements	California Department of Parks and Recreation	Planting native plants at the Sycamore Canyon campground public parking entrance area. Invasive weeds would be removed and native plants installed on the bare/disturbed areas to improve park aesthetics and habitat values.	Notice of Exemption certified on January 2018	Adjacent to project site
Electric Vehicle Charging Station Installations	California Department of Parks and Recreation	Installation of two electric vehicle chargers for California Department of Parks and Recreation fleet use within two maintenance yards. One maintenance yard being in Point Mugu State Park.	Notice of Exemption certified on December 2017	Adjacent to project site
Sycamore Cove Fire Rings	California Department of Parks and Recreation	Installation of four fire rings and three coal receptacles within Sycamore Cove campground. Two ADA accessible fire pits are also proposed.	Notice of Exemption certified on September 2017	Adjacent to project site
Point Mugu Upper Sycamore Canyon Trail Repair	California Department of Parks and Recreation	Repair an equestrian trail within upper Sycamore Canyon that was severely eroded after rain events following the 2013 Springs Fire, by constructing a retaining wall from native rock.	Notice of Exemption certified on October 2017	Adjacent to project site
Sycamore Cove Day Use Accessibility Improvements	California Department of Parks and Recreation	Construct accessibility improvements on the facilities within Point Mugu State Park. The improvements include, but are not limited to, modifications to: restroom shelters, portable restrooms, accessible parking, signage, paths of travel, water stations, showers, and trash receptacles.	Notice of Exemption certified on August 2017	Adjacent to project site
Automated Pay Machines at Point Mugu State Park	California Department of Parks and Recreation	Installation of seven automated pay machines (APM) in existing parking lots within Point Mugu State Park. One APM will be installed at Sycamore Canyon Campground and three installed within Sycamore Cove Beach.	Notice of Exemption certified on February 2016	Adjacent to project site
Big Sycamore Creek Project (EA 33350)	Caltrans	Replacement of the existing Rock Slope Protection and construction of a new seawall from post mile 4.5 to 4.6 on PCH. A secant wall to protect the abutments of Big Sycamore Bridge and stabilize the west side of the highway is also proposed.	Preliminary design phase starting in 2020	0.3 – 0.4 miles

Pavement Rehabilitation (EA 30330)	Caltrans	Cold planing of 0.2 feet of asphalt pavement and overlaying with 0.2 feet of rubberized hot mix asphalt from PM 0.0 – 4.4 along PCH. Replacement of Metal Beam Guard Rail with Midwest Guardrail System is also proposed.	Design phase completed on April 2018. Advertising to follow	Traverses project limits
Construct BMP's for Stormwater Mitigation (EA 32270)	Caltrans	Construction of storm water best management practices throughout the following locations in Ventura County PCH from PM 0.0 – 28.5, SR-101 from PM 22.0 – 43.6, SR-34 PM 4.3 – 17.7, and SR-150 PM 2.5 – 34.4.	Preliminary design phase in progress	Traverses project limits

Biological Environment

The project is located on PCH along the coastline with the Pacific Ocean to the west and the Santa Monica Mountains to the east. The project is proposed along cliff sides that terminate into the ocean at PM 4.0 and onto Sycamore Cove Beach at PM 4.2. The close proximity to the ocean and beach makes the project area sensitive to biological resources. At the base of the cliff side at PM 4.0 is black abalone habitat in the intertidal zone and kelp forest. Adjacent to PM 4.2 is Sycamore Cove Beach which is used by California grunion for spawning events. Within the general project area, bat surveys identified Mexican free-tailed bats to be present.

Impacts to California grunion and Mexican free-tailed bats would be avoided and/or minimal as a result of construction windows. Therefore, these two resources will not be analyzed for cumulative impacts because the proposed project itself would have a minimal impact on these two resources. The black abalone habitat and EFH will be analyzed for cumulative impacts because, although impacts will be reduced by the incorporation of BMPs, impacts would be substantial in the unlikely event that the BMPs fail.

The black abalone habitat and EFH at PM 4.0 could be impacted by increased sedimentation onto the habitats. These habitats have been subject to sedimentation loading due to landslides from the Santa Monica Mountains following the 2013 Camarillo Springs and wave induced slope erosion from extreme storm events. These impacts however are naturally caused and not project-related.

Nevertheless, this project was proposed to serve as a permanent solution for wave induced slope erosion. These habitats were possibly impacted when temporary projects were constructed. Caltrans project EA 4X370 deployed large boulders in the intertidal zone and base of the slope to dissipate wave energy for the stabilization of PCH, which had become compromised from severe storm events. The intertidal zone houses the black abalone habitat, and kelp forest is found at the base of the slope. It is possible that the habitats were buried from sedimentation from natural erosion, then the large boulders were placed over this sedimentation. In which case the project-related impacts on the black abalone habitat and kelp forest would be minimal because the naturally-caused impacts were so substantial.

Since construction of EA 4X370, the black abalone habitat and kelp forest have rebounded to healthy, rich habitats. This proposed project is designed to protect the health of the two sensitive habitats. A debris blanket BMP will be deployed and biological monitoring will be conducted. In the unlikely event that the debris blanket BMP fails, mitigation will be proposed. The other projects proposed within the area are not expected to impact these habitats because the projects are restricted to the roadway, not the cliff side. All projects mentioned in Table 2.14 are general maintenance projects that will not drastically alter the biological sensitive habitats. No capacity increasing projects are proposed in the foreseeable future. Therefore, these projects would not contribute to an adverse cumulative impact on biological resources.

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Chapter 3: California Environmental Quality Act (CEQA) Evaluation

3.1 Determining Significance Under CEQA

The proposed project is a joint project by the Caltrans and the Federal Highway Administration (FHWA) and is subject to state and federal environmental review requirements. Project documentation, therefore, has been prepared in compliance with both the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). FHWA's responsibility for environmental review, consultation, and any other actions required by applicable Federal environmental laws for this project are being, or have been, carried out by Caltrans pursuant to 23 United States Code Section 327 (23 USC 327) and the Memorandum of Understanding dated December 23, 2016 and executed by FHWA and Caltrans. Caltrans is the lead agency under CEQA and NEPA.

One of the primary differences between NEPA and CEQA is the way significance is determined. Under NEPA, significance is used to determine whether an EIS, or a lower level of documentation, will be required. NEPA requires that an EIS be prepared when the proposed federal action (project) *as a whole* has the potential to "significantly affect the quality of the human environment." The determination of significance is based on context and intensity. Some impacts determined to be significant under CEQA may not be of sufficient magnitude to be determined significant under NEPA. Under NEPA, once a decision is made regarding the need for an EIS, it is the magnitude of the impact that is evaluated and no judgment of its individual significance is deemed important for the text. NEPA does not require that a determination of significant impacts be stated in the environmental documents.

CEQA, on the other hand, does require Caltrans to identify each "significant effect on the environment" resulting from the project and ways to mitigate each significant effect. If the project may have a significant effect on any environmental resource, then an EIR must be prepared. Each and every significant effect on the environment must be disclosed in the EIR and mitigated if feasible. In addition, the CEQA Guidelines list a number of "mandatory findings of significance," which also require the preparation of an EIR. There are no types of actions under NEPA that parallel the findings of mandatory significance of CEQA. This chapter discusses the effects of this project and CEQA significance.

3.2 CEQA Environmental Checklist

This checklist identifies physical, biological, social, and economic factors that might be affected by the proposed project. In many cases, background studies performed in connection with the projects will indicate that there are no impacts to a particular resource. A NO IMPACT answer in the last column reflects this determination. The words "significant" and "significance" used throughout the following checklist are related to CEQA, not NEPA, impacts. The questions in this form are intended to encourage the thoughtful assessment of impacts and do not represent thresholds of significance.

Project features, which can include both design elements of the project, and standardized measures that are applied to all or most Caltrans projects such as BMPs and measures included in the Standard Plans and Specifications or as Standard Special Provisions, are considered to be an integral part of the project and have been considered prior to any significance determinations documented below; see Chapters 1 and 2 for a detailed discussion of these features. The annotations to this checklist are summaries of information contained in Chapter 2 in order to provide the reader with the rationale for significance determinations; for a more detailed discussion of the nature and extent of impacts, please see Chapter 2. This checklist incorporates by reference the information contained in Chapters 1 and 2.

3.2.1 Aesthetics

Would the project:	**Significant and Unavoidable Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☐	☒
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☒
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☐	☒
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☐	☒

a) No Impact: Although PCH is not considered a scenic highway because the County of Ventura has not sought designation, the highway does offer natural scenic vistas that are highly valued by travelers. The secant walls will be constructed to stand entirely underground which will not impact the scenic vista to the west, including the Pacific Ocean and beach front. The guardrails will be replaced only 2 inches taller than what was originally installed and is not expected to impact the motorist's views of the scenic vistas.

b) No Impact: No scenic resources within the eligible state scenic highway would be impacted.

c) No Impact: The existing visual character of the site will not be degraded because the proposed project would not block views of the scenic vistas and natural conditions will be restored.

d) No Impact: The project is not proposing any project features that involve lighting or would result in glares.

3.2.2 *Agriculture and Forest Services*

In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment Project; and the forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board.

Would the project:	Significant and Unavoidable Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☒
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?	☐	☐	☐	☒
d) Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☒
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☐	☒

a) No Impact: No Farmland exists within the project area.

b) No Impact: The zoning within the project area according to the Ventura County General Plan is recreational use, not agricultural use. There are no parcels under a Williamson Act contract within the project limits.

c) No Impact: The project area is not zoned as forest land or timberland. There are no forest or timberlands within the project limits.

d) No Impact: The proposed project would not result in the loss of forest land or convert forest land into non-forest land. There are no forest or timberlands within the project limits.

e) No Impact: The proposed project would not result in changes to the existing environment that would convert farmland into non-agricultural use or convert forest land into non-forest use.

3.2.3 Air Quality

Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations.				
Would the project:	**Significant and Unavoidable Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☒	☐
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☒	☐
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non- attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☐	☒	☐
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☒	☐
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☐	☒

a, b, c, d) Less Than Significant Impact: The proposed project is located in the South Central Coast Air Basin (SCCAB) and is within the jurisdiction of the Ventura County Air Pollution Control District (VCAPCD), which is the primary agency responsible for attaining state and federal air quality standards in the SCCAB. Therefore this project must comply with the VCAPCD Dust Implementation Rule 55 to minimize temporary emissions during project construction. Temporary construction emissions is the only air quality impact this project will impose because the project is not a capacity-increasing transportation project and will not have a permanent impact on traffic volumes. The project would generate a less than significant amount of pollutants during construction due to the very short duration of project construction (1 year).

For CEQA, the VCAPCD does not have construction air significance thresholds as construction-related emissions of reactive organic compounds and nitrogen oxides are not counted towards the two significance thresholds, since these emissions are temporary. The project is located in an area that is in non-attainment for State PM_{10} and ozone standards; and non-attainment for Federal ozone standard. The project is expected to have a neutral influence on both of these pollutants because the project is considered an exempt project pursuant to 40 CFR 93.126 and is not expected to result in a significant increase in the number of diesel vehicles or increase in vehicle idling that would impact PM_{10} emissions. In addition, the latest 2016 Air Quality Management Plan (AQMP) incorporates a comprehensive strategy aimed at controlling pollutions in an effort to bring the County in attainment of the applicable federal ozone standard by 2020. The 2016 AQMP control strategy consists of a local component implemented by the VCAPCD, including emission control measures from previous plans with new and further study emission control measures. These measures will be incorporated into the project as applicable to reduce ozone concentrations. Therefore the proposed project would not conflict with AQMP, violate any air quality standard, or result in a net increase of any criteria pollutants. No sensitive receptors exist within the project area, thus will not be exposed to substantial pollutants.

e) No Impact: Neither the constructed project or temporary construction activities are expected to emit any objectionable odors that would affect a substantial number of people.

3.2.4 Biological Resources

Would the project:	Significant and Unavoidable Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	☒	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or US Fish and Wildlife Service?	☐	☐	☒	☐
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☒	☐
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☒	☐
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☒	☐

a) Less Than Significant Impact: Suitable black abalone habitat was found within the intertidal zone by PM 4.0 where a secant wall is proposed. Black abalone surveys were conducted by biologists from Caltrans, private consultants, and NOAA Fisheries Service. Black abalone were found absent from this location. However, in order to protect the intertidal zone where the black abalone habitat exists, a debris blanket with silt fencing will be installed to prevent loose debris from degrading the habitat. Biological monitoring will be conducted to ensure that the debris blanket BMP is installed and fully functional for secant wall construction. With selection and through the better understanding of Alternative 1 – Cantilever Option, the impacts to the habitat would be less than significant and therefore mitigation is no longer proposed. Impacts to the black abalone habitat would be reduced to less than significant with the inclusion of the debris blanket project feature.

The California least tern and Western snowy plover nest and winter on sandy beaches along the California coastline. The sandy beach on Sycamore Cove Beach meets the habitat criteria of both endangered species. Although neither bird species are known to occur at this small beach for nesting or roosting, suitable habitat is present and preconstruction nesting bird surveys will be conducted to ensure that no nests or endangered birds would be impacted during construction. As such, impacts to the California least tern and Wester snowy plovers is expected to be less than significant.

The Mexican free-tailed bat is known to roost in rocky caves. The species was identified during a bat survey conducted by Caltrans biologist and is found to potentially roost in close proximity to the project during construction. The project area contains several rocky cliffs, cliff faces, and crevices that the bat species can use for roosting. Cable net meshing is also proposed along the mountain side of the northbound PCH to prevent rock fall from impacting commuters during construction traffic management. In order to prevent construction activities from affecting the bat, several project features have been proposed to minimize and avoid impacts as described in Section 2.17 Animal Species. These project features would reduce impacts to the bat species to less than significant.

b) Less Than Significant Impact: The CNDDB Species list showed EFH is present within the project area. Kelp forest exists within ocean and borders the intertidal zone at PM 4.0. Kelp forest is classified as 3 types of EFH: Groundfish Essential Fish Habitat, Coastal Pelagic Essential Fish Habitat, and Highly Migratory Essential Fish Habitat. Kelp forests harbor a wider variety of diverse plants and animals than almost any other ocean community. Many organisms, especially fish, use kelp forests as safe shelter from predators or rough storms and are a good source of food. The project may impact the kelp forest at PM 4.0 by introducing loosened dirt from the excavated slope face into the waterway. The additional dirt and debris can impact the kelp forest by increasing turbidity and physically burying the kelp. These impacts can hinder kelp-growth as a short-term effect. In order to reduce impacts to less than significant, dirt must be restricted from entering the waterway and potentially impacting the kelp forest. Therefore, a project feature to minimize impacts was included into the project scope as mentioned in Section 2.18 Threatened and Endangered Species. The project feature calls for a debris blanket and fencing to be installed to hold the debris on the slope, where it can be easily removed and discarded. From this added project feature, the impacts to sensitive natural communities was reduced to less than significant.

c) Less Than Significant Impact: Section 404 of the Clean Water Act requires a permit before dredged or fill material may be discharged into waters of the United States. The construction activities required for the proposed project does not have the potential to intentionally discharge dredged material into the Pacific Ocean, which is a water of the United States. The proposed project has the potential to release incidental fallback into the Pacific Ocean but that is not regulated under Section 404. Therefore, after coordination with the USACE, a Section 404 permit was found not needed for the proposed project. Nonetheless a debris blanket and fencing would still be installed along the slope to slow and hold debris in place so that less debris is discharged into the ocean. Reducing the amount of loose soil and debris from entering the Pacific Ocean creates the adverse effect to Section 404 waters less than significant.

d) <u>Less Than Significant Impact</u>: California grunion are native fish that use sandy beaches to spawn. Grunion surveys determined California grunions using Sycamore Cove Beach adjacent to PM 4.2 for spawning activities. Construction of the secant wall at PM 4.2 was expected to potentially impact the California grunion spawning habitat due to excavation of the slope, however after selection of Alternative 1 – Cantilever Option the habitat is not at risk of becoming degraded. The alternative will not involve excavation of the slope, consequently large amounts of sedimentation cannot land on the beach during construction. Impacts to the California grunion is less than significant because debris does not have the potential to land on the California grunion when they are out of the water and on the beach during spawning events.

e) <u>No Impact</u>: The Ventura County LCP grants certain protections to trees classified as protected trees within the coastal zone of the county. The plan has a Tree Protection Goal of "protect trees that function as important biological, watershed, visual beauty, provide historic resources within coastal areas of Ventura County." None of the alternatives propose removal of a protected tree, as defined in the Ventura County LCP. The proposed project would have no impact on local policies or ordinances protecting biological resources.

f) <u>Less Than Significant Impact</u>: No habitat conservation plan or natural community conservation plan are designated within the project impact area. However, the project is found within the CEHC, as described in Section 2.14 Natural Communities. The CEHC works to identify large expansions of intact habitat or natural landscape and identify linkages between them, in an effort to conserve wildlife corridors. A map will be created from the information gathered by the CEHC Project. The CEHC Project is not a habitat conservation plan but results from the CEHC Project are intended to be used to inform conservation plans[31]. Therefore, the information generated from the CEHC is important for conservation plans and the CEHC map represents wildlife corridors within Caltrans which should not be restricted. The proposed project site is located at the very edge of the CEHC map and was not found to prevent wildlife movement within the CEHC. The proposed project would have a less than significant impact on any habitat or natural community conservation plan or the CEHC map.

[31] https://www.wildlife.ca.gov/conservation/planning/connectivity/CEHC. Accessed on July 25, 2018.

3.2.5 Cultural Resources

Would the project:	Significant and Unavoidable Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	☐	☐	☐	☒
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	☐	☐	☒	☐
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☒
d) Disturb any human remains, including those interred outside of dedicated cemeteries?	☐	☐	☒	☐

a) No Impact: After consultation with the various databases and sources mentioned in Chapter 2 Cultural Resources, the APE was not found to contain any historic, architectural, or archaeological resources. It was determined that there are no National Register of Historic Places listed or eligible cultural resources, within the project's APE. As a result, no cultural resources qualify as historical resources pursuant to CEQA, or are exempt per the Section 106 Programmatic Agreement. No built environment resources exist within the APE and none were evaluated. This is reflected in the No Historic Properties Affected finding made in the project's HPSR.

b) Less than Significant Impact: The area surrounding the APE contains archaeological resources because the general coastal area in Ventura County was heavily used by Native Americans. The landscape contained woodland and coastal habitats with an abundance of resources that supported the Chumash Indians. The project's actual APE was thoroughly reviewed with archival research, Native American consultation, and a field survey by Caltrans archaeologist. After completion of the research, the project's APE was not found to contain any archaeological resources. The project location is outside of the known Native American sites and the area had been altered when PCH was first constructed in the 1920's.

However, there is always a potential for previously undocumented cultural materials to be unearthed during construction activities. It is Caltrans' policy that if cultural materials are discovered during construction, all earth-moving activity within and around the immediate discovery area be halted until a qualified archaeologist can assess the nature and significance of the find. Potential effects to these materials would be avoided and/or minimized with the inclusion of project feature CUL-1 mentioned in Section 2.7 Cultural Resources. Therefore, any impacts would be less than significant.

c) No Impact: Paleontological resources or unique geological features were not found within the APE, after review of databases and field survey. Therefore, the project does not have the potential to impact such resources.

d) Less Than Significant Impact: As discussed in Section 2.7 Cultural Resources, the area was highly disturbed during the creation of PCH which makes the area unlikely for encountering human remains during construction. After investigation of the APE, it was determined that there is no potential to encounter human remains during project construction. however, there is always a potential for previously undocumented cultural materials or human remains to be unearthed during excavation activities. If human remains are discovered, the State of California Health and Safety Code (H&SC) Section 7050.5 states that further disturbances and activities shall stop in any area or nearby area suspected to overlie remains, and the County Coroner contacted. If the remains are thought by the coroner to be Native American, the coroner will notify the Native American Heritage Commission (NAHC), who, pursuant to PRC Section 5097.98, will then notify the Most Likely Descendent (MLD). At this time, the Caltrans Resident Engineer will contact Caltrans District 7 Environmental Branch so that they may work with the MLD on the respectful treatment and disposition of the remains. Therefore, any potential impacts to human remains would be less than significant.

3.2.6 Geology and Soils

Would the project:	Significant and Unavoidable Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42?	☐	☐	☐	☒
ii) Strong seismic ground shaking?	☐	☐	☐	☒
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☐	☒
iv) Landslides?	☐	☐	☐	☒
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☒	☐
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	☐	☐	☒

d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☐	☒
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	☐	☐	☐	☒

i. No Impact: The project is not expected to rupture a known fault anywhere within the vicinity.

ii. No Impact: The project site is located within a seismically active area in which the Santa Monica Mountains are actively undergoing compressing. The constructed project may experience seismic activity, however the project is not expected to be a potential risk of loss, injury, or death because the secant walls would exist entirely submerged underground.

iii. No Impact: The construction project may experience seismic activity and even liquefaction, but because the secant walls would exist underground, they would not be a potential risk of loss, injury, or death.

iv. No Impact: The surrounding Santa Monica Mountains make the project area vulnerable to landslides during heavy rain events, especially rainy seasons that follow intense wildfires. Landslides can move large amounts of soil on top of the already submerged proposed secant walls. The secant walls are designed to uphold and support the slope of PCH. The landslide would add additional load to the wall however since the walls would be constructed underground, the load is expected to be sustained by the wall. Therefore there would be no impact to loss, injury or death involving landslide.

b) Less Than Significant Impact: The project would not result in substantial soil erosion. The intent of the proposed project is to prevent soil erosion from the slope of PCH. The project would prevent destructive slope erosion from continuously impacting the project area and further eroding the coastline. During construction, excavated soil in the construction areas would be exposed and there would be an increased potential erosion, especially during a storm event. Project construction would use debris blankets and other erosion/debris control measures to hold loosened debris on the slope. Additionally construction will last 1 year so the exposure of the construction areas would be short-term.

   In terms of top soil, the 2 build alternatives differ in their impacts. Alternative 1 – Cantilever Option would only remove the top soil that is the diameter of the piles and needed to construct the piles for the secant walls. Alternative 2 – Ground Anchor Option would require the face and top of the slope to be removed for installation of the anchor. The top soil would be removed and replaced with fill soil, although soil from the site would be reused as appropriate. These impacts to topsoil are considered to be less than significant because the amount of topsoil removed would only be the length and width of the walls.

c) No Impact: The soil within the project site was found stable enough to construct the secant walls. The soil is not located on a geologic unit that is unstable or have the potential to become unstable from result of the project.

d) No Impact: The project area is not located on expansive soils; therefore the project would not have substantial risks to life or property.

e) No Impact: The project is located in an area that is underdeveloped, without community residents. The project site itself is on the roadway, abutting the Pacific Ocean. This immediate project area does not contain septic tanks or alternative waste water disposal systems. The ability for these soils to contain the possibility of supporting septic tanks or alternative waste water disposal systems is mute because the area would not be used in this manner in the future as a result of the proposed project.

3.2.7 Greenhouse Gas Emissions

Would the project:	**Significant and Unavoidable Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	Caltrans has used the best available information based to the extent possible on scientific and factual information, to describe, calculate, or estimate the amount of greenhouse gas emissions that may occur related to this project. The analysis included in the climate change section of this document provides the public and decision-makers as much information about the project as possible. It is Caltrans' determination that in the absence of statewide-adopted thresholds or GHG emissions limits, it is too speculative to make a significance determination regarding an individual project's direct and indirect impacts with respect to global climate change. Caltrans remains committed to implementing measures to reduce the potential effects of the project. These measures are outlined in the climate change section that follows the CEQA checklist and related discussions.			
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?				

3.2.8 Hazards and Hazardous Materials

Would the project:	**Significant and Unavoidable Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☒	☐
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☒	☐

c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☒

a) Less Than Significant Impact: The proposed project will involve ADL contaminated soil, removal of yellow/white traffic paint, treated wood waste, and electrical equipment. These materials will need to be disposed of at an off-site disposal facility. Exposure to contaminants can be managed to minimal exposure or full avoidance by adhering to protocol for the removal, handling, and disposal of such materials.

b) Less Than Significant Impact: Vehicles traveling on highways while transporting hazardous substances, always have the potential to spill and impact the roadway and/or adjacent properties and resources. PCH however is a coastal 2 lane highway that is used more for coastal access and scenic views than transportation. Also, the windy roadway does not make it ideal for truck transportation. Therefore, the likelihood of the project posing a significant hazard to the public due to accident conditions is low and a less than significant impact.

c) No Impact: No existing or proposed schools are located within a 0.25-mile radius of the project location. Therefore, hazardous materials would not be emitted or handled within a 0.25 radius of an existing or proposed school.

d) No Impact: Government Code section 65962.5 requires the California Environmental Protection Agency to develop at least annually an updated Hazardous Waste and Substances Sites (Cortese) List[32]. The Cortese List is a planning document used by the State, local agencies, and developers to comply with CEQA requirements in providing information about the location of hazardous

[32] https://www.dtsc.ca.gov/SiteCleanup/Cortese_List.cfm. Accessed on July 30, 2018

materials release sites. The project is not located on a site that is included in the Cortese List and therefore, not cause a significant hazard to the public or the environment.

e) No Impact: The nearest airport is Santa Paula Airport, located about 40 miles from the project site. The project is not located on airport land or within 2 miles of a public (or public use) airport that would result in a safety hazard for people residing or working in the project area.

f) No Impact: The project is not within the vicinity of a private airstrip.

g) No Impact: PCH will remain open by paving the northbound shoulder of PCH and utilizing this area as a travel through lane. This will allow PCH to remain available for access in any established emergency response/evacuation plan.

h) No Impact: The project proposes to construct secant walls to reinforce the stability of the slope upholding PCH. Construction or operation of the project would not expose people or structures to a significant risk of loss, injury, or death involving wildland fires.

3.2.9 Hydrology and Water Quality

Would the project:	**Significant and Unavoidable Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Violate any water quality standards or waste discharge requirements?	☐	☐	☒	☐
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☒	☐
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☐	☐	☐	☒
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	☐	☐	☐	☒
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☒	☐
f) Otherwise substantially degrade water quality?	☐	☐	☒	☐

g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	☒
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☒
j) Inundation by seiche, tsunami, or mudflow	☐	☐	☐	☒

a) Less Than Significant Impact: The project will require a 401 Water Quality Certification from the Water Control Board. The certification requires that all project activities comply with applicable water quality standards and limitations. Caltrans has and will continue to coordinate with the Water Control Board to ensure that appropriate measures to meet water quality standards are met during project construction. Therefore, water quality standards and waste discharges would not be violated as a result of careful coordination.

b) Less Than Significant Impact: During construction of the secant walls, drilling will be required. Due to the high-water table level at the project location, dewatering will likely be needed to complete drilling for the cast-in-drill hole piles. Dewatering will be temporary and only done to the extent needed for drilling. The amount of dewatering required is not expected to substantially deplete groundwater supplies. In addition, the constructed secant walls will not substantially interfere with groundwater recharge.

c) No Impact: The project would not alter the existing drainage pattern of the area that would cause substantial erosion or siltation either on or off-site.

d) No Impact: The project would not alter the existing drainage pattern of the area that would increase the rate or amount of surface run-off to produce flooding either on or off-site.

e) Less Than Significant Impact: No additional runoff water would contribute to the existing drainage system since the amount of impervious surfaces would not increase. The project would contribute as a point source for polluted runoff during construction. Construction would involve earth-moving activities that have the possibility of adding soil to runoff. To reduce the amount of loose soil that can be washed into runoff, a debris blanket would be used to hold the soil in place. Other measures to reduce soil from entering runoff during construction would be considered and discussed among the Caltrans project development team.

f) Less Than Significant Impact: See above response to e).

g) No Impact: The project would have no effect on placement of housing within a 100-year flood hazard area.

h) No Impact: The project is not located within a 100-year flood hazard area, therefore the constructed secant walls would not be constructed in a 100-year flood hazard area that could potentially impede or redirect flood flows.

i) No Impact: The secant walls would be constructed underground and intended to support the slope of PCH. The project would not expose people or structures to some sort of flood risk, including a risk of a failed levee or dam.

j) No Impact: The project is found within an area that would be inundated by seiche, tsunami, or mudflow. However the construction of the project would have no impact or influence on the natural disasters because the secant walls would be underground and used for structural purposes.

3.2.10 Land Use and Planning

Would the project:	Significant and Unavoidable Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Physically divide an established community?	☐	☐	☐	☒
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☒
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☒	☐

a) No Impact: The proposed project will not physically divide an established community within the project area.

b) No Impact: The proposed project is consistent with the land use goals, policies and regulations established in the Ventura County General Plan and Ventura County Coastal Area Plan, that both cover the project area.

c) Less Than Significant Impact: See the above mentioned f) response in the Biological Resources section of Chapter 3.

3.2.11 Mineral Resources

Would the project:	Significant and Unavoidable Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☒

a) No Impact: The project would not result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state.

b) No Impact: The project scope would not impact a mineral resource recovery site.

3.2.12 Noise

Would the project result in:	Significant and Unavoidable Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☐	☒
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☐	☒
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

a) No Impact: Project construction would not create a permanent increase in noise levels or not adhere to policies within the Ventura County General Plan. Post-construction noise levels would remain consistent with pre-construction noise levels. The project would have no impact on standards in the local general plan or noise ordinance, or applicable standards of agencies.

b) No Impact: No sensitive human noise receptors were identified within the project vicinity and no excessive groundborne vibration is expected for project construction.

c) No Impact: The project will not produce a permanent increase in ambient noise levels within the project vicinity. The noise level within the area will return to pre-construction conditions.

d) Less Than Significant Impact: During construction, the project area will experience a 3-4 dBA increase from ambient noise levels. This increase is considered a less than significant impact on human receptors according to Caltrans' Traffic Noise Analysis Protocol for New Highway Construction and Reconstruction Projects (May 2011), that states 12dBA as a substantial increase. Therefore, the construction noise is considered a less than significant impact on human receptors.

e) No Impact: The closest airport is Santa Paula Airport, located 40 miles from the project area. The project would not expose people within the project area to excessive noise levels.

f) No Impact: The project is not within the vicinity of a private airstrip.

3.2.13 Population and Housing

Would the project:	Significant and Unavoidable Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

a) No Impact: The project would not increase capacity of existing transportation facilities and would not induce local or regional growth. Therefore, the project would not result in direct or indirect population growth in the area.

b) No Impact: The project would not require any right-of-way acquisitions or cause displacement of communities. Therefore, the project would not result in impacts to housing.

c) No Impact: Residential communities are not found within the project vicinity and the project would not impact a community that would require replacement housing.

3.2.14 Public Services

	Significant and Unavoidable Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	☒

a) No Impact: The proposed project is not expected to increase the use of recreational facilities, such as camping or hiking in Sycamore Canyon Campground or the Santa Monica Mountains Recreation Area. The project scope proposes permanent restoration on the slope upholding PCH. The project will help protect the roadway from deterioration due to erosion and will help secure future access to these recreational facilities. But the project itself will not contribute to an increase in the use of recreational facilities.

b) No Impact: The project scope does not include or propose construction of recreational facilities, which might have an adverse physical effect on the environment.

3.2.15 Recreation

a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:	Significant and Unavoidable Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
Fire protection?	☐	☐	☐	☒
Police protection?	☐	☐	☐	☒
Schools?	☐	☐	☐	☒
Parks?	☐	☐	☒	☐
Other public facilities?	☐	☐	☐	☒

a) <u>No Impact:</u> The proposed project would not impact fire protection for the area. PCH would remain open and available for motorists to utilize, including public service vehicles.

b) <u>No Impact:</u> The proposed project would not impact police protection for the area; please see the above letter (a).

c) <u>No Impact:</u> Schools are not located within or near the project area.

d) <u>Less Than Significant Impact:</u> Temporary construction easement from Point Mugu State Park will be required for both build alternatives. Coordination with State Parks has been initiated, as delegated in Section 4(f) of the U.S. Department of Transportation Act of 1966. Sycamore Cove Beach of Point Mugu State Park will remain open during construction to the public and operate as normal. The only areas that would be closed to access are the areas designated for TCE, as they will contain construction equipment and staging. The project will have a less than significant impact on the park.

e) <u>No Impact:</u> No other public facilities would be impacted as a result of the proposed project.

3.2.16 *Transportation/Traffic*

Would the project:	Significant and Unavoidable Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?	☐	☐	☐	☒
b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?	☐	☐	☐	☒
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒
e) Result in inadequate emergency access?	☐	☐	☐	☒
f) Conflict with adopted policies, plans or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?	☐	☐	☐	☒

a) No Impact: The proposed project would not conflict with any applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system. The project is only proposing to stabilize the highway and provide permanent protection from the damaging effects of slope erosion. The performance of the circulation is unrelated to the scope of the proposed project.

b) No Impact: The proposed project would not conflict with an applicable congestion management plan.

c) No Impact: Air traffic patterns would not be changed as a result of the project.

d) No Impact: The completion of this project will not change the alignment of the roadway or uses of the project area, nor will there be a substantial increase of hazards due to a design feature.

e) No Impact: The highway would remain open with 1 travel lanes in each direction. Emergency vehicles will be able to safely travel through the project area, as previously done prior to construction.

f) <u>No Impact:</u> In the 2017 Plan for Improved Agency Partnering between Caltrans and the Commission, the California Coastal Trail is proposed through the project as mentioned in Section 2.2 Coastal Zone. Incorporation of the California Coastal Trail is outside the scope of the proposed project, however the proposed project does not impede future construction of the trail. The proposed project would actually preserve travel on PCH by protecting the roadway from slope erosion. Although the shoulder on northbound PCH would be paved as a result of the project's traffic management plan, the shoulder cannot remain open and accessible after construction due to the risk of rock fall from the mountain. By restricting access to the northbound shoulder, safety along PCH will not be compromised or decreased. The through lanes within the project area will remain serviceable after construction.

3.2.17 Tribal Cultural Resources

Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:	Significant and Unavoidable Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or	☐	☐	☐	☒
b) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resource Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.	☐	☐	☐	☒

a) <u>No Impact:</u> A Sacred Lands File Search was made to the NAHC to determine whether any Native American sacred sites exist within the project area. The search found no Native American sacred sites to exist within the APE, including cultural resources listed or eligible for listing in the California Register of Historical Resources or in a local register of historical resources.

b) <u>No Impact:</u> As described in Chapter 2.7 Cultural Resources, although the Sacred Lands File Search found no sacred sites within the APE, the NAHC recommended Caltrans contact 6 individuals that may have knowledge of cultural resources within the project vicinity. The 6 individuals were contacted but none provided specific archaeological site information (See Chapter 4.2.4 Native American Coordination). Therefore, the lead agency determined no significant tribal cultural resources to exist within the APE.

3.2.18 Utilities and Service Systems

Would the project:	Significant and Unavoidable Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☒
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☒
e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☒
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	☒
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☒

a) No Impact: The project does not propose nor necessitate incrementally expanding wastewater treatment facilities. Water discharge from project construction would be minimal and reduced by WQ-1. Therefore, wastewater treatment requirements of the applicable Regional Water Quality Control Board would not be exceeded.

b) No Impact: The project deals entirely with constructing secant walls for slope stability. The secant walls would not have an impact on wastewater treatment facilities, including construction of new water or wastewater treatment facilities.

c) No Impact: The project would not necessitate construction of new or expansion of existing storm water drainage facilities. The existing drainage system within the project limits would be retained to current conditions and the project would not require capacity enhancements to the existing drainage system.

d) No Impact: The project is a slope protection project for PCH and would not require a substantially greater water supply. Water would be needed during construction but is considered insignificant because the water supply available in the area is sufficient.

e) No Impact: The proposed project would not require a substantial amount of wastewater to be processed by the area's wastewater treatment facility. An increase of wastewater treatment capacity will not be necessary; therefore, no impact would occur.

f) No Impact: The construction or operation of the project would not require a substantially greater landfill accommodation. An increase of landfill capacity will not be necessary.

g) No Impact: The proposed project would not conflict with federal, state, or local statutes and regulations relating to solid waste. All statutes and regulations would be abided by and no impact would occur.

3.2.19 Mandatory Findings of Significance

	Significant and Unavoidable Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☒	☐	☐
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☐	☐	☒	☐
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☒	☐

a) Less Than Significant with Mitigation Incorporated: The project site at PM 4.0 contains habitat for the endangered black abalone and kelp forest which is EFH. These two habitats could be impacted by excavation that causes sedimentation to enter the waterway creating turbidity and physically burying the habitats. These construction impacts could be significant if the sedimentation enters the waterway without any restrictive measures. Caltrans proposes in its project features to deploy a debris blanket with silt fencing along the slope of this location. The BMP would be designed to hang off the slope and catch loosened debris excavated from the top of the slope. Both alternatives propose the deployment of the BMP. The debris blanket BMP would reduce impacts to the black abalone habitat and EFH to less than significant for both alternatives. However, in the unlikely event that the debris blanket BMP completely fail, direct impacts to the black abalone habitat would be substantial because a considerable amount of sedimentation will enter the waterway and the habitat. Caltrans is proposing mitigation for both build alternatives if post construction surveys reveal that construction activities have impacted the black abalone habitat. Mitigation would be applied as described in Section 2.18 Threatened and Endangered Species to reduce impacts to less than significant with mitigation.

b) Less Than Significant Impact: A cumulative impact could occur if the proposed project would result in an incrementally considerable contribution to a significant cumulative impact in consideration of past, present, and reasonable foreseeable future projects. As discussed in the above sections, the project would not result in any unavoidable significant impacts, nor would it result in a cumulatively considerable impact on any resource area. The area is located in a rural, fairly secluded area that, as mentioned in Section 2.20 Cumulative Impacts, the projects proposed in the area are general maintenance projects that would not create a significant cumulative impact when considered this proposed project. In addition, the past projects include temporary actions to prevent slope erosion from wave impacts. This project would serve as a permanent solution to stabilize the slope and roadway. As such, the proposed project would not create cumulative significant impacts.

c) Less Than Significant Impact: The proposed project would not result in significant project-level impacts that could directly affect human health, including hazardous materials, air quality, water quality, or additional risk of geological hazards. Therefore, the proposed project would result in a less than significant impact.

3.3 Climate Change

Climate change refers to long-term changes in temperature, precipitation, wind patterns, and other elements of the earth's climate system. An ever-increasing body of scientific research attributes these climatological changes to GHG emissions, particularly those generated from the production and use of fossil fuels.

While climate change has been a concern for several decades, the establishment of the Intergovernmental Panel on Climate Change (IPCC) by the United Nations and World Meteorological Organization in 1988 has led to increased efforts devoted to GHG emissions reduction and climate change research and policy. These efforts are primarily concerned with the emissions of GHGs generated by human activity, including carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), tetrafluoromethane, hexafluoroethane, sulfur hexafluoride (SF_6), HFC-23 (fluoroform), HFC-134a (1,1,1, 2-tetrafluoroethane), and HFC-152a (difluoroethane).

In the U.S., the main source of GHG emissions is electricity generation, followed by transportation.[33] In California, however, transportation sources (including passenger cars, light-duty trucks, other trucks, buses, and motorcycles) are the largest contributors of GHG emissions.[34] The dominant GHG emitted is CO_2, mostly from fossil fuel combustion.

Two terms are typically used when discussing how we address the impacts of climate change: “greenhouse gas mitigation” and “adaptation.” Greenhouse gas mitigation covers the activities and policies aimed at reducing GHG emissions to limit or “mitigate” the impacts of climate change. Adaptation, on the other hand, is concerned with planning for and responding to impacts resulting from climate change (such as adjusting transportation design standards to withstand more intense storms and higher sea levels).

3.3.1 Regulatory Setting

This section outlines federal and state efforts to comprehensively reduce GHG emissions from transportation sources.

Federal

To date, no national standards have been established for nationwide mobile-source GHG reduction targets, nor have any regulations or legislation been enacted specifically to address climate change and GHG emissions reduction at the project level.

The National Environmental Policy Act (NEPA) (42 United States Code [USC] Part 4332) requires federal agencies to assess the environmental effects of their proposed actions prior to making a decision on the action or project.

The Federal Highway Administration (FHWA) recognizes the threats that extreme weather, sea-level change, and other changes in environmental conditions pose to valuable transportation infrastructure and those who depend on it. FHWA therefore supports a sustainability approach that assesses vulnerability to climate risks and incorporates resilience into planning, asset management, project development and design, and operations and maintenance practices.[35] This approach encourages

33 https://www.epa.gov/ghgemissions/us-greenhouse-gas-inventory-report-1990-2014
34 https://www.arb.ca.gov/cc/inventory/data/data.htm
35 https://www.fhwa.dot.gov/environment/sustainability/resilience/

planning for sustainable highways by addressing climate risks while balancing environmental, economic, and social values—"the triple bottom line of sustainability."[36] Program and project elements that foster sustainability and resilience also support economic vitality and global efficiency, increase safety and mobility, enhance the environment, promote energy conservation, and improve the quality of life. Addressing these factors up front in the planning process will assist in decision-making and improve efficiency at the program level, and will inform the analysis and stewardship needs of project-level decision-making.

Various efforts have been promulgated at the federal level to improve fuel economy and energy efficiency to address climate change and its associated effects.

The Energy Policy Act of 1992 (EPACT92, 102nd Congress H.R.776.ENR): With this act, Congress set goals, created mandates, and amended utility laws to increase clean energy use and improve overall energy efficiency in the United States. EPACT92 consists of 27 titles detailing various measures designed to lessen the nation's dependence on imported energy, provide incentives for clean and renewable energy, and promote energy conservation in buildings. Title III of EPACT92 addresses alternative fuels. It gave the U.S. Department of Energy administrative power to regulate the minimum number of light-duty alternative fuel vehicles required in certain federal fleets beginning in fiscal year 1993. The primary goal of the Program is to cut petroleum use in the United States by 2.5 billion gallons per year by 2020.

Energy Policy Act of 2005 (109th Congress H.R.6 (2005–2006): This act sets forth an energy research and development program covering: (1) energy efficiency; (2) renewable energy; (3) oil and gas; (4) coal; (5) Indian energy; (6) nuclear matters and security; (7) vehicles and motor fuels, including ethanol; (8) hydrogen; (9) electricity; (10) energy tax incentives; (11) hydropower and geothermal energy; and (12) climate change technology.

Energy Policy and Conservation Act of 1975 (42 USC Section 6201) and Corporate Average Fuel Standards: This act establishes fuel economy standards for on-road motor vehicles sold in the United States. Compliance with federal fuel economy standards is determined through the Corporate Average Fuel Economy (CAFE) program on the basis of each manufacturer's average fuel economy for the portion of its vehicles produced for sale in the United States.

U.S. EPA's authority to regulate GHG emissions stems from the U.S. Supreme Court decision in *Massachusetts* v. *EPA* (2007). The Supreme Court ruled that GHGs meet the definition of air pollutants under the existing Clean Air Act and must be regulated if these gases could be reasonably anticipated to endanger public health or welfare. Responding to the Court's ruling, U.S. EPA finalized an endangerment finding in December 2009. Based on scientific evidence it found that six GHGs constitute a threat to public health and welfare. Thus, it is the Supreme Court's interpretation of the existing Act and EPA's assessment of the scientific evidence that form the basis for EPA's regulatory actions.

U.S. EPA in conjunction with the National Highway Traffic Safety Administration (NHTSA) issued the first of a series of GHG emission standards for new cars and light-duty vehicles in April 2010[37] and significantly increased the fuel economy of all new passenger cars and light trucks sold in the United States. The standards required these vehicles to meet an average fuel economy of 34.1 miles per gallon by 2016. In August 2012, the federal government adopted the second rule that increases fuel economy

[36] https://www.sustainablehighways.dot.gov/overview.aspx
[37] https://one.nhtsa.gov/Laws-&-Regulations/CAFE-%E2%80%93-Fuel-Economy

for the fleet of passenger cars, light-duty trucks, and medium-duty passenger vehicles for model years 2017 and beyond to average fuel economy of 54.5 miles per gallon by 2025. Because NHTSA cannot set standards beyond model year 2021 due to statutory obligations and the rules' long timeframe, a mid-term evaluation is included in the rule. The Mid-Term Evaluation is the overarching process by which NHTSA, EPA, and ARB will decide on CAFE and GHG emissions standard stringency for model years 2022–2025. NHTSA has not formally adopted standards for model years 2022 through 2025. However, the EPA finalized its mid-term review in January 2017, affirming that the target fleet average of at least 54.5 miles per gallon by 2025 was appropriate. In March 2017, President Trump ordered EPA to reopen the review and reconsider the mileage target.[38]

NHTSA and EPA issued a Final Rule for "Phase 2" for medium- and heavy-duty vehicles to improve fuel efficiency and cut carbon pollution in October 2016. The agencies estimate that the standards will save up to 2 billion barrels of oil and reduce CO_2 emissions by up to 1.1 billion metric tons over the lifetimes of model year 2018–2027 vehicles.

State

With the passage of legislation including State Senate and Assembly bills and executive orders, California has been innovative and proactive in addressing GHG emissions and climate change.

Assembly Bill 1493, Pavley Vehicular Emissions: Greenhouse Gases, 2002: This bill requires the California Air Resources Board (ARB) to develop and implement regulations to reduce automobile and light truck GHG emissions. These stricter emissions standards were designed to apply to automobiles and light trucks beginning with the 2009-model year.

Executive Order S-3-05 (June 1, 2005): The goal of this executive order (EO) is to reduce California's GHG emissions to: (1) year 2000 levels by 2010, (2) year 1990 levels by 2020, and (3) 80 percent below year 1990 levels by 2050. This goal was further reinforced with the passage of Assembly Bill 32 in 2006 and SB 32 in 2016.

Assembly Bill 32 (AB 32), Chapter 488, 2006: Núñez and Pavley, The Global Warming Solutions Act of 2006: AB 32 codified the 2020 GHG emissions reduction goals as outlined in EO S-3-05, while further mandating that ARB create a scoping plan and implement rules to achieve "real, quantifiable, cost-effective reductions of greenhouse gases." The Legislature also intended that the statewide GHG emissions limit continue in existence and be used to maintain and continue reductions in emissions of GHGs beyond 2020 (Health and Safety Code Section 38551(b)). The law requires ARB to adopt rules and regulations in an open public process to achieve the maximum technologically feasible and cost-effective GHG reductions.

Executive Order S-01-07 (January 18, 2007): This order sets forth the low carbon fuel standard (LCFS) for California. Under this EO, the carbon intensity of California's transportation fuels is to be reduced by at least 10 percent by the year 2020. ARB re-adopted the LCFS regulation in September 2015, and the

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[38] http://www.nbcnews.com/business/autos/trump-rolls-back-obama-era-fuel-economy-standards-n734256 and https://www.federalregister.gov/documents/2017/03/22/2017-05316/notice-of-intention-to-reconsider-the-final-determination-of-the-mid-term-evaluation-of-greenhouse

changes went into effect on January 1, 2016. The program establishes a strong framework to promote the low-carbon fuel adoption necessary to achieve the Governor's 2030 and 2050 GHG reduction goals.

Senate Bill 97 (SB 97), Chapter 185, 2007, Greenhouse Gas Emissions: This bill requires the Governor's Office of Planning and Research (OPR) to develop recommended amendments to the California Environmental Quality Act (CEQA) Guidelines for addressing GHG emissions. The amendments became effective on March 18, 2010.

Senate Bill 375 (SB 375), Chapter 728, 2008, Sustainable Communities and Climate Protection: This bill requires ARB to set regional emissions reduction targets for passenger vehicles. The Metropolitan Planning Organization (MPO) for each region must then develop a "Sustainable Communities Strategy" (SCS) that integrates transportation, land-use, and housing policies to plan how it will achieve the emissions target for its region.

Senate Bill 391 (SB 391), Chapter 585, 2009, California Transportation Plan: This bill requires the State's long-range transportation plan to meet California's climate change goals under AB 32.

Executive Order B-16-12 (March 2012) orders State entities under the direction of the Governor, including ARB, the California Energy Commission, and the Public Utilities Commission, to support the rapid commercialization of zero-emission vehicles. It directs these entities to achieve various benchmarks related to zero-emission vehicles.

Executive Order B-30-15 (April 2015) establishes an interim statewide GHG emission reduction target of 40 percent below 1990 levels by 2030 in order to ensure California meets its target of reducing GHG emissions to 80 percent below 1990 levels by 2050. It further orders all state agencies with jurisdiction over sources of GHG emissions to implement measures, pursuant to statutory authority, to achieve reductions of GHG emissions to meet the 2030 and 2050 GHG emissions reductions targets. It also directs ARB to update the Climate Change Scoping Plan to express the 2030 target in terms of million metric tons of carbon dioxide equivalent ($MMTCO_2e$). Finally, it requires the Natural Resources Agency to update the state's climate adaptation strategy, *Safeguarding California*, every 3 years, and to ensure that its provisions are fully implemented.

Senate Bill 32, (SB 32) Chapter 249, 2016, codifies the GHG reduction targets established in EO B-30-15 to achieve a mid-range goal of 40 percent below 1990 levels by 2030.

3.3.2 Environmental Setting

In 2006, the Legislature passed the California Global Warming Solutions Act of 2006 (AB 32), which created a comprehensive, multi-year program to reduce GHG emissions in California. AB 32 required ARB to develop a Scoping Plan that describes the approach California will take to achieve the goal of reducing GHG emissions to 1990 levels by 2020. The Scoping Plan was first approved by ARB in 2008 and must be updated every 5 years. The second updated plan, *California's 2017 Climate Change Scoping Plan*, adopted on December 14, 2017, reflects the 2030 target established in EO B-30-15 and SB 32.

The AB 32 Scoping Plan and the subsequent updates contain the main strategies California will use to reduce GHG emissions. As part of its supporting documentation for the updated Scoping Plan, ARB released the GHG inventory for California.[39] ARB is responsible for maintaining and updating California's GHG Inventory per H&SC Section 39607.4. The associated forecast/projection is an estimate of the emissions anticipated to occur in the year 2020 if none of the foreseeable measures included in the Scoping Plan were implemented.

An emissions projection estimates future emissions based on current emissions, expected regulatory implementation, and other technological, social, economic, and behavioral patterns. The projected 2020 emissions provided in Figure 3-1 represent a business-as-usual (BAU) scenario assuming none of the Scoping Plan measures are implemented. The 2020 BAU emissions estimate assists ARB in demonstrating progress toward meeting the 2020 goal of 431 MMTCO2e[40]. The 2018 edition of the GHG emissions inventory found total California emissions of 429 MMTCO$_2$e for 2016.

The 2020 BAU emissions projection was revisited in support of the First Update to the Scoping Plan (2014). This projection accounts for updates to the economic forecasts of fuel and energy demand as well as other factors. It also accounts for the effects of the 2008 economic recession and the projected recovery. The total emissions expected in the 2020 BAU scenario include reductions anticipated from Pavley I and the Renewable Electricity Standard (30 MMTCO$_2$e total). With these reductions in the baseline, estimated 2020 statewide BAU emissions are 509 MMTCO$_2$e.

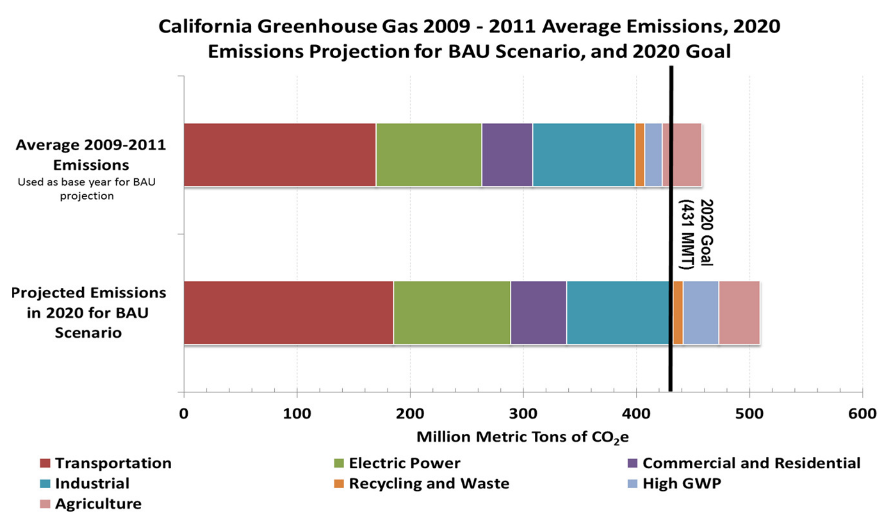

Figure 3-1: 2020 Business as Usual (BAU) Emissions Projection 2014 Edition

https://www.arb.ca.gov/cc/inventory/data/bau.htm

3.3.3 Project Analysis

An individual project does not generate enough GHG emissions to significantly influence global climate change. Rather, global climate change is a cumulative impact. This means that a project may contribute to a potential impact through its *incremental* change in emissions when combined with the

[39] 2018 Edition of the GHG Emission Inventory released (July 2018) https://www.arb.ca.gov/cc/inventory/data/data.htm

[40] The revised target using Global Warming Potentials (GWP) from the IPCC Fourth Assessment Report (AR4)

contributions of all other sources of GHG.[41] In assessing cumulative impacts, it must be determined if a project's incremental effect is "cumulatively considerable" (CEQA Guidelines Sections 15064(h)(1) and 15130). To make this determination, the incremental impacts of the project must be compared with the effects of past, current, and probable future projects. To gather sufficient information on a global scale of all past, current, and future projects to make this determination is a difficult, if not impossible, task.

GHG emissions for transportation projects can be divided into those produced during operations and those produced during construction. The following represents a best faith effort to describe the potential GHG emissions related to the proposed project.

3.3.4 Operational Emissions

The purpose of the proposed project is to permanently restore slopes damaged by past storms, and to prevent future storm-related erosion that could undermine slopes and result in roadway failure. The project would not alter the highway or increase vehicle miles traveled. After project construction, the constructed secant walls have a low-to-no potential to increase GHG emissions. Only during construction will GHGs be emitted by construction equipment and activities, as described in the next section.

3.3.5 Construction Emissions

Construction GHG emissions would result from material processing, on-site construction equipment, and traffic delays due to construction. These emissions will be produced at different levels throughout the construction phase; their frequency and occurrence can be reduced through innovations in plans and specifications and by implementing better traffic management during construction phases.

In addition, with innovations such as longer pavement lives, improved traffic management plans, and changes in materials, the GHG emissions produced during construction can be offset to some degree by longer intervals between maintenance and rehabilitation activities.

The Sacramento Metropolitan Air Quality Management District Road Construction Emissions Model version 8.1.0 was utilized to quantify this proposed project's construction GHG emissions, as a requirement set forth in EO B-30-15. Table 3.1 below shows the construction GHG emissions for both build alternatives.

[41] This approach is supported by the AEP: *Recommendations by the Association of Environmental Professionals on How to Analyze GHG Emissions and Global Climate Change in CEQA Documents* (March 5, 2007), as well as the South Coast Air Quality Management District (Chapter 6: The CEQA Guide, April 2011) and the US Forest Service (Climate Change Considerations in Project Level NEPA Analysis, July 13, 2009).

Table 3.1 Construction Emissions for Both Build Alternatives: Alternative 1 and Alternative 2

	Emission Estimates	CO_2	CH_4	N_2O	CO_{2e}
Alternative 1 – Cantilever Option	Daily Maximum (lbs/day)	21,723.51	4.65	0.36	21,945.73
	Total (tons/project)	1,946.23	0.39	0.03	1,965.57
Alternative 2 – Ground Anchor Option	Daily Maximum (lbs/day)	80,752.41	4.77	2.30	81,556.24
	Total (tons/project)	5,091.76	0.40	0.14	5,142.10

CO_{2e} = carbon dioxide equivalent. Note that CO_{2e} is comprised of carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) GHG emissions.

The values shown in the table indicate that Alternative 2 – Ground Anchor Option will release more GHG emissions than Alternative 1 – Cantilever Option. Construction equipment usually runs on diesel fuel, which would be the main contributor to GHG emissions that would be released during the 12 months required to construct the project. The data presented in Table 1 was modeled by input of the estimated volume of exported soil and asphalt from grubbing, excavation, grading, paving, and utilities relocation for each of the build alternatives. Alternative 2 would require more material to be hauled from the construction site than Alternative 1 because more excavation and grubbing is required to install the ground anchor. Soil excavation for the piles is required for both build alternatives. Alternative 2 however, would also require the face of the slope to be excavated for installation of the ground anchor. Alternative 1 would not require any slope excavation, only excavation for the piles. Additional excavation would require more construction trucks to haul off the excavated dirt, increasing the amount of construction vehicles miles traveled (VMT). Thus the additional construction equipment needed for Alternative 2, likely running on diesel fuel, would release more GHG emissions than Alternative 1.

Caltrans Standard Specifications apply to all construction contracts. Section 7-1.02C requires contractor to certify they are aware of and will comply with emissions reduction regulations mandated by ARB. Section 14-9.02, Air Pollution Control, requires contractors to comply with all rules, regulations, ordinances, and statutes related to air quality. Efforts to reduce GHG emissions, such as reduced idling of vehicles and other Caltrans construction best management practices, will be implemented in the project. A traffic management plan will be implemented during construction to maintain travel in both directions and minimize traffic delays and idling that can produce GHG.

3.4 CEQA Conclusion

While the project will result in GHG emissions during construction it is anticipated that the project will not result in any increase in operational GHG emissions. While it is Caltrans' determination that in the absence of further regulatory or scientific information related to GHG emissions and CEQA significance, it is too speculative to make a significance determination regarding the project's direct impact and its contribution on the cumulative scale to climate change, Caltrans is firmly committed to implementing measures to help reduce GHG emissions. These measures are outlined in the following section.

3.4.1 Greenhouse Gas Reduction Strategies

Statewide Efforts

In an effort to further the vision of California's GHG reduction targets outlined in AB 32 and SB 32, Governor Brown identified key climate change strategy pillars (concepts). These pillars highlight the idea that several major areas of the California economy will need to reduce emissions to meet the 2030 GHG emissions target. These pillars are (1) reducing today's petroleum use in cars and trucks by up to 50 percent; (2) increasing from one-third to 50 percent our electricity derived from renewable sources; (3) doubling the energy efficiency savings achieved at existing buildings and making heating fuels cleaner; (4) reducing the release of methane, black carbon, and other short-lived climate pollutants; (5) managing farm and rangelands, forests, and wetlands so they can store carbon; and (6) periodically updating the state's climate adaptation strategy, *Safeguarding California*.

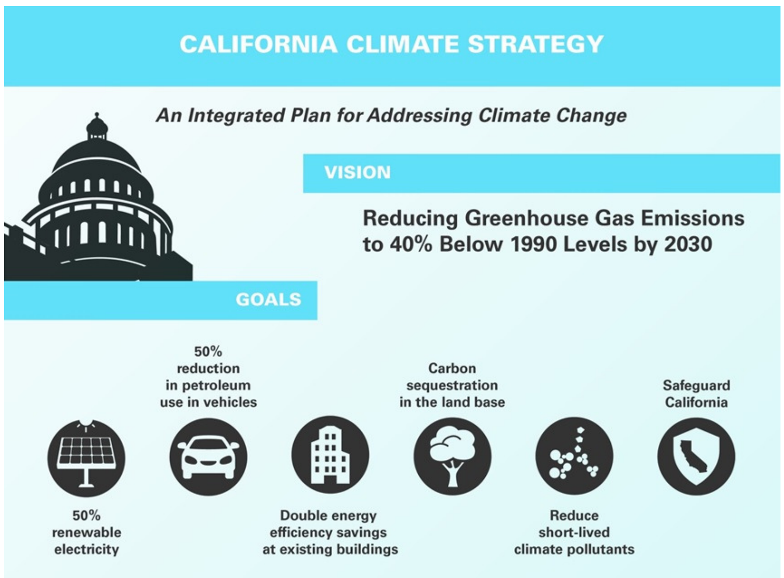

Figure 3-2: The Governor's Climate change pillars: 2030 Greenhouse gas reduction goals

The transportation sector is integral to the people and economy of California. To achieve GHG emission reduction goals, it is vital that we build on our past successes in reducing criteria and toxic air pollutants from transportation and goods movement activities. GHG emission reductions will come from cleaner vehicle technologies, lower-carbon fuels, and reduction of vehicle miles traveled. One of Governor Brown's key pillars sets the ambitious goal of reducing today's petroleum use in cars and trucks by up to 50 percent by 2030.

Governor Brown called for support to manage natural and working lands, including forests, rangelands, farms, wetlands, and soils, so they can store carbon. These lands have the ability to remove carbon dioxide from the atmosphere through biological processes, and to then sequester carbon in above- and below-ground matter.

Caltrans Activities

Caltrans continues to be involved on the Governor's Climate Action Team as the ARB works to implement EOs S-3-05 and S-01-07 and help achieve the targets set forth in AB 32. EO B-30-15, issued in

April 2015, and SB 32 (2016), set a new interim target to cut GHG emissions to 40 percent below 1990 levels by 2030. The following major initiatives are underway at Caltrans to help meet these targets.

California Transportation Plan (CTP 2040)
The California Transportation Plan (CTP) is a statewide, long-range transportation plan to meet our future mobility needs and reduce GHG emissions. The CTP defines performance-based goals, policies, and strategies to achieve our collective vision for California's future statewide, integrated, multimodal transportation system. It serves as an umbrella document for all of the other statewide transportation planning documents.

SB 391 (Liu 2009) requires the CTP to meet California's climate change goals under AB 32. Accordingly, the CTP 2040 identifies the statewide transportation system needed to achieve maximum feasible GHG emission reductions while meeting the state's transportation needs. While MPOs have primary responsibility for identifying land use patterns to help reduce GHG emissions, CTP 2040 identifies additional strategies in Pricing, Transportation Alternatives, Mode Shift, and Operational Efficiency.

Caltrans Strategic Management Plan
The Strategic Management Plan, released in 2015, creates a performance-based framework to preserve the environment and reduce GHG emissions, among other goals. Specific performance targets in the plan that will help to reduce GHG emissions include:

- Increasing percentage of non-auto mode share
- Reducing VMT per capita
- Reducing Caltrans' internal operational (buildings, facilities, and fuel) GHG emissions

Funding and Technical Assistance Programs
In addition to developing plans and performance targets to reduce GHG emissions, Caltrans also administers several funding and technical assistance programs that have GHG reduction benefits. These include the Bicycle Transportation Program, Safe Routes to School, Transportation Enhancement Funds, and Transit Planning Grants. A more extensive description of these programs can be found in *Caltrans Activities to Address Climate Change* (2013).

Caltrans Director's Policy 30 (DP-30) Climate Change (June 22, 2012) is intended to establish a department policy that will ensure coordinated efforts to incorporate climate change into departmental decisions and activities.

Caltrans Activities to Address Climate Change (April 2013) provides a comprehensive overview of activities undertaken by Caltrans statewide to reduce GHG emissions resulting from agency operations.

Project-Level GHG Reduction Strategies
SCAG has identified mitigation measures that are within the jurisdiction and authority of the ARB, air quality management districts, and other regulatory agencies that project proponents should consider to reduce impacts to air quality as shown in the 2016-2040 RTP/SCS Program Environmental Impact Report. Caltrans has identified the following feasible project-level measures to reduce construction emissions that will be implemented in the project to reduce GHG emissions and potential climate change impacts from the project.

- Ensure that all construction equipment is properly tuned and maintained
- Minimize idling time to 5 minutes—saves fuel and reduces emissions

- The highway would remain open with one travel lane in each direction. A traffic management plan will be used to minimize traffic flow interference from construction activities
- The proposed project would not impede future development of the California Coastal Trail in the project area, and would support future alternative modes of travel by protecting the roadway from slope erosion and failure

Adaptation Strategies

"Adaptation strategies" refer to how Caltrans and others can plan for the effects of climate change on the state's transportation infrastructure and strengthen or protect the facilities from damage—or, put another way, planning and design for resilience. Climate change is expected to produce increased variability in precipitation, rising temperatures, rising sea levels, variability in storm surges and their intensity, and the frequency and intensity of wildfires. These changes may affect the transportation infrastructure in various ways, such as damage to roadbeds from longer periods of intense heat; increasing storm damage from flooding and erosion; and inundation from rising sea levels. These effects will vary by location and may, in the most extreme cases, require that a facility be relocated or redesigned. These types of impacts to the transportation infrastructure may also have economic and strategic ramifications.

Federal Efforts

At the federal level, the Climate Change Adaptation Task Force, co-chaired by the CEQ, the Office of Science and Technology Policy (OSTP), and the National Oceanic and Atmospheric Administration (NOAA), released its interagency task force progress report on October 28, 2011[42], outlining the federal government's progress in expanding and strengthening the nation's capacity to better understand, prepare for, and respond to extreme events and other climate change impacts. The report provided an update on actions in key areas of federal adaptation, including: building resilience in local communities, safeguarding critical natural resources such as fresh water, and providing accessible climate information and tools to help decision-makers manage climate risks.

The federal Department of Transportation issued *U.S. DOT Policy Statement on Climate Adaptation* in June 2011, committing to "integrate consideration of climate change impacts and adaptation into the planning, operations, policies, and programs of DOT in order to ensure that taxpayer resources are invested wisely and that transportation infrastructure, services and operations remain effective in current and future climate conditions."[43]

To further the DOT Policy Statement, on December 15, 2014, FHWA issued order 5520 (*Transportation System Preparedness and Resilience to Climate Change and Extreme Weather Events*).[44] This directive established FHWA policy to strive to identify the risks of climate change and extreme weather events to current and planned transportation systems. The FHWA will work to integrate consideration of these risks into its planning, operations, policies, and programs in order to promote preparedness and resilience; safeguard federal investments; and ensure the safety, reliability, and sustainability of the nation's transportation systems.

[42] https://obamawhitehouse.archives.gov/administration/eop/ceq/initiatives/resilience
[43] https://www.fhwa.dot.gov/environment/sustainability/resilience/policy_and_guidance/usdot.cfm
[44] https://www.fhwa.dot.gov/legsregs/directives/orders/5520.cfm

FHWA has developed guidance and tools for transportation planning that fosters resilience to climate effects and sustainability at the federal, state, and local levels.[45]

State Efforts

On November 14, 2008, then-Governor Arnold Schwarzenegger signed EO S-13-08, which directed a number of state agencies to address California's vulnerability to sea-level rise caused by climate change. This EO set in motion several agencies and actions to address the concern of sea-level rise and directed all state agencies planning to construct projects in areas vulnerable to future sea-level rise to consider a range of sea-level rise scenarios for the years 2050 and 2100, assess project vulnerability and, to the extent feasible, reduce expected risks and increase resiliency to sea-level rise. Sea-level rise estimates should also be used in conjunction with information on local uplift and subsidence, coastal erosion rates, predicted higher high water levels, and storm surge and storm wave data.

Governor Schwarzenegger also requested the National Academy of Sciences to prepare an assessment report to recommend how California should plan for future sea-level rise. The final report, *Sea-Level Rise for the Coasts of California, Oregon, and Washington* (Sea-Level Rise Assessment Report)[46] was released in June 2012 and included relative sea-level rise projections for the three states, taking into account coastal erosion rates, tidal impacts, El Niño and La Niña events, storm surge, and land subsidence rates; and the range of uncertainty in selected sea-level rise projections. It provided a synthesis of existing information on projected sea-level rise impacts to state infrastructure (such as roads, public facilities, and beaches), natural areas, and coastal and marine ecosystems; and a discussion of future research needs regarding sea-level rise.

In response to EO S-13-08, the California Natural Resources Agency (Resources Agency), in coordination with local, regional, state, federal, and public and private entities, developed *The California Climate Adaptation Strategy* (Dec 2009),[47] which summarized the best available science on climate change impacts to California, assessed California's vulnerability to the identified impacts, and outlined solutions that can be implemented within and across state agencies to promote resiliency. The adaptation strategy was updated and rebranded in 2014 as *Safeguarding California: Reducing Climate Risk* (Safeguarding California Plan).

Governor Jerry Brown enhanced the overall adaptation planning effort by signing EO B-30-15 in April 2015, requiring state agencies to factor climate change into all planning and investment decisions. In March 2016, sector-specific Implementation Action Plans that demonstrate how state agencies are implementing EO B-30-15 were added to the Safeguarding California Plan. This effort represents a multi-agency, cross-sector approach to addressing adaptation to climate change-related events statewide.

EO S-13-08 also gave rise to the *State of California Sea-Level Rise Interim Guidance Document* (SLR Guidance), produced by the Coastal and Ocean Working Group of the California Climate Action Team (CO-CAT), of which Caltrans is a member. First published in 2010, the document provided "guidance for incorporating sea-level rise (SLR) projections into planning and decision making for projects in

[45] https://www.fhwa.dot.gov/environment/sustainability/resilience/

[46] *Sea Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future* (2012) is available at: http://www.nap.edu/catalog.php?record_id=13389.

[47] http://www.climatechange.ca.gov/adaptation/strategy/index.html

California," specifically, "information and recommendations to enhance consistency across agencies in their development of approaches to SLR."[48]

Climate change adaptation for transportation infrastructure involves long-term planning and risk management to address vulnerabilities in the transportation system from increased precipitation, and flooding; the increased frequency and intensity of storms and wildfires; rising temperatures; and rising sea levels. Caltrans is actively engaged in working towards identifying these risks throughout the state and will work to incorporate this information into all planning and investment decisions as directed in EO B-30-15.

3.4.2 Project Specific Wave Run-Up Study for Sea Level Rise

This project is located within the coastal zone and will require approval of a consolidated CDP from the Commission and Ventura County Planning Division. As requested by these agencies and in order to comply with the requirements of the permit, Caltrans is preparing a wave run-up study for this project. The wave run-up study includes an analysis of wave dynamics under sea level rise and with the inclusion of the proposed secant walls. The wave run-up study is discussed further in the Coastal section of this document in Chapter 2.

Geographic Mapping for Sea Level Rise

The Cal-Adapt website provides visualization tools that allow users to identify potential climate change risks in specific geographic areas throughout the state. The Cal-Adapt website models inundation location and depth data resulting from different increments of sea level rise coupled with extreme 100-year storm events. The user can focus on a specific geographic area, choose a desired sea level rise measurement, and run the model to demonstrate to what depth the area expected to be inundated.

In addition to this tool, the CO-CAT adopted statewide sea level rise scenarios and a sea level rise interim guidance document in April 2017 and updated in March 2018, which Caltrans was involved in developing[49]. This document created a common set of values that allow all state agencies to plan for sea level rise with the same assumptions. The set of values are sea level rise projections for designated years. The set of values put forth in the document, roughly coincide with the possible sea level rise scenarios in Cal-Adapt. This allows a state agency to input the measurements of sea level rise set forth by the CO-CAT, into the Cal-Adapt website and receive a visualization of how the area is expected to be inundated under these conditions. The Cal-Adapt website uses the metric system for mapping data. In order for the following sea level rise discussion to be consistent with the mapped figures, the metric system will also be used.

The sea level rise projections were taken from the CO-CAT 2018 guidance document and are based on tide gauges in Santa Monica. Caltrans used the "Medium-High Risk Aversion" values for compliance with AB-2800 that recommends State agencies to consider high emissions scenario for sea level rise. Emission scenarios are referred to as Representative Concentration Pathways (RCPs) and are associated with the amount of sunlight absorbed by the Earth versus reflected back to space. The highest emission scenario

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[48] http://www.opc.ca.gov/2013/04/update-to-the-sea-level-rise-guidance-document

[49] Coastal and Ocean Working Group of the California Climate Action Team (CO-CAT). 2018. *State of California Sea-Level Rise Guidance 2018 Update.* http://www.opc.ca.gov/webmaster/ftp/pdf/agenda_items/20180314/Item3_Exhibit-A_OPC_SLR_Guidance-rd3.pdf

is known as RCP 8.5 and reflects a “business-as-usual” scenario in which minimal global efforts to limit or reduce emissions are undertaken. The sea level rise estimates are tabulated in from 2050 through 2100 under the RCP 8.5 scenario with a 66% probability of occurring, 0.5% probability of occurring, and the H++ scenario. The H++ scenario is an extreme projection of sea level rise with no known probability for occurring. The cause of extreme sea level rise in the H++ scenario is the loss of the West Antarctic ice sheet as a result of high emissions. The project design life of the secant walls is 75 years and the construction start year is 2020. The values for 2095 were included in by interpolation from estimates given in the guidance document for 2090 and 2100 so to show the sea level rise projections for the end of the project design life. The likelihood of sea level rise reaching the projected levels calculated under the RCP 8.5 0.5% probability (greatest risk) is also shown in the table below.

Table 3.2 Sea-Level Rise Projections adopted by the CO-CAT (2018)

Emissions Scenario	Projected Sea-Level Rise (feet and meters)				
	2050	2070	2090	2095 (interpolated)	2100
RCP 8.5 High emissions (66% probability)	0.6–1.1 ft [0.2-0.3 m]	1.0–1.8 ft [0.3-0.5 m]	1.3–2.8 ft [0.4-0.9 m]	1.4–3.1 ft [0.4-0.9 m]	1.5–3.3 ft [0.5-1.0 m]
RCP 8.5 High emissions (0.5% probability)	1.9 ft [0.6 m]	3.4 ft [1.0 m]	5.5 ft [1.7 m]	6.2 ft [1.9 m]	6.8 ft [2.1 m]
Probability that SLR will meet or exceed a given height in a given year (0.5% probability at RCP 8.5)	0.2%	0.8%	0.7% (5 ft) 0.3% (6 ft)	0.3%–1.0%	0.3%
H++	2.6 ft [0.8 m]	5.1 ft [1.6 m]	8.1 ft [2.5 m]	9.0 ft [2.7 m]	10 ft [3.0]
Source: OPC 2018*.* Tables 25 and 26.					

The Cal-Adapt website was used to show illustrations of sea level rise scenarios within the project area. The lowest available sea level rise scenario in the Cal-Adapt tool is 0.5 m, which is just below the projected 0.5% probability value for the year 2050. The next available sea level rise measurement is 1.0 m which is the 0.5% probability value for the year 2070. The last sea level rise scenario accessible in the Cal-Adapt website is 1.41 m which is within the 0.5% probability projected range for 2070 and 2100. Figure 3-3, Figure 3-4, and Figure 3-5 depict the three sea level rise scenarios for the project area, as shown in the Cal-Adapt website, overlapped with the proposed placement of the secant walls.

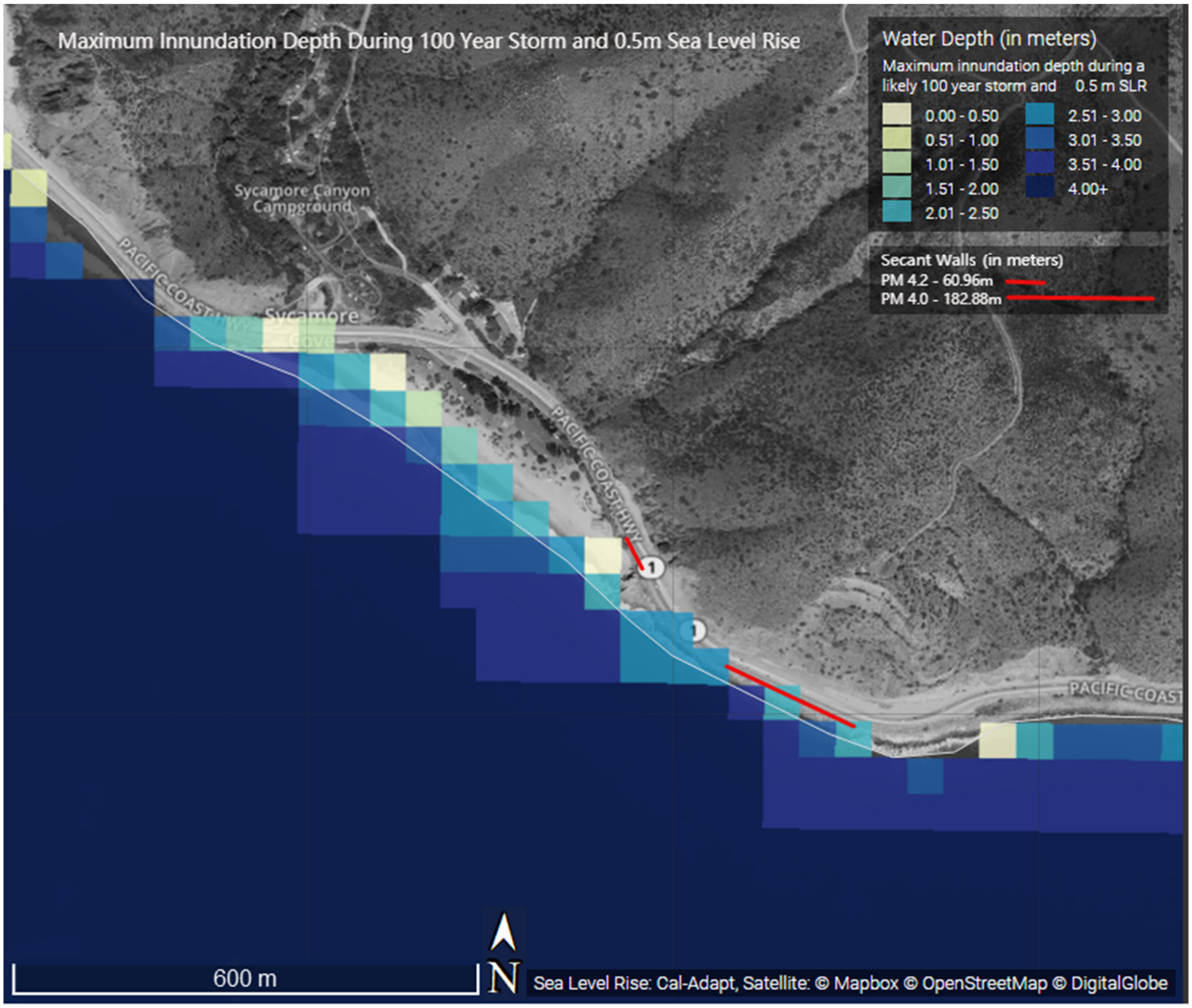

Figure 3-3: Sea level rise of 0.5 meter within the project area from Cal-Adapt website.

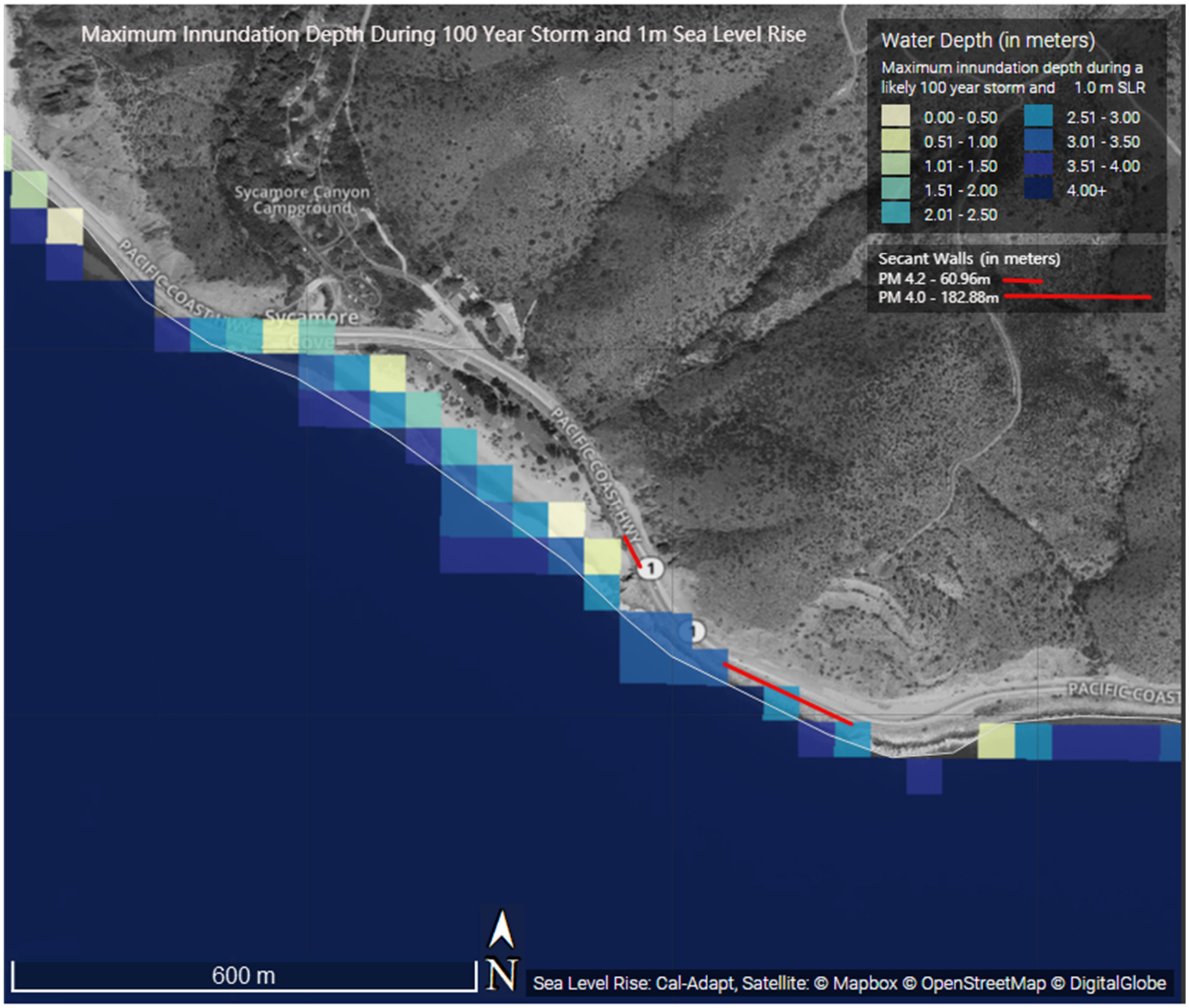

Figure 3-4: Sea level rise of 1.0 meter within the project area from Cal-Adapt website.

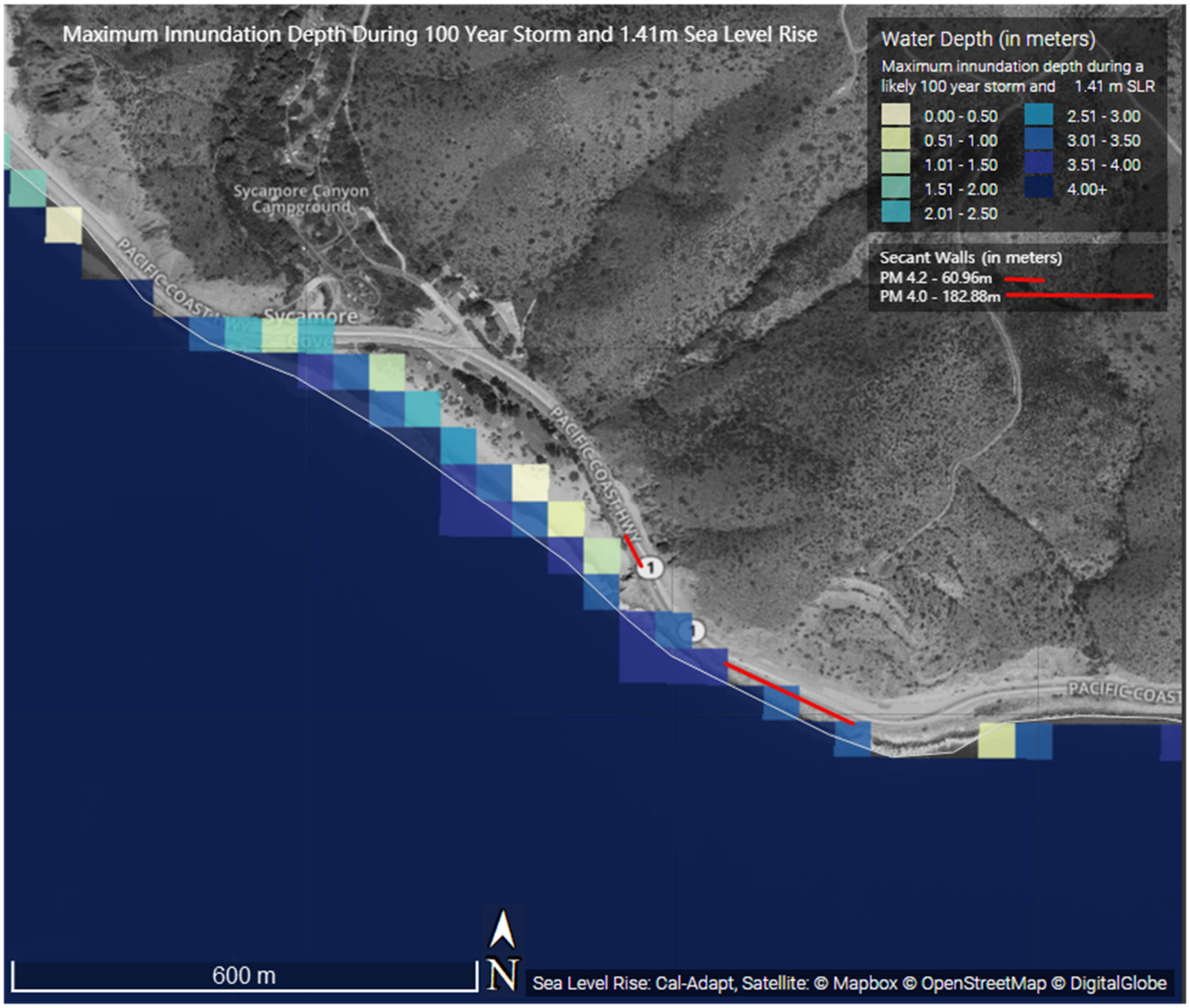

Figure 3-5: Sea level rise of 1.41 meters within the project area from Cal-Adapt website.

Data from Cal-Adapt is shown as colored tiles representing inundation depth mosaics acquired from the original source layer and are assembled as maximum of source layers. The inundation depth layer for each tile is at 50 m by 50 m spatial resolution. As shown, the grids are coarse and do not exhibit data for every segment of the coastline. Nevertheless, valuable information can be derived from these maps to inform Caltrans on how sea level rise could potentially impact the project.

The inundation depth mosaics discussed below are those that cover the stretch of the secant walls and intersect or are inland from the white line representing the coastline. The white line in each map is roughly where the Pacific Ocean meets the coast today, without a 100-year storm. The white line represents the present-day encroachment of the water level on the coast. Any mosaic tile found inland from the coastal white line in Figures 3-3 – 3-5, would be caused by a 100-year storm and sea level rise.

Table 3.3, below, summarizes the average and maximum inundation depth mosaics that were found within the areas by the proposed secant walls. The water level at the PM 4.2 proposed secant wall at rises slower due to sea level rise than the water level at the PM 4.0 proposed secant wall. The minimum value in the average range for the inundation water depth at PM 4.2 is always smaller than the minimum value in the average range for inundation water depth at PM 4.0. The minimum value for the PM 4.2 range is 0 m, 0 m, and 0.51 m; while the minimum value for the PM 4.0 range is 2.01 m, 2.51 m, and 3.01 m for sea level rise scenarios of 0.5 m, 1.0 m, and 1.41 m respectively.

Upon observation of the area at each of the secant wall locations, one or two mosaic tiles were found to represent a water depth much greater than the average range of mosaic tiles. These outliers were usually located further off-shore from the proposed wall, but within the coastal area of the white line. These values are tabulated in Table 3.3 as the maximum water depth for each of the sea level rise scenarios and represent the maximum flooding that may occur within certain spots of the project area.

Table 3.3 Inundation Water Depths During Sea Level Rise Scenarios and 100-Year Storm

Sea Level Rise (meters)	Water Depth at PM 4.0		Water Depth at PM 4.2	
	Average Range (meters)	**Maximum (meters)**	**Average Range (meters)**	**Maximum (meters)**
0.5	2.01 to 3.50	3.51 to 4.00	0.00 to 2.50	3.01 to 3.50
1.0	2.51 to 4.00	4.00+	0.00 to 3.00	3.51 to 4.00
1.41	3.01 to 4.00	4.00+	0.51 to 3.51	3.51 to 4.00+

In combination with the illustrations produced by the Cal-Adapt website, the wave run-up study analyzed sea level rise to produce a more holistic survey of the project area. All analyses of sea level rise within the Wave run-up study was conducted by analyzing the 100-year high water storm surge event combined with the various sea level rise estimates. The 100-year storm surge was assumed based on the annual probability of extreme water levels measured from the NOAA extreme water level for Santa Monica gauge. The assumed storm surge was 7.9 ft and was added to sea level rise scenario RCP 8.5 with 0.5% probability. Figures X-X below show plan views that contain the highest astronomic tide line (HATL) and mean high tide line (MHTL). Figures X-X are cross sections that include the beach profile, applicable tidal datums, still water levels including storm surge and sea level rise, wave runup elevations, and the proposed elevation of the secant wall. The 2020 value is considered as the current condition at the start of the project life.

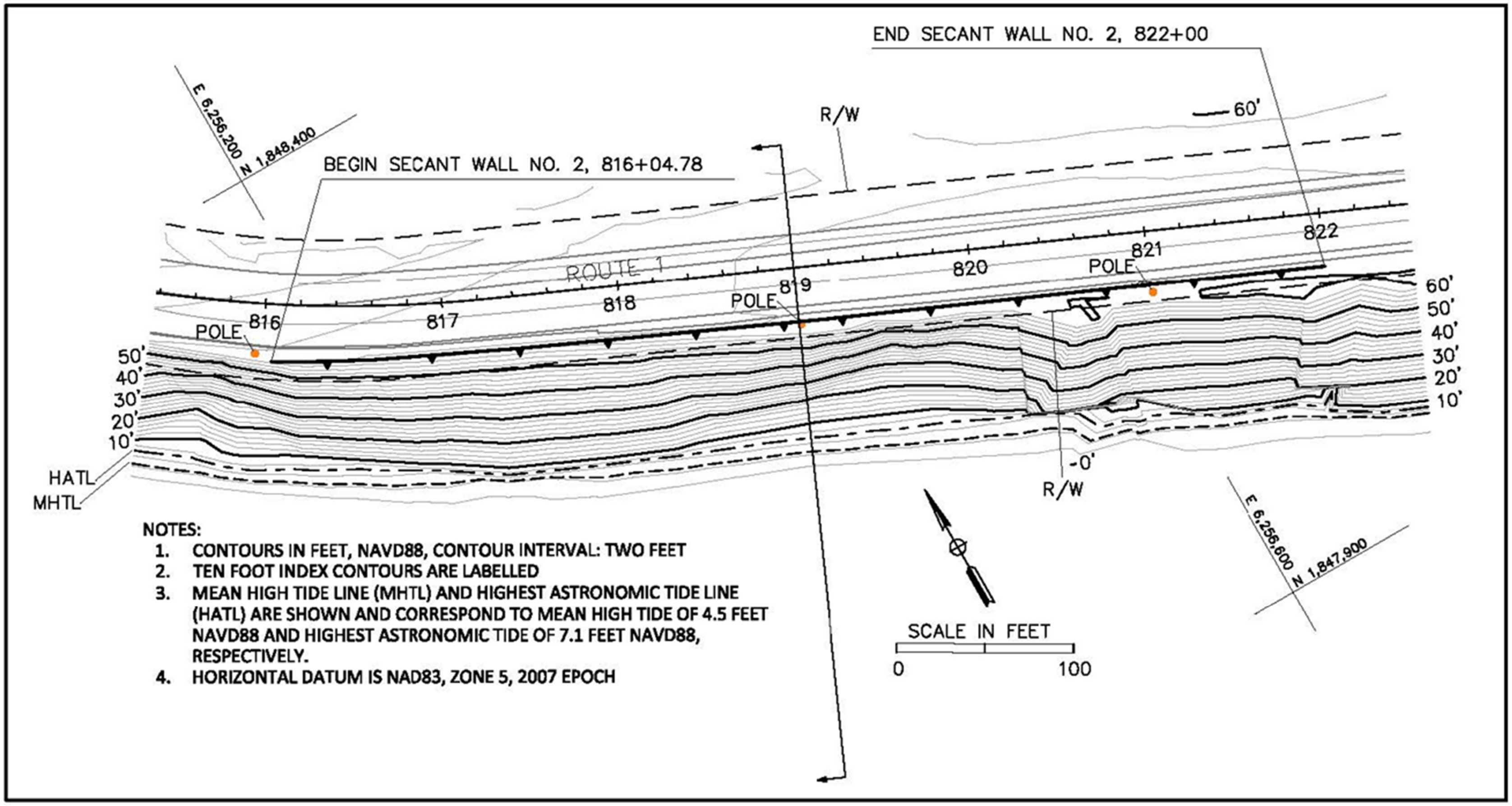

Figure 3-6: Plan view of the proposed secant wall and surrounding topography at PM 4.0.

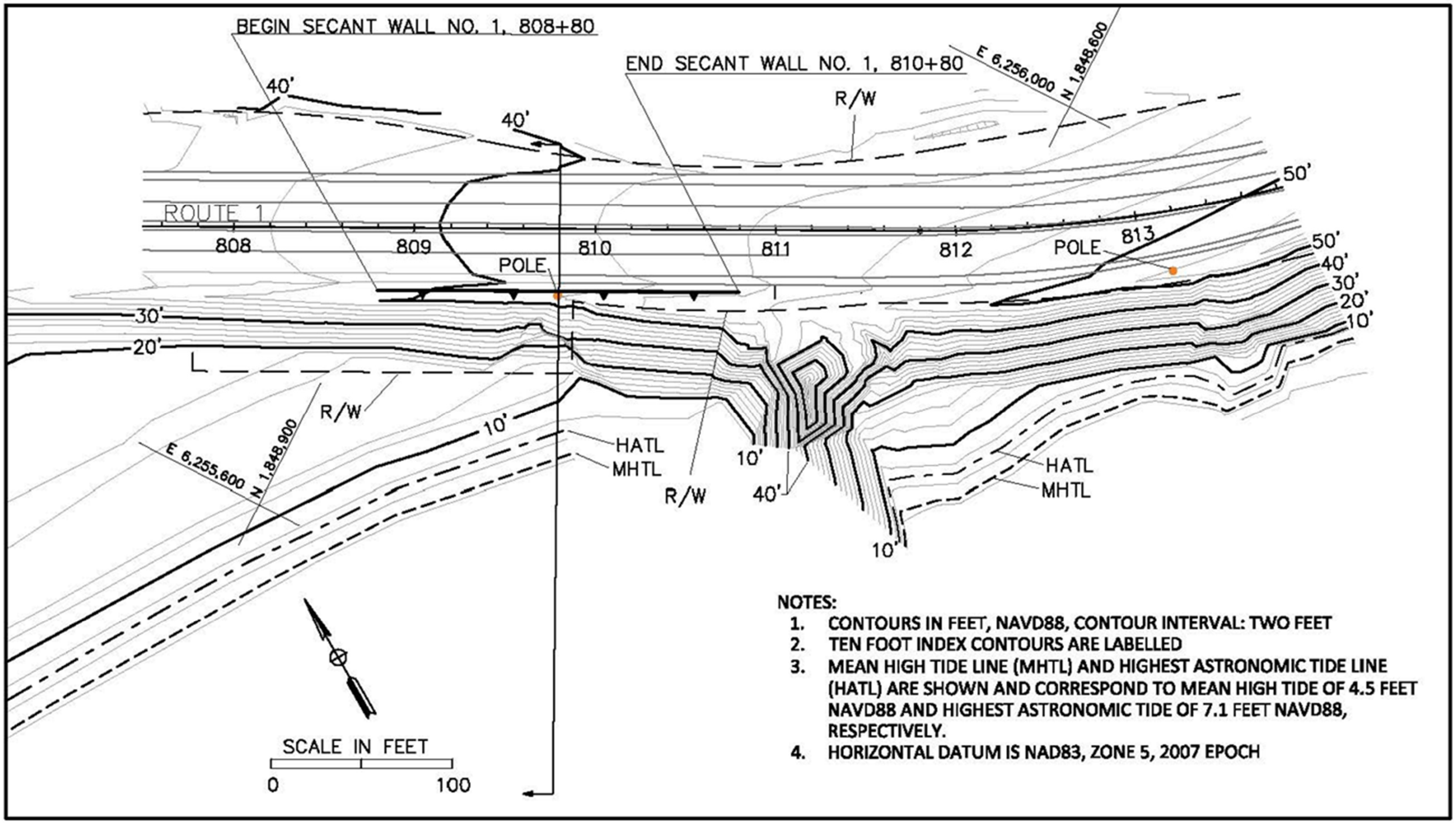

Figure 3-7: Plan view of the proposed secant wall and surrounding topography at PM 4.2.

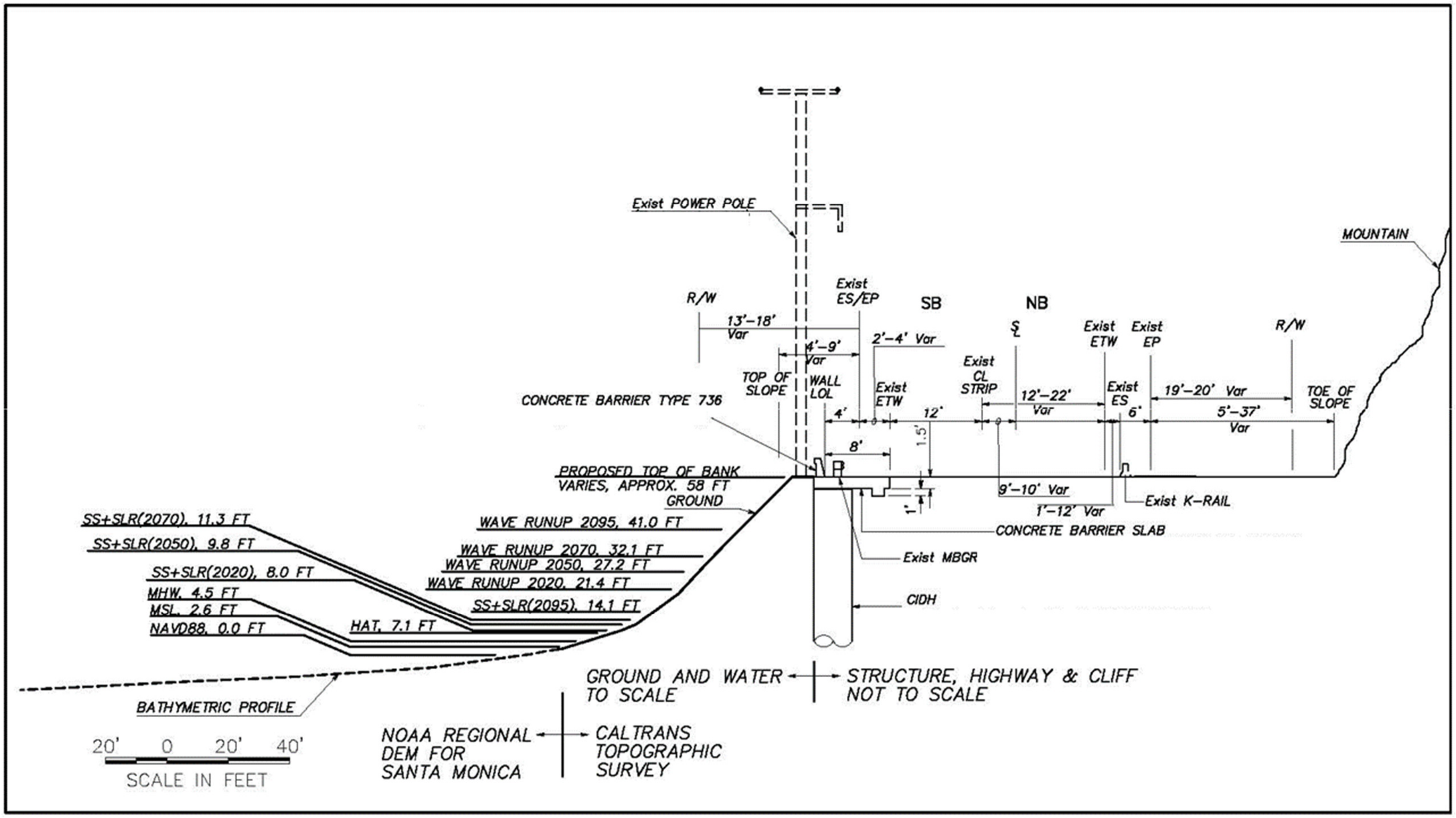

Figure 3-8: Cross section view of the proposed secant wall and applicable water levels at PM 4.0

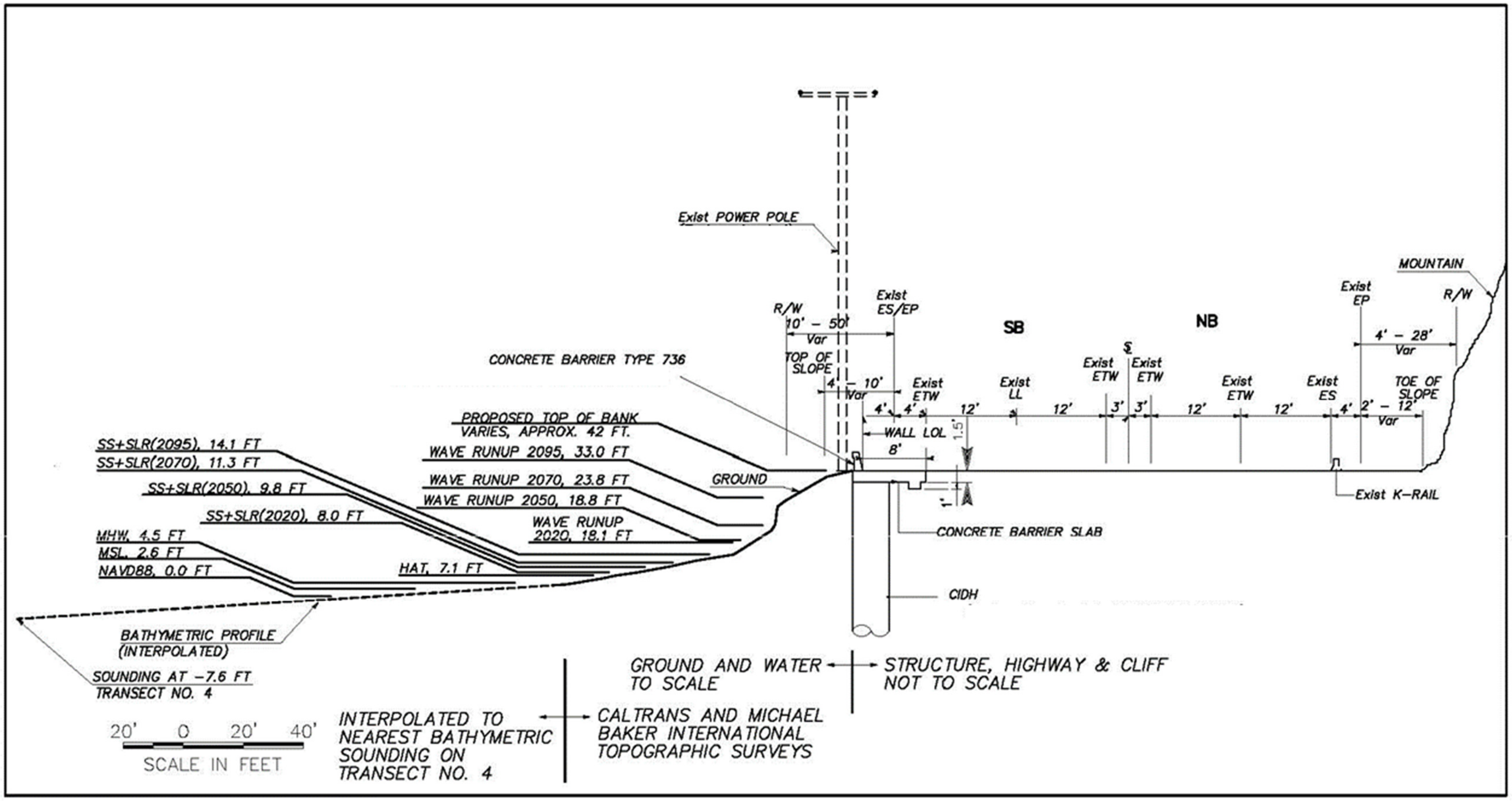

Figure 3-9: Cross section view of the proposed secant wall and applicable water levels at PM 4.2.

The maps showed that even with the project sea level rise scenarios and 100-year storm surge, the secant walls will not be flooded by seawater. The water line is projected below the top bank in each scenario and wave runup. The top of the bank at PM 4.2 is at a height of 42 ft from the datum while the highest sea level rise scenario with storm surge was measured at 14.1 ft and the highest wave run up was 33 ft. The top of the bank at PM 4.0 is 58 feet high and the highest sea level rise scenario with storm surge was measured at 14.1 ft and wave run up of 41 ft. The height of PM 4.0 is greater from the datum than PM 4.2 which gives PM 4.0 more of a buffer from sea level rise and 100-year storm surge. The top of the banks is well above the projected sea level rise and 100-year storm surge wave height.

The data from the wave run-up study shows PM 4.0 will not be as severely affected by sea level rise as the location at PM 4.2. Although the Cal-Adapt website showed that the water level at PM 4.0 will rise quicker than the water level at PM 4.2, the cross section views showed that the water line at PM 4.0 will actually remain lower from the top bank than the water line at PM 4.2 for every sea level rise scenario. When analyzed with a datum as shown in the wave run up study, PM 4.0 still contained more capacity between the waterline and the top of the bank. This may be at attributed to the difference in vertical and horizontal profiles of the two proposed secant locations. PM 4.2 exhibits more space between the edge of the water and the top of the bank in a horizontal gradient, as seen through the presence of the beach. PM 4.0 is cliff-like with a minimum horizontal spatial buffer from the water line but its' height from the datum is actually higher than PM 4.2.

Under the extreme (H++) sea level scenario in 2095, sea levels are expected to rise 6.2 ft (1.9 m). As mentioned above, the secant walls and top bank will exceed the wave runup associated with sea level rise and 100-year storm surge. Additionally, even considering tsunami, the tsunami runup elevations are estimated to be 19 feet and 6 feet below the proposed top of the secant wall at PM 4.0 and PM 4.2 respectively. The scour depths for the H++ scenario are also not expected to cause increased scour depth if the boulders placed along PM 4.0 remain in place as proposed in this project.

Both project locations are susceptible to sea level rise and may experience erosion if sea level rises as expected. Both sites however will not be flooded with the project sea level rise and cause the roadway to be inundated. The proposed secant walls will serve as a physical barrier between the impacts of the waves and the slope upholding the roadway. The walls are meant to protect the slope from erosion and maintain stability of the roadway during storms. The secant walls would protect the slope supporting the roadway and reflect the wave energy back into the sea.

The waves will continue to erode the shoreline without a barrier such as a secant wall, and eventually the stability of the slope will be compromised. The project area contains a minimal spatial buffer from the Pacific Ocean as shown in the figures, therefore the options to protect the roadway are limited. The secant wall will provide a hard barrier to the base of the slope to prevent erosion. The area at PM 4.0 may continue to have boulders at the base of the wall to absorb wave energy and allow beach build up. At PM 4.2, the natural dirt slope will remain in front of the wall for aesthetic purposes and serve as a soft barrier from wave energy. Results from the completed wave run-up study is included in Appendix G.

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Chapter 4: Comments and Coordination

Early and continuing coordination with the general public and public agencies is an essential part of the environmental process. It helps planners determine the necessary scope of environmental documentation and the level of analysis required, and to identify potential impacts and avoidance, minimization, and/or mitigation measures and related environmental requirements. Agency and tribal consultation and public participation for this project have been accomplished through a variety of formal and informal methods, including interagency coordination meetings, public meetings, public notices, and project development team meetings. This chapter summarizes the results of Caltrans' efforts to fully identify, address, and resolve project-related issues through early and continuing coordination.

4.1 Scoping

The process by which a lead agency solicits input from the public and other agencies regarding the breadth and depth of issues related to a proposed project is called scoping. Scoping helps to identify significant issues and determine the range of actions, alternatives, environmental effects, and mitigation measures to be analyzed in depth in the environmental document. Members of the public, relevant federal, state, regional and local agencies, resource agencies, tribal governments, interest groups, community organizations, and other interested parties may participate in the scoping process by providing comments or recommendations regarding issues to be investigated in the environmental document.

Under the CEQA, scoping is designed to examine a proposed project early in the environmental analysis and review process, and is intended to identify the range of issues pertinent to the proposed project and feasible alternatives or mitigation measures to avoid potentially significant environmental effects. NEPA defines scoping as an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action. Formal scoping is not required for environmental assessments (EAs). However, CEQ regulations mandate that federal agencies involve environmental agencies, applicants, and the public to the extent practicable in the EA process. As an agency with NEPA assignment, Caltrans performs federal responsibility for environmental decisions and approvals under NEPA for highway projects in California funded by the FHWA and therefore acts as a federal agency in this regard.

The scoping process is not intended to resolve differences of opinion regarding the proposed project or evaluate its merits. Instead, the process allows all interested parties to express their concerns regarding the proposed project, ensuring that all opinions and comments are considered in the environmental analysis. Scoping is an effective way to bring together and address the concerns of agencies, groups, and individuals potentially affected by the project as well as other interested persons, such as the general public, who might not be in accord with actions of the project on environmental grounds.

4.1.1 Notice of Scoping and Initiation of Studies

Notice of Scoping and Initiation of Studies letters were sent to agencies and other interested parties on October 18, 2017 and November 20, 2017. Letters were sent to 14 federal and regional agencies, including the: USACE, United States Department of the Interior, FHWA, Natural Resources Conservation Service of the United States Department of Agriculture, United States Forest Service, USFWS, United States National Park Service, EPA, NOAA Fisheries Service, Office of Environmental Policy and Compliance of the United States Department of Interior, Federal Transit Administration, FEMA, Advisory

Council on Historic Preservation, and the County of Ventura Planning Division. Fourteen state agencies received letters, including the: California Highway Patrol, Commission, Department of Conservation, CDFW, Department of Forestry and Fire Protection, Native American Heritage Commission, Office of Historic Preservation, California Department of Parks and Recreation, Public Utilities Commission, RWQCB, Resources Agency, Santa Monica Mountains Conservancy, State Lands Commission, and Department of Water Resources.

Because no residential communities exist in or near the project area, letters were only sent to federal, state, and regional agencies. No letters were mailed to individual members of the public because the area does not contain any residents.

Responses to the Notice of Scoping and Initiation of Studies letters were received from two agencies, the Commission and CDFW. Their concerns are summarized below.

California Department of Fish and Wildlife
CDFW submitted comments as a Responsible Agency under CEQA and as California's Trustee Agency for fish and wildlife resources. CDFW made note of several species that could exist in the project area, including California Grunion (*Leuresthes tenuis*), California Least Tern (*Sternula antillarum browni*), Western Snowy Plover (*Charadrius alexandrines nivosus*), nesting birds, and tidal species, and recommended measures to avoid, minimize, and mitigate impacts to these species. CDFW also recommended wildlife and plant surveys, a hydrology report to study Sycamore Canyon Creek and other ephemeral streambeds located near the project site, and to take careful note of tidal habitats that could be impacted by construction and maintenance of the seawall.

These comments are acknowledged and will be taken into consideration when developing project features and avoidance, minimization, and mitigation measures for the project.

California Coastal Commission
The Commission submitted comments as an agency with jurisdiction over the coastal zone and its resources. The Commission advised that the environmental study should consider potential effects of sea level rise, and that a sea level rise and wave run-up analysis may need to be completed to do so. It also recommended modeling effects of various sea level rise and storm scenarios on each of the project alternatives' structures.

The Commission also reiterated the initiatives of the 2017 Plan for Improved Agency Partnering between Caltrans and the Commission, including the interagency agreement between the two. Among the 2017 Plan, are goals to: collaborate on the California Coastal Trail that may pass along the Pacific Coast Highway within the project area; provide space for safe pedestrian and bicycle use along the transportation corridor; and enhance connections to existing public access and recreational facilities, including Point Mugu State Park and the public beach and ocean below the highway. It also recommended that the project incorporate context sensitive, see-through bridge and guardrail designs to enhance visual resources in the coastal zone and provide for native species and invasive control in landscaping plans.

Notification of future activity associated with this or related projects was requested. Coordination will be ongoing with the Commission. Discussion regarding the CDP will be discussed further in the Section 4.2 Interagency Consultation and Coordination of this chapter.

4.1.2 California State Parks

An email was sent on October 3, 2017 to State of California Department of Parks and Recreation with an inquiry about archaeological sensitivity within the Sycamore Cove Beach area. A reply was received from Barbara Tejada, Archaeologist for the Angeles and Channel Coast Districts, on October 9, 2017. Ms. Tejada stated that there were no recorded sites in Sycamore Cove Beach, though scattered shell had been observed. She stated that it was redeposited since it was located in a manufactured berm.

4.2 Interagency Consultation and Coordination

4.2.1 Coastal Development Permit

Because the entire project is within the coastal zone, a CDP will be required. A LCP was certified in 1983 for Ventura County, meaning the Ventura County Planning Division may process a CDP for development within its LCP jurisdiction. For new development below the mean high tide line, a CDP is required from the Commission.

Because the project takes place in both the jurisdictions of the Ventura County Planning Division and the Commission, the Commission is authorized to process a consolidated CDP application when the applicant, the local government, and the Commission all agree to do so, as per Coastal Act Section 30601.3. A consolidated CDP application will be prepared to satisfy both the Commission and Ventura County Planning Division.

Placement of the cable net mesh on the mountain side adjacent to northbound PCH after project construction was mentioned to the Commission via email on April 3, 2019. Zach Rehm from the Commission responded on April 9, 2019 expressed that there is not a consensus or specific policy on the preferred method to mitigate falling rock while also preserving environmental and visual resources. Safety among the motorists, cyclists, and pedestrians was mentioned as a requirement for any project under the Coastal Act and Ventura County LCP policies. Considering safety as the utmost priority, Caltrans decided to maintain after construction the cable net mesh on the mountain and the k-rail and fencing on the northbound shoulder due to the current hazards discussed in Section 1.4.1.

4.2.2 Waters of the United States

During circulation of the draft environmental document, the proposed project was presumed to require the discharge of dredge and fill material into waters of the United States. As such, Section 404 coordination and permit would have been required from USACE. Furthermore, when a federal license or permit is required for a project that will result in a discharge to waters of the United States, a Section 401 water quality certification is also required from the State or RWQCB. After selection of Alternative 1 – Cantilever Option as the build alternative, a teleconference with USACE occurred on May 15, 2019. Plans showing the proposed project and jurisdictional lines of USACE were used during the teleconference to aid in coordination. It was determined during the teleconference that through these plans and the selection of Alternative 1 – Cantilever Option, a Section 404 permit would not be required. Correspondingly a Section 401 water quality certification was also determined not required. Final design plans will be issued to USACE in the next design phase to

4.2.3 National Marine Fisheries Service

Early coordination with NOAA Fisheries Service began on December 19, 2017. Details of coordination are discussed in Chapter 2 of the environmental document and in depth in the Natural Environment Study (NES). Coordination has been ongoing.

4.2.4 Native American Coordination

As a part of AB52 of CEQA, consultation with tribal governments that may have interest or knowledge about the project area, is required for a project with an effect that may cause a substantial adverse change in the significance of a tribal cultural resource.

Native American Heritage Commission

A Sacred Lands File search was requested from the NAHC on September 8, 2017. Frank Lienert, Associate Governmental Program Analyst, of the NAHC responded on September 20, 2017. The search did not identify the presence of Native American cultural sites in the vicinity. However, the NAHC recommended contacting six individuals that may have knowledge of cultural resources in or close to the project's APE. Attempts to contact and responses of these six individuals are described below:

Native American Tribes, Groups, and Individuals

- Julie Tumamait-Stenslie, Chairperson, Barbareño/Ventureño Band of Mission Indians, Chumash

  A letter was mailed out by Caltrans on September 15, 2017 with the project description and invitation to be a consulting party. The letter was received by Ms. Tumamait-Stenslie on September 18, 2017. A follow-up email and voicemail were sent out on October 26, 2017. No response has been received to date.

- Kenneth Kahn, Chairperson, Santa Ynez Band of Chumash Indians

  A letter was mailed out by Caltrans on September 25, 2017 with the project description and invitation to be a consulting party. The letter was received by Mr. Kahn on September 27, 2017. A follow-up email and voicemail were sent out on October 26, 2017. No response has been received to date.

- Raudel Joe Banuelos, Jr., Barbareño/Ventureño Band of Mission Indians, Chumash

  A letter was mailed out by Caltrans on September 25, 2017 with the project description and invitation to be a consulting party. The letter was returned to Caltrans as undeliverable after several attempts were made by USPS. A follow-up voicemail was left on October 26, 2017. No response has been received to date.

- Patrick Tumamait, Barbareño/Ventureño Band of Mission Indians, Chumash

  A letter was mailed out by Caltrans on September 25, 2017 with the project description and invitation to be a consulting party. The letter was received on September 27, 2017. On October 11, 2017, Caltrans returned Mr. Tumamait's voicemail with a phone call. He did not provide any specific archaeological site information for the area, but he requested to be contacted if cultural material is revealed during construction.

- Eleanor Arrellanes, Barbareño/Ventureño Band of Mission Indians, Chumash

  A letter was mailed out by Caltrans on September 25, 2017 with the project description and invitation to be a consulting party. The letter was received on October 5, 2017. Caltrans followed up with a phone call on October 16, 2017. Ms. Arrellanes did not provide any specific archaeological site information for the area at the time, but stated that she would contact Caltrans if anything arises.

- Mia Lopez, Coastal Band of the Chumash Nation

  Since no mailing address was provided, an initial voicemail was left with Ms. Lopez on September 25, 2017. The voicemail stated that a project was being undertaken in Ventura

County on SR-1 and requested to be called back if Ms. Lopez would like to be a consulting party. A follow-up voicemail was left on October 26, 2017, reiterating the project information and request. No response has been received to date.

Caltrans will continue to consult with the interested Native American representatives as they respond. Any comments or concerns provided by the representatives will be addressed in an addendum to the HPSR. Consultation documentation, including logs, mailed letters, emails, and NAHC results are located in Appendix C of the HPSR.

4.3 Project Site Visits

A project site visit was coordinated on March 15, 2018. In attendance were representatives from Caltrans, the Commission, the RWQCB, the Ventura County Planning Division, and private consultants. The CDFW and the USACE were also invited, but declined the invitation or were unable to attend. The intent of the visit was to initiate an early coordination site visit with these regulatory agencies, receive feedback on the proposed construction of the seawalls, and discuss potential impacts to the shoreline.

4.4 Section 4(f)

Both build alternatives would require TCEs for the 2 proposed locations for the proposed secant walls. The TCE at PM 4.0 is estimated to be 0.206 acres and the TCE at PM 4.2 is about 0.038 acres. Both areas proposed for TCE would be used for construction staging, equipment storage, and access. In addition to these construction uses, the Alternative 2 – Ground Anchor Option would also require the TCE to be used for the removal of 4 feet of dirt from the slope for the entire length of the wall. Slope excavation is required for removal in order to install the ground anchor that is crucial for the construction of Alternative 2 – Ground Anchor Option. The slope would be fully restored after construction to resemble pre-construction conditions, including installation of the appropriate amount of dirt to fill the excavated slope and replanting the slope.

The property needed for TCE is called Point Mugu State Park and the owner of this property is the State of California Department of Parks and Recreation. As a public park facility, Point Mugu State Park is afforded special protections under Section 4(f) of the U.S. Department of Transportation Act of 1966. For the purposes of Section 4(f), this type of temporary occupancies would not constitute a use because the five conditions listed in 23 Code of Federal Regulations (CFR) 774.13(d) have been met prior to circulation of the final environmental document. The only requirement that had not been met prior to circulation of the draft environmental document was documented agreement by the official with jurisdiction over the Section 4(f) resource meeting the 5 conditions. Consultation was initiated by Caltrans on September 07, 2018 and a response from the State of California Department of Parks and Recreation concurring with applying the exception for temporary occupancies on Point Mugu State Park was received on March 18, 2019. The letter sent to the official with jurisdiction with attachments are included in the following pages and the letter of concurrence is also shown below.

STATE OF CALIFORNIA—CALIFORNIA STATE TRANSPORTATION AGENCY EDMUND G. BROWN Jr., Governor

DEPARTMENT OF TRANSPORTATION
DISTRICT 7
100 S. MAIN STREET, SUITE 100
LOS ANGELES, CA 90012
PHONE (213) 897-0703
FAX (213) 897-0360
TTY 711
www.dot.ca.gov

Making Conservation a California Way of Life.

September 7, 2018

Suzanne Goode
Senior Environmental Planner
California State Parks
1925 Las Virgenes Road
Calabasas, CA 91302

Dear Ms. Goode,

The California Department of Transportation (Caltrans) District 7, proposes to construct 2 secant walls on the southbound/coastal side of State Route (SR) 1, also known as Pacific Coast Highway (PCH), in Ventura County at post mile 4.0 and 4.2 to stabilize the roadway foundation. The secant wall at post mile 4.0 is proposed at 600 feet long and up to 70 feet high. The second secant wall at post mile 4.2 is proposed at 200 feet long and up to 70 feet high. Both secant walls will be constructed to stand completely underground and not visible to the public. The purpose of this project is to perform permanent restoration of damage incurred by severe storm events within the project limits. The slope has sustained severe surf erosion that has undermined the roadway, and high intensity storms have resulted in cracks and displacements of the roadway shoulder. The proposed construction is intended to help stabilize the eroded slope and highway. The project would require temporary construction easements (TCE) in Point Mugu State Park.

Caltrans is the lead agency under the California Environmental Quality Act (CEQA) and the National Environmental Policy Act of 1969 (NEPA). A Draft Initial Study (IS)/Environmental Assessment (EA) is being prepared for this project, which includes a no build alternative and 2 build alternatives (Alternative 1: Cantilever Option and Alternative 2: Ground Anchor Option). Both build alternatives would require TCEs for the 2 proposed locations for the secant walls. The TCE at post mile 4.0 is estimated to be 0.206 acres and the TCE at post mile 4.2 is about 0.038 acres.

Both areas proposed for TCE would be used for construction staging, equipment storage, and construction access. In addition to these construction uses, the Alternative 2: Ground Anchor Option would also require the TCE to be used for the removal of 4 feet of dirt from the slope for the entire length of the wall. Minor slope excavation is required for removal in order to install the ground anchor that is crucial for the construction of Alternative 2: Ground Anchor Option. The slope would be fully restored after construction to resemble pre-construction conditions, including installing the appropriate amount of dirt to fill the excavated slope and replanting the slope with native plants. All activity on park property would be temporary and intermittent.

As a public park facility managed by the State of California Department of Parks and Recreation, Point Mugu State Park is afforded special protections under Section 4(f) of the U.S. Department of Transportation Act of 1966. Section 4(f) defines "use" in three ways: permanent

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incorporation/permanent easement; constructive use; and temporary occupancy. Permanent incorporation/permanent easements involve a right-of-way acquisition of Section 4(f)-protected land as part of the transportation project. The transportation agency or project sponsor directly purchases the property (fee simple acquisition), and the property sustains a permanent impact, as the Section 4(f) protected property is changed to a transportation facility.

Temporary occupancy results when a Section 4(f) property, in whole or in part, is required for project construction-related activities. The property is not permanently incorporated into a transportation facility, but the activity is adverse in terms of the preservation purpose of Section 4(f). However, there are five conditions listed in 23 Code of Federal Regulations (CFR) 774.13(d) that if met, would be "temporary occupancies of land… so minimal as to not constitute a use within the meaning of Section 4(f)". Those conditions are as follows:

- Duration must be temporary, i.e., less than the time needed for construction of the project, and there should be no change in ownership of the land;
- Scope of the work must be minor, i.e., both the nature and the magnitude of the changes to the Section 4(f) property are minimal;
- There are no anticipated permanent adverse physical impacts, nor will there be interference with the protected activities, features, or attributes of the property, on either a temporary or permanent basis;
- The land being used must be fully restored, i.e., the property must be returned to a condition which is at least as good as that which existed prior to the project; and
- There must be documented agreement of the official(s) with jurisdiction over the Section 4(f) resource regarding the above conditions.

A constructive use of Section 4(f) lands occurs only if there is no permanent incorporation of land or temporary occupancy constituting Section 4(f) use. If the proximity impacts of the proposed project on adjacent or nearby Section 4(f) protected property are substantial- that is, when the protected activities, features, or attributes of the Section 4(f) property are substantially diminished- constructive use occurs.

Under the no build alternative, no construction would take place, and there would be no disturbance to any public park facility. Therefore, there would be no potential effect on Section 4(f) resources or facilities in the project study area.

Caltrans considers the build alternatives to meet the above conditions for exception to temporary occupancy. No permanent acquisition of Section 4(f) protected resources or facilities is required, and the duration of construction in the TCEs is estimated to be 1 year. The project is proposed to be constructed in phases; the TCE for the first wall would be occupied with equipment during construction at that location while the second location would be vacant, then the second TCE would undergo construction while the first location is clear. The public does not have access to the area involving the TCE, so there would be no effect on public access, as the remaining portions of Point Mugu State Park would continue to be available for recreational use and access during construction.

Ms. Suzanne Goode
Page 3

The intent of this communication is to initiate consultation and coordination with your agency to determine temporary occupancy of Point Mugu State Park and to ensure that all reasonable measures to minimize harm have been considered. Caltrans aims to abide by all established policies as required by agencies with jurisdiction over Section 4(f) facilities, and any recommended measures to preserve operation and maintenance of such facilities during construction. Caltrans is seeking your written concurrence that the exception for temporary occupancies in 23 CFR 774.13(d) is applicable to Point Mugu State Park. If comments are not received from your agency by the end of the draft environmental document circulation period, a lack of objection may be assumed and the process may proceed to a final evaluation.

If you have any questions, please contact me at (213) 897-9572 or the project's lead environmental planner, Vanessa Velasco, at (213) 897-7665.

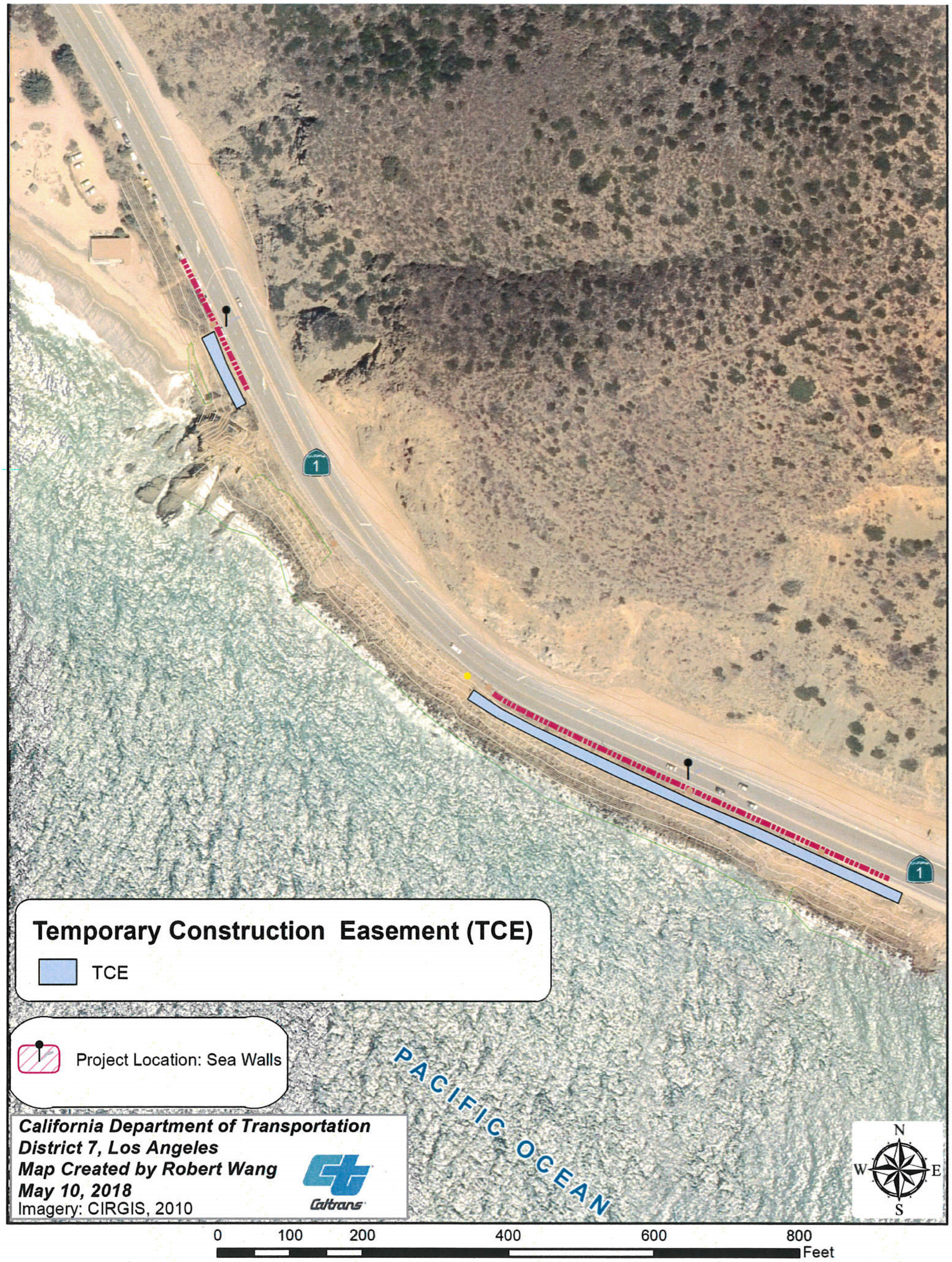
Sincerely,

Lourdes Ortega

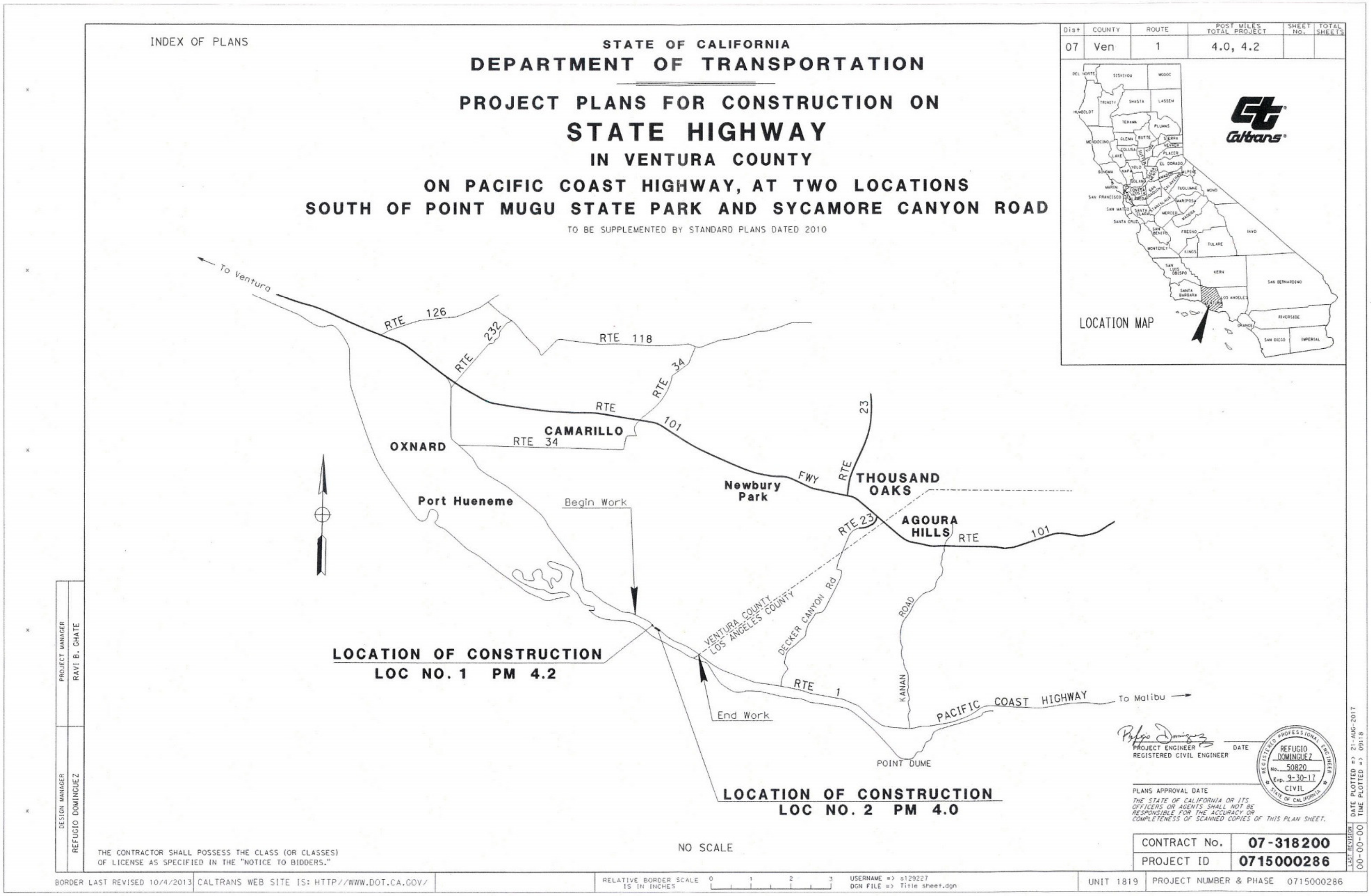
LOURDES ORTEGA
Senior Environmental Planner
Division of Environmental Planning
California Department of Transportation

Enclosure: Project Plans
TCE Map

"Provide a safe, sustainable, integrated and efficient transportation system to enhance California's economy and livability"



Temporary Construction Easement (TCE)
TCE
Project Location: Sea Walls
California Department of Transportation
District 7, Los Angeles
Map Created by Robert Wang
May 10, 2018
Imagery: CIRGIS, 2010
Caltrans
PACIFIC OCEAN
N
W
E
S
1
0
100
200
400
600
800
Feet


INDEX OF PLANS
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
PROJECT PLANS FOR CONSTRUCTION ON
STATE HIGHWAY
IN VENTURA COUNTY
ON PACIFIC COAST HIGHWAY, AT TWO LOCATIONS
SOUTH OF POINT MUGU STATE PARK AND SYCAMORE CANYON ROAD
TO BE SUPPLEMENTED BY STANDARD PLANS DATED 2010
Dist 07 COUNTY Ven ROUTE 1 POST MILES TOTAL PROJECT 4.0, 4.2
LOCATION MAP
To Ventura
RTE 126
RTE 232
RTE 118
RTE 34
RTE 101
RTE 23
OXNARD
CAMARILLO
Port Hueneme
Newbury Park
THOUSAND OAKS
AGOURA HILLS
Begin Work
End Work
VENTURA COUNTY
LOS ANGELES COUNTY
DECKER CANYON Rd
KANAN ROAD
RTE 1
PACIFIC COAST HIGHWAY
To Malibu
POINT DUME
LOCATION OF CONSTRUCTION
LOC NO. 1 PM 4.2
LOCATION OF CONSTRUCTION
LOC NO. 2 PM 4.0
NO SCALE
PROJECT MANAGER RAVI B. CHATE
DESIGN MANAGER REFUGIO DOMINGUEZ
PROJECT ENGINEER DATE
REGISTERED CIVIL ENGINEER
REFUGIO DOMINGUEZ No. 50820 Exp. 9-30-17 CIVIL
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PROJECT ID 0715000286
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UNIT 1819
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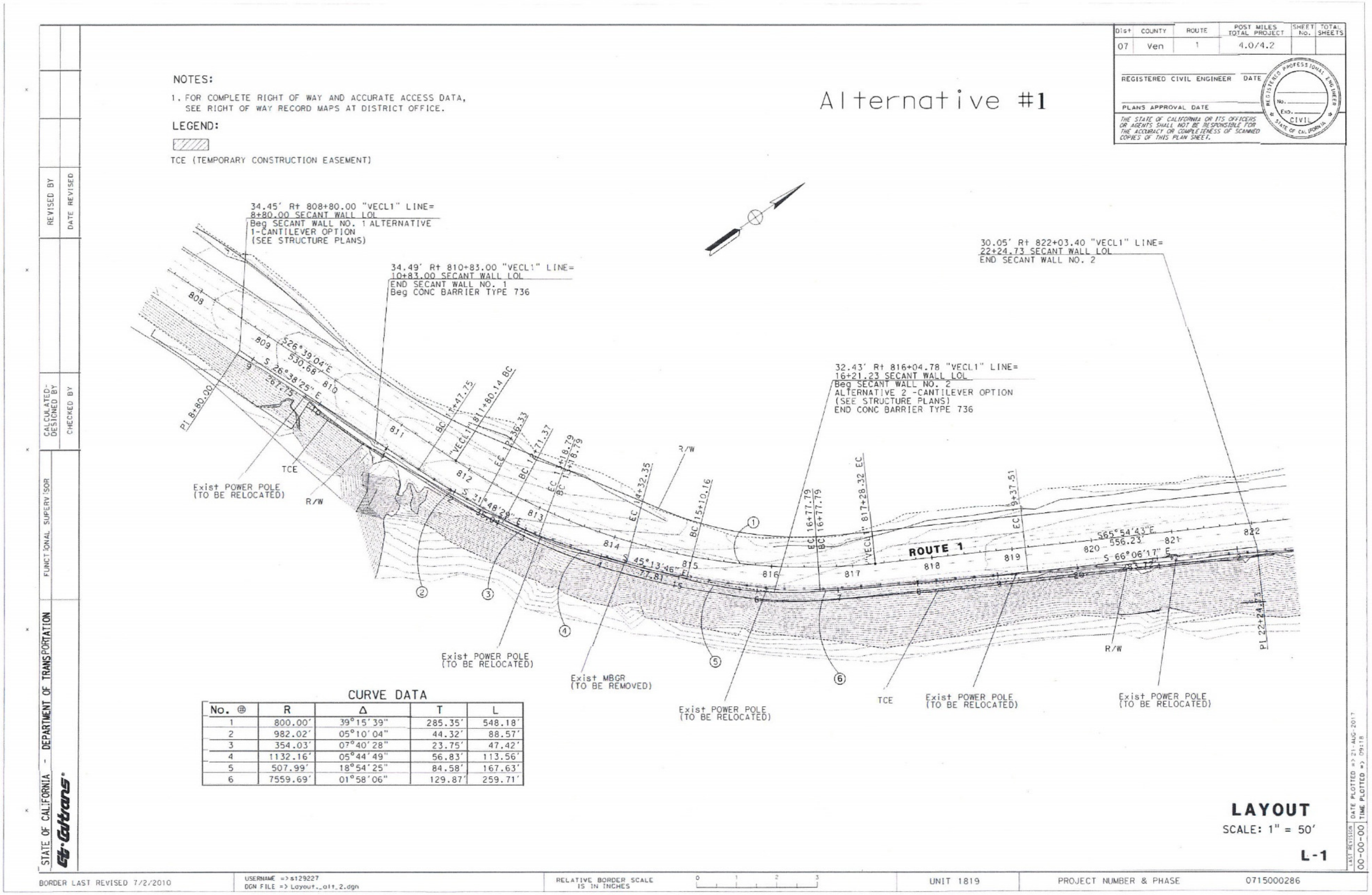

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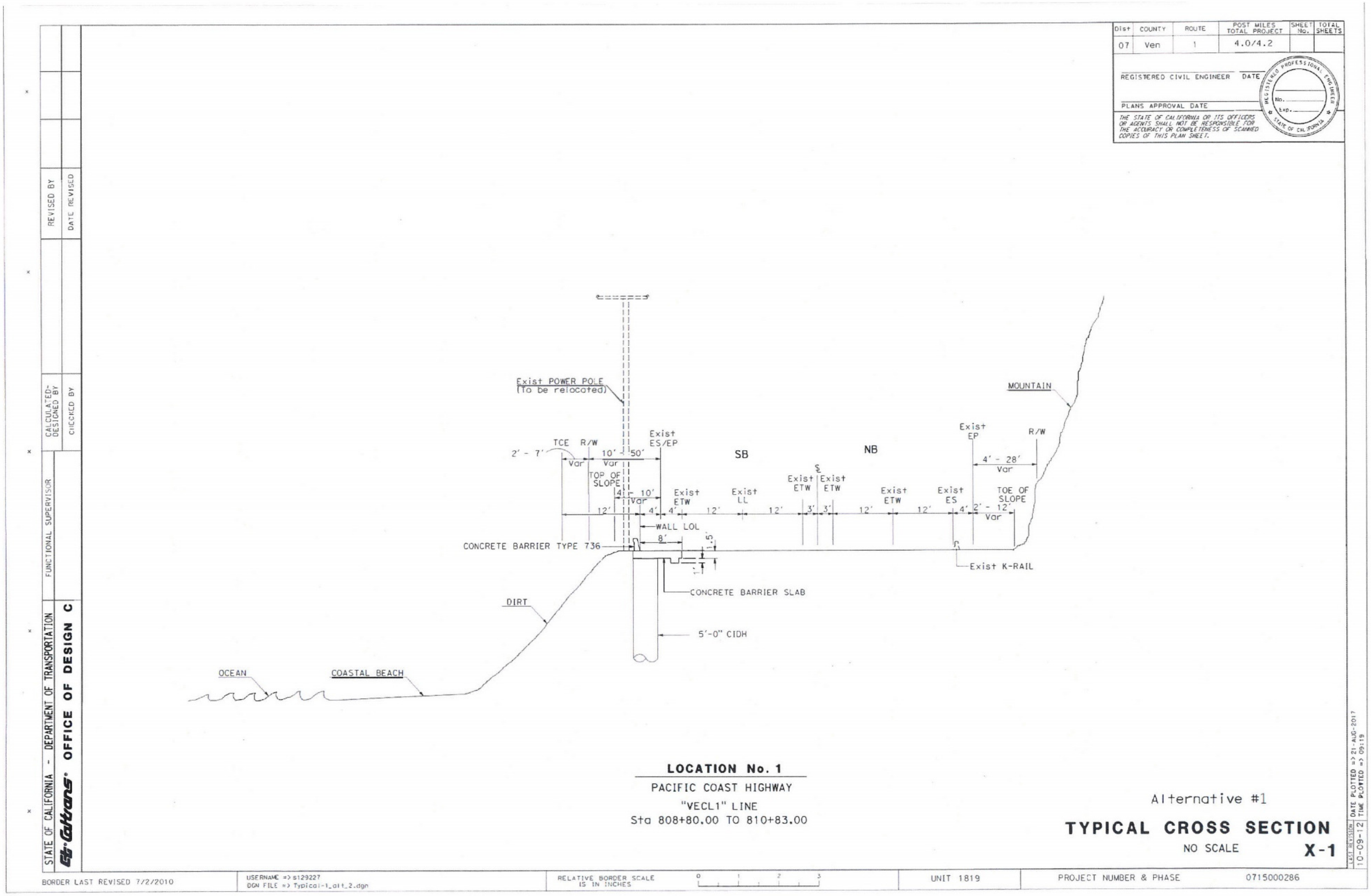
3	354.03'	07°40'28"	23.75'	47.42'
4	1132.16'	05°44'49"	56.83'	113.56'
5	507.99'	18°54'25"	84.58'	167.63'
6	7559.69'	01°58'06"	129.87'	259.71'



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TOE OF SLOPE
WALL LOL
CONCRETE BARRIER TYPE 736
Exist K-RAIL
CONCRETE BARRIER SLAB
DIRT
5'-0" CIDH
OCEAN
COASTAL BEACH
LOCATION No. 1
PACIFIC COAST HIGHWAY
"VECL1" LINE
Sta 808+80.00 TO 810+83.00
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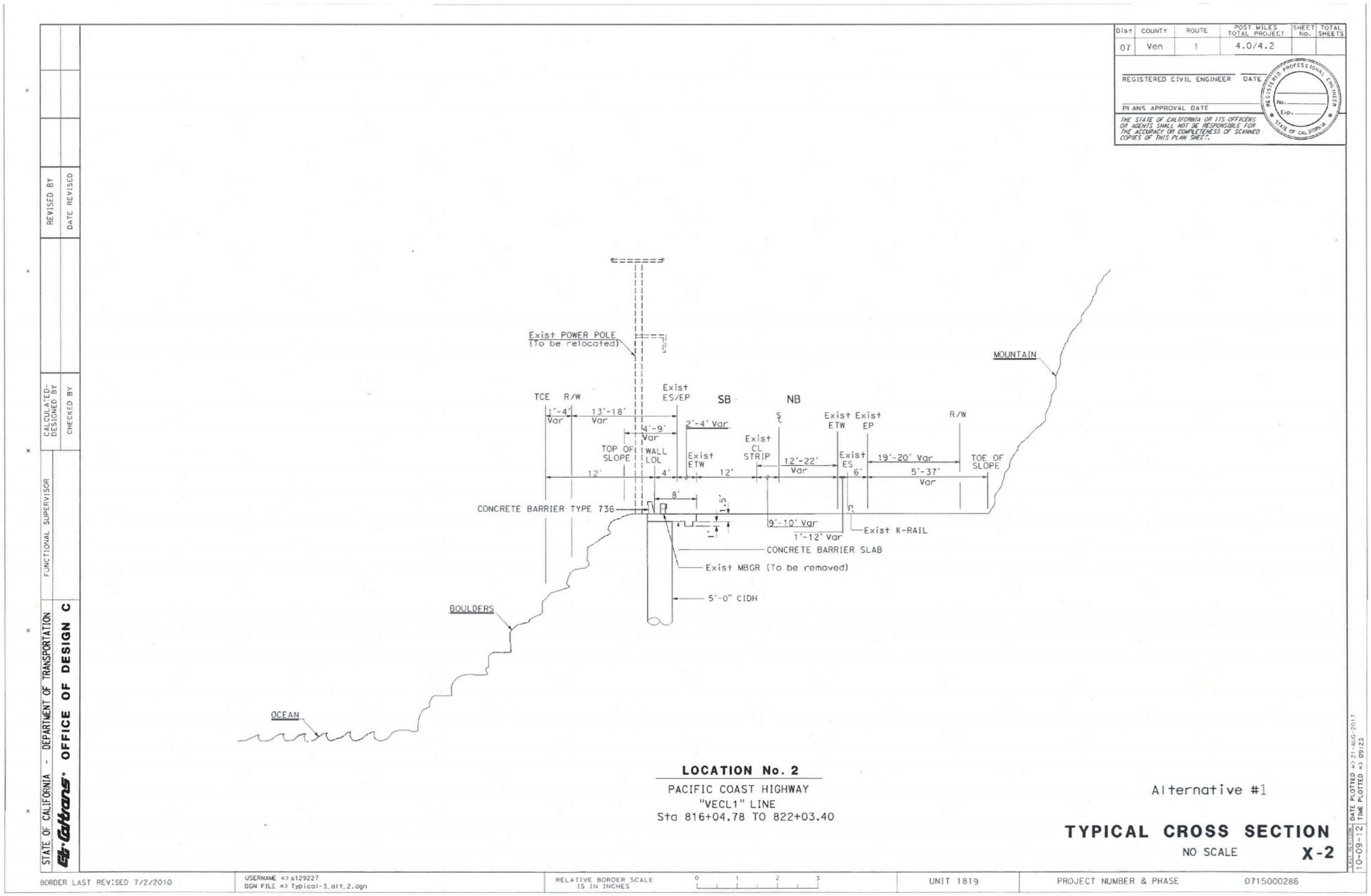
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2'-4' Var
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WALL LOL
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Exist CL STRIP
12'-22' Var
Exist ES
19'-20' Var
TOE OF SLOPE
5'-37' Var
12'
4'
12'
6'
8'
1.5'
CONCRETE BARRIER TYPE 736
9'-10' Var
1'-12' Var
Exist K-RAIL
CONCRETE BARRIER SLAB
Exist MBGR (To be removed)
5'-0" CIDH
BOULDERS
OCEAN
LOCATION No. 2
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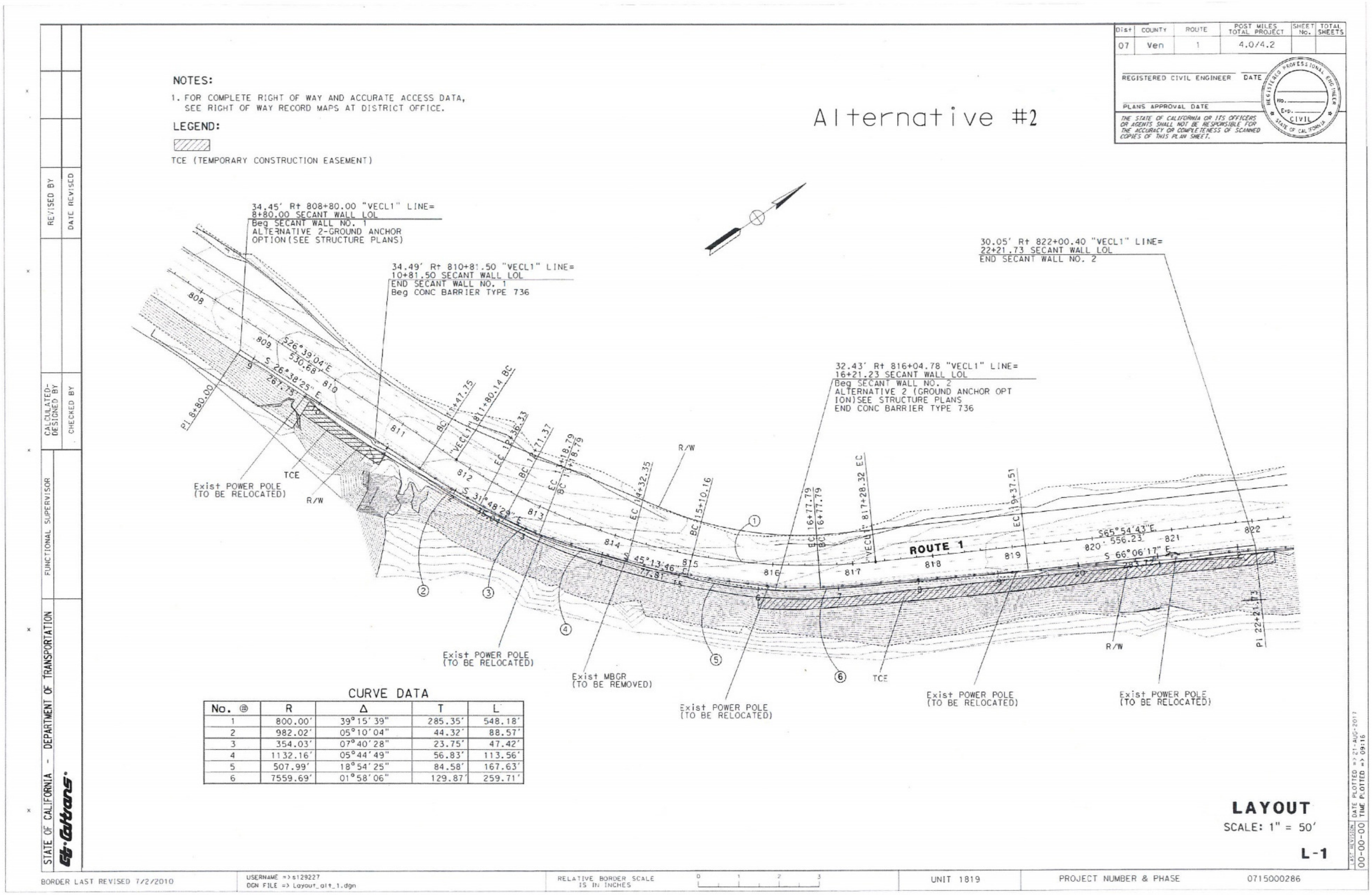

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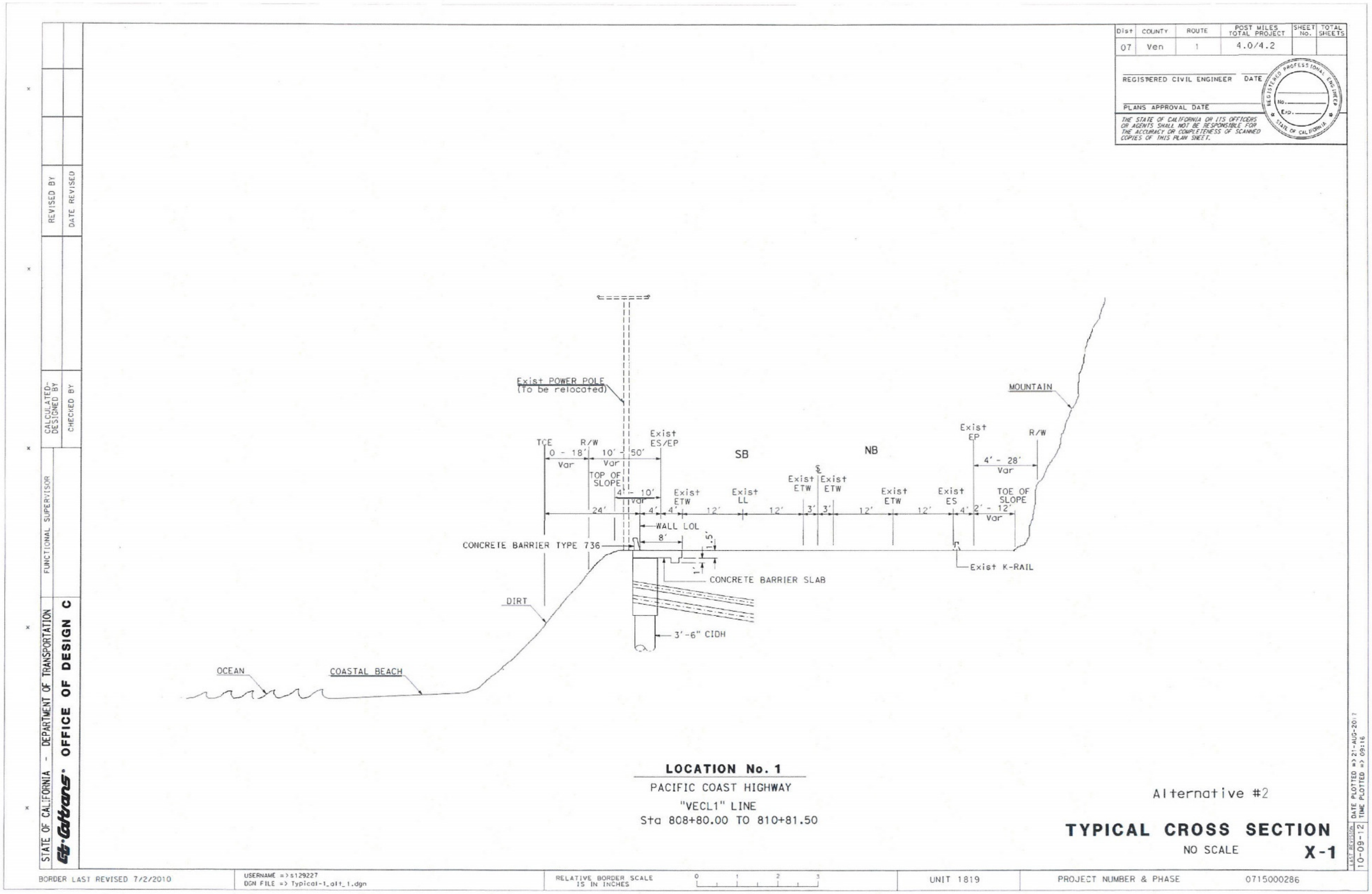

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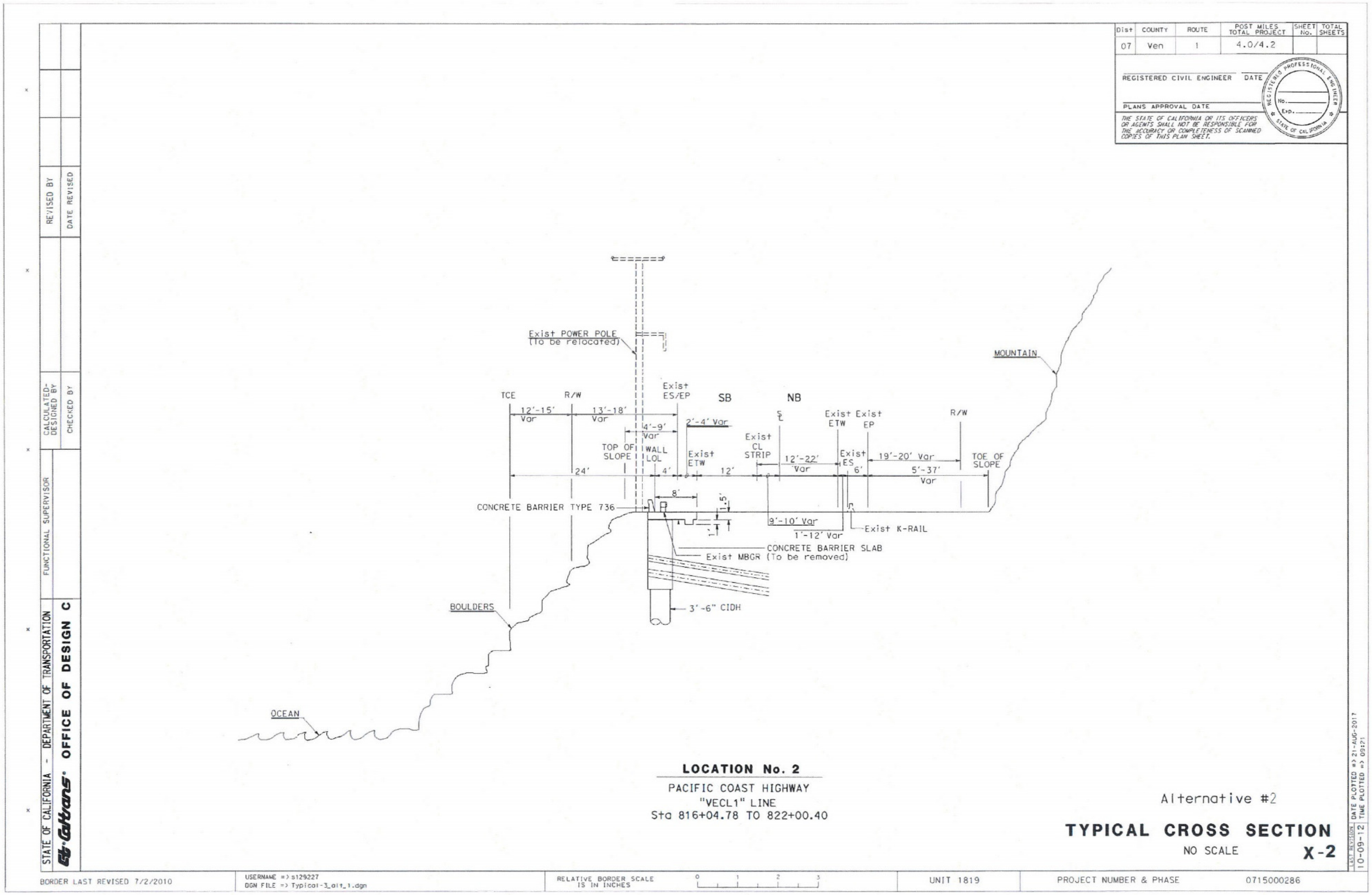
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2'-4' Var
Exist ETW
Exist EP
R/W
TOP OF SLOPE
WALL LOL
Exist ETW
Exist CL STRIP
12'-22' Var
Exist ES
19'-20' Var
TOE OF SLOPE
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4'
12'
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8'
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OCEAN
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REVISED BY
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DGN FILE => Typical-3_alt_1.dgn
RELATIVE BORDER SCALE IS IN INCHES
UNIT 1819
PROJECT NUMBER & PHASE
0715000286

From: Aguilar, Eduardo A@DOT
To: Velasco, Vanessa@DOT; Ortega, Lourdes@DOT
Cc: Baquiran, Anthony R@DOT
Subject: Section 4(f) Concurrence from State Parks: Ven-1 Secant Wall
Date: Tuesday, March 19, 2019 4:59:04 PM

Vanessa,
Below is your Section 4(f) Concurrence from Danielle of State Parks for the Ven-1 Secant Wall job.
At PS&E you'll need to obtain a Right-of-Entry Permit. We can help you with that if you like.

From: LeFer, Danielle@Parks <Danielle.LeFer@parks.ca.gov>
Sent: Monday, March 18, 2019 2:54 PM
To: Harrison, Kimberly@DOT <Kimberly.Harrison@dot.ca.gov>; Aguilar, Eduardo A@DOT <eduardo.aguilar@dot.ca.gov>
Cc: Erickson, Michael@DOT <Michael.Erickson@dot.ca.gov>
Subject: Re: Postponed: Wednesday 11AM Meeting at Leo Carrillo State Park (regarding archaeo site that stretches from Arroyo Sequit to Willow Creek)

This is an email of concurrence for the Section 4(f) Concurrence for PCH Secant Wall in Pt Mugu State Park, in Ventura County .

A Right of Entry permit will be required prior to start of construction.

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4.5 Public Agencies Comment Letters and Responses

A-1

RESOURCE MANAGEMENT AGENCY

county of ventura

Planning Division
Kimberly L. Prillhart
Director

November 20, 2018

Lourdes Ortega, Senior Environmental Planner
Division of Environmental Planning
Caltrans, District 7
100 S. Main Street, MS 16A
Los Angeles, CA 90012

Subject: Notice of Availability of Draft Initial Study/Environmental Assessment with Intent to Adopt Mitigated Negative Declaration/Finding of No Significant Impact for the VEN-1 Permanent Slope Restoration Project on State Route (SR)-1.

Dear Ms. Ortega,

Thank you for the opportunity to comment on the Draft Initial Study/Environmental Assessment for the Caltrans VEN-1 Permanent Slope Restoration Project. The Ventura County Planning Division reviewed the Notice of Availability of Draft Initial Study/Environmental Assessment document for the proposed project and provides the following response:

1. **Local Coastal Program (LCP).** The proposed project is located within the Coastal Zone and is subject to the Local Coastal Program (LCP) which is comprised of the Coastal Area Plan (CAP) and the Coastal Zoning Ordinance (CZO). Please refer to the Local Coastal Program of Ventura County on the County's website at https://vcrma.org/local-coastal-program which provides specific standards, goals and policies for this area. Information about the County's LCP and guiding documents can be found on our website and shall be consulted as part of the environmental analysis for the project. Specifically, the comments below should be taken into consideration as part of the final environmental document:

   Section 2.1.3, Ventura County Coastal Area Plan
   A general alignment for the Coastal Trail was planned by the County of Ventura Planning Division and adopted by the Board of Supervisors in December 2016. The Local Coastal Program Amendments for the Coastal Trail were certified by the California Coastal Commission in June, 2017. The County's Local Coastal Program describes the need for multimodal improvements for cyclists and pedestrians in the project area, either through the provision of Class 1 multi-modal pathway, or a Class 2 Bike lane and a natural surface pathway on the road shoulder for pedestrians.

   Table 2.3 should be updated to include the Coastal Trail policies in Coastal Area Plan Section 4.1.1-E, Policies 1.2 through 3.7, as needed. Program 2 is also relevant as it requires the Coastal Trail to be included in Discretionary Project Reviews for road improvement projects. A-1-1

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A-1-1: The Coastal Trail policies in the Ventura County Coastal Area Plan were reviewed as requested by the commenter and included in Table 2.3 as appropriate.

Section 2.2.3 describes that installing multimodal options along the highway would be a financial burden and engineering challenge that is beyond the scope of this project. It describes that construction of the build alternative does not prohibit future implementation of multi-modal options for other Caltrans projects. The County Planning Division does not agree with this assessment, as these are substantial road improvements that will decide the configuration of the road for decades. If space for the Coastal Trail is not included with the proposed project it is unlikely that the trail will be constructed in the project area during the foreseeable future. A-1-2

As Caltrans is aware, bicycle and pedestrian pathways are frequently added to bridges through a cantilever design, and thus the similar engineering design should be applied to the secant walls to include additional space on the ocean side of the roadway for a bike path and pedestrian trail. When combined with the space on the inland side of the road shoulder, there would be sufficient space within the right-of-way to provide multi-modal infrastructure. Section 2.5.3 describes that some of the road shoulder on the northbound lanes will be paved to provide space for traffic during construction. This additional roadway space should be dedicated to pedestrian and bicycle facilities after construction. A-1-3

Section 2.5: Traffic and Transportation/Pedestrian and Bicycle Facilities

This section begins with a description of the federal Highway Administration requirements for anticipated pedestrian and/or bicycle traffic during the development Federal-aid highway projects. It states that every effort must be made to minimize the detrimental effects on all highway users who share the facility. This is followed by a US Department of Transportation Accessibility Policy Statement pledging a fully accessible multimodal transportation system. Section 2.5.1 however does not discuss Assembly Bill No. 1396, which was approved by the Governor in 2007. The law requires transportation planning agencies such as Caltrans, whose jurisdiction includes property designated for the Coastal Trail, to coordinate with specified agencies regarding development of the trial, and to include provisions for the trail in their regional transportation plans. A-1-4

Section 2.5.2 should be modified to describe that the project area is a popular route for cyclists and that pedestrians also use the area to park and access the beach. The County has certified coastal policies and an alignment for the Coastal Trail that traverses the project site in Coastal Area Plan Section 4.1.1. The need for pedestrian and bicycle improvements is especially necessary given the project's proximity to popular Sycamore Cove recreational facilities on both sides of Pacific Coast Highway without a designed pedestrian crossing. The northern proposed secant wall site is near the Great Sand Dune, also a popular site for visitors to stop and hike, and many mountain bikers use the road shoulder to connect a trail that loops between Sycamore and La Jolla Canyons. Furthermore the proposed southern secant wall is located at segment of the roadway where two southbound lanes merge into one lane, causing motorists to accelerate to pass slower vehicles. This configuration is a safety hazard for non-vehicular travelers and more space should be provided for cyclists and pedestrians. A-1-5

CEQA Checklist, Item 3.2.16-F Transportation/Traffic

A-1-2: The objective of this proposed project is to stabilize the roadway in place within the project limits. This will prevent PCH from deteriorating and becoming a compromised throughway due to wave erosion. Public access will be retained on PCH so that future projects can implement projects along the planned Coastal Trail. The proposed project is a crucial project needed to preserve the roadway as it exists today so that improvements like bicycle facilities, can be implemented in the future. However, the commenter's concerns are valid and important to Caltrans. Caltrans is in the early project development of Big Sycamore Creek Bridge Project which involves widening Big Sycamore Creek Bridge, located about 0.2 miles from proposed project. Caltrans is considering including the Coastal Trail within this project segment, as bicycle facilities are easier to be incorporated in a bridge widening project.

A-1-3: Caltrans is unable to convert the paved northbound shoulder, into permanent roadway widening due to the safety concerns described in Section 1.4. In addition, this project's post miles extend from 4.2 to 4.4 on PCH. Should the shoulder be used for a bicycle lane, the lane would only extend 0.2 miles which is impractical for the user.

A-1-4: Assembly Bill No 1396 was added to Section 2.5.1 in the manner the commenter described its applicability.

A-1-5: Section 2.5.2 was revised to emphasize that the roadway within the project limits is a popular route for cyclists. This section also describes the available parking within the project limits and has been modified to include that beachgoers use PCH as parking to access the beach.

The finding that the proposed project would have no impact on adopted policies, plans, or programs regarding bicycle or pedestrian facilities is inconsistent with the County Local Coastal Program and Assembly Bill No. 1396. Caltrans should include the Coastal Trail in its applicable Transportation Concept Reports and District System Management Plans. It should also continue to coordinate the design of this project with the coastal Commission, Coastal Conservancy, and County of Ventura regarding modifications to the design of either Alternatives 1 or 2, to include a cantilevered Coastal Trail segment. If necessary, road realignment onto the northbound shoulder that is planned to be paved could also be used to allow for additional space for the Coastal Trail. A-1-6 A-1-7

2. **Initial Study Assessment Guidelines.** To assist with the environmental review required under the California Environmental Quality Act (CEQA), the County of Ventura adopted Initial Study Assessment Guidelines by topical area that provide threshold criteria and standard methodology used in determining whether or not a project (individually or cumulatively with other projects) could have a significant effect on the environment.
These guidelines can be found on the County's website at https://vcrma.org/ceqa-implementation-and-initial-study-assessment-guidelines. We request this document be consulted and taken into consideration as part of the environmental review document. A-1-8

3. **Archaeology**. The proposed project is located in an area known or suspected to have prehistoric uses and classified as having "Very Sensitive – High Likelihood of Archaeological Sites"[1] as identified in the Ventura County General Plan. Due to the potential impacts on archaeological resources in the area, applicable record searches and/or surveys shall be conducted, and consultation with the Native American Heritage Commission (NAHC) shall occur in accordance with AB 52. Record searches and consultation with the NAHC are documented in Chapter 4, Section 4.2.4 Interagency Consultation and Coordination. Therefore, Planning Staff concurs with the Less than Significant Impact determination as cited in the Draft Initial Study (IS). A-1-9

Thank you again for the opportunity to comment. Should you have any questions about the contents of this letter, please contact me at 805-654-3327 or via email at linda.blackbern@ventura.org

Sincerely,

Linda Blackbern

Linda Blackbern, Senior Planner
Long Range Planning Section
Ventura County Planning Division

Cc: File RMA#17-023-1

[1] Figure 1.8.1 Archaeological Sensitivity Map (South Half), Ventura County General Plan RESOURCES APPENDIX

A-1-6: Bicycles are not generally included in the Transportation Concept Reports and District System Management Plans because they are traffic operations planning documents. However, accommodations for bicycles are incorporated into Caltrans' projects, when applicable, as required by Deputy Directive 64-R2. The findings in Chapter 2.1.3 have been modified to reflect inconsistencies with policies, plans, and programs concerning bicycle facilities on the Coastal Trail.

A-1-7: Coordination between Caltrans, California Coastal Commission, and Ventura County has been ongoing throughout the preliminary design phase which began during the environmental scoping period, and coordination will continue throughout the final design phase to ensure the agencies are involved prior to the Coastal Development Permit application. The Coastal Conservancy has been added to the distribution list, please see Section 6.4.

A-1-8: Caltrans does not produce environmental documents with thresholds. Caltrans abides by CEQA guidelines by analyzing project impacts through the use of the Standard Environmental Reference, found at: http://www.dot.ca.gov/ser/

A-1-9: The commenter's support for the Less Than Significant Impact determination for archaeological resources, NAHC coordination conducted and documented in Chapter 4, and Section 4.2.4 Interagency Consultation and Coordination is acknowledged and included in the project record.

A-2

Ventura County Air Pollution Control District

669 County Square Dr
Ventura, California 93003

tel 805/645-1400
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www.vcapcd.org

Michael Villegas
Air Pollution Control Officer

VENTURA COUNTY
AIR POLLUTION CONTROL DISTRICT
Memorandum

TO: Lourdes Ortega, Caltrans Division of Environmental Planning

DATE: November 19, 2018

FROM: Nicole Collazo, Planning Division

SUBJECT: Request for Review of Draft Initial Study/Environmental Assessment with Intent to Adopt MND/FONSI, Slope Restoration Project on SR-1 (RMA #17-023-1)

Air Pollution Control District staff has reviewed the Draft Initial Study/Environmental Assessment for the project number referenced above. The proposed project would consist of a one-year long construction on State Route 1, mile posts 4.0 to 4.2, to perform permanent restoration of damage as a result of several storm events. The construction of two secant walls at post miles 4.0 and 4.2 is proposed for both Alternatives 1 and 2 (Alternative 3 is a no-build scenario). Alternative 1 will not require slope excavation and Alternative 2 will require slope excavation in order to station heavy equipment that will install anchors underground for additional stabilization. In addition, the existing metal beam guardrails will be removed during construction and be replaced with Midwest Guardrail system in both build alternatives. The project Lead Agency for both the NEPA and CEQA review is the California Department of Transportation (Caltrans).

General Comments

District staff concur with the findings that operational air quality impacts from the project would be less than significant based on the nature of emissions being temporary and short-term (Page 67), and the General Conformity analysis provided (Page 63, exemption). As a commenting agency, we recommend the following changes to the Draft Initial Study/Environmental Assessment:

NEPA Section 2.12.1 Air Quality (and GHG emissions)

- Page 67, last paragraph: Please change "SCCAB Dust Implementation Rule 55" to "APCD Rule 55, Fugitive Dust" and any similar reference thereafter. A-2-1

- Pages 67- 68, construction emission calculations: We request for the emission calculation model results to be included in the Draft Initial Study/Environmental Assessment along with model assumptions used. There is not enough information included in this section to concur with construction emission estimates. For example, the Sacramento Metropolitan Air Quality A-2-2

A-2-1: The environmental document has been revised to reflect the change from "SCCAB Dust Implementation Rule 55" to "VAPCD Fugitive Dust Rule 55".

A-2-2: The construction emissions calculations have been added to the final environmental document within Appendix D showing the input and output values from the model.

Management District's Roadway Construction Emissions Model (RCEM) version 8.1.0 has preset values for soil hauling truck roundtrips at 30 miles per day; was this preset value used or was a more accurate mileage used for the model run? Other parameters needed include soil type for the project site, equipment type and unit amounts, miles per day, trips per day, and/or if Tier 4 engines were used as a possible mitigation measure for PM and DPM. A-2-3

- Page 68, AQ Environmental Commitments: In addition to AQ-2 through AQ-4, and due to the proposed project emission amount, we recommend adding the following environmental commitments in order to further reduce the air quality affects from construction equipment as it relates to NOx, Particulate Matter and Diesel Particulate Matter:

The following are recommended measures for construction equipment and vehicles: A-2-4

I. Diesel powered equipment should be replaced by electric equipment whenever feasible.

II. Lengthen the construction period during smog season (May through October), to minimize the number of vehicles and equipment operating at the same time.

III. Use alternatively fueled construction equipment, such as compressed natural gas (CNG), liquefied natural gas (LNG), or electric, if feasible.

We would like to acknowledge current rules and regulations that must be complied with:

I. Construction equipment shall not have visible emissions greater than 20% opacity, as required by APCD Rule 50, Opacity.

II. All portable diesel-powered equipment over 50 BHP shall be registered with the State's Portable Equipment Registration Program (PERP) or an APCD Portable Permit. For more information on portable equipment requirements and qualifications, please visit https://www.arb.ca.gov/portable/perp/perpfaq_04-16-15.pdf.

III. Off-Road Heavy-Duty trucks shall comply with the California State Regulation for In-Use Off-Road Diesel Vehicles (Title 13, CCR §2449), the purpose of which is to reduce NO_X and diesel particulate matter exhaust emissions.

IV. On-Road Heavy-Duty trucks shall comply with the California State Regulation for In-Use On-Road Diesel Vehicles (Title 13, CCR §2025), the purpose of which is to reduce NO_X and diesel particulate matter exhaust emissions. A-2-5

V. All commercial on-road and off-road diesel vehicles are subject to the idling limits of Title 13, CCR §2485, §2449(d)(3), respectively. Construction equipment shall not idle for more than five (5) consecutive minutes. The idling limit does not apply to: (1) idling when queuing; (2) idling to verify that the vehicle is in safe operating condition; (3) idling for testing, servicing, repairing or diagnostic purposes; (4) idling necessary to accomplish work for which the vehicle was designed (such as operating a crane); (5) idling required to bring the machine system to operating temperature, and (6) idling necessary to ensure safe operation of the vehicle. It is the Permittee's responsibility to have a written idling policy that is made available to operators of the vehicles and equipment and informs them that idling is limited to 5 consecutive minutes or less, except as exempted in subsection a. above.

CEQA Evaluation Chapter 3, Section 3.2.3 Air Quality

A-2-3: Caltrans requires contractors to comply with all applicable rules, regulations, and ordinances as applicable. Caltrans also requires contractors to plan out and perform construction activities such as hauling routes and number of trips. As the project is currently in planning stage, default values in the SMAQMD's RCEM version 8.1.0 have been utilized to estimate construction emissions for a typical construction scenario, which include the number of truck trips calculated based on the default value of 30 miles per roundtrip of soil hauling and sand gravel soil (soil type 1). As contractors will be required to comply with the current and applicable rules and regulations, mitigation options to utilize newer on-road fleet or Tier 4 off-road equipment were not utilized in the estimate.

A-2-4: Caltrans will follow its Air Pollution Control standard specifications and incorporate these measures in the final design phase.

A-2-5: The rules and regulations are acknowledged. Caltrans will ensure that the contractors comply with all applicable rules, regulations, and ordinances throughout the construction of this project.

- Page 108, discussion: Please change "SCCAB" on the last word of the first sentence to "County of Ventura". The South Central Coast Air Basin (SCAAB) comprises of San Luis Obispo, Santa Barbara, and Ventura Counties. The VCAPCD is the primary responsible agency responsible for attaining state and federal air quality standards only in the County of Ventura. A-2-6

- Page 108, discussion: The emission exemption referenced in the discussion section is 40 CFR 93.126. This subsection pertains to exemptions from a conformity analysis. It is more suitable for CEQA purposes and how VCAPCD reviews air quality significance determinations to reference the following language: The VCAPCD does not have construction air significance thresholds as "construction-related emissions (including portable engines and portable engine-driven equipment subject to CARB's PERP and used for construction operation or repair and maintenance activities) of ROC and NOx are not counted towards the two significance thresholds, since these emissions are temporary" (VCAPCD Air Quality Assessment Guidelines [AQAG], 2003, Page 5-3). A-2-7

For clarification purposes, portable equipment may be exempt from the requirements of Rule 10, Permits Required, but must comply with emission standards and prohibitions. The mobile equipment, exempt or not, will always be subject to our Rule 55, Fugitive Dust, Rule 51, Nuisance, and Rule 50, Opacity. The Draft Initial Study/Environmental Assessment does include design features such as covering all soil stockpiles and paving the adjacent shoulder for rerouted traffic as suitable measures taken for the reduction of fugitive dust and airborne particles.

In addition, please change "SCCAB Dust Implementation Rule 55" to "APCD Rule 55, Fugitive Dust" and any similar reference thereafter. A-2-8

Thank you for the opportunity to review the proposed project and Draft Initial Study/Environmental Assessment.

If you have any questions, please call me at 645-1426 or email me at nicole@vcapcd.org.

A-2-6: The environmental document has been revised to reference "county of Ventura", rather than "VCAPCD ".

A-2-7: The referenced discussion describes the thresholds for CEQA and was added as the commenter advised.

A-2-8: This comment is a duplicate from A-2-1. The environmental document has been as revised, please see response to A-2-1.

STATE OF CALIFORNIA - NATURAL RESOURCES AGENCY EDMUND G. BROWN JR, *Governor*

CALIFORNIA COASTAL COMMISSION
South Coast Area Office
200 Oceangate, Suite 1000
Long Beach, CA 90802-4302
(562) 590-5071

November 21, 2018

Lourdes Ortega
Senior Environmental Planner
California Department of Transportation, District 7
Division of Environmental Planning
100 South Main Street, MS 16A
Los Angeles, CA 90012

RE: VEN-1 Permanent Slope Restoration Project (07-VEN-1 PM 4.0/4.2)
Comments on Proposed MND/EA 31820 (SCH # 2017101045)

Ms. Ortega:

Thank you for the invitation to comment on the proposed Mitigated Negative Declaration/Environmental Assessment for the VEN-1 Permanent Slope Restoration Project at Postmiles 4.0 and 4.2 along Pacific Coast Highway in unincorporated Ventura County. These comments are supplemental to the comments provided on the Scoping Notice for this project in a letter dated November 22, 2017 (please review that letter for more detailed description of project issues and requested environmental analysis). Coastal Commission staff appreciates the opportunity to comment on the environmental review process for the project. The entire project is within the Coastal Zone, so a coastal development permit(s) will be required following the CEQA review phase of the project. The Coastal Commission certified a Local Coastal Program (LCP) for Ventura County in 1983, which is the standard of review for new development above the mean high tide line. The Ventura County Planning Division may process a coastal development permit (CDP) for development within its LCP jurisdiction, which could be appealed to the Coastal Commission. For new development below the mean high tide line, a coastal development permit is required from the Coastal Commission and the standard of review is the Chapter 3 policies of the Coastal Act.

One of the primary tenets of the Coastal Act is to protect and enhance public access to and along the coast, which requires an interconnected and multi-modal transportation system. The Coastal Act also includes policies to preserve and enhance visual resources and avoid fill of coastal waters, which should inform the project design.

California Coastal Trail

As noted in the environmental document, the project is located along a scenic highway popular with coastal visitors. As noted in the environmental document, the shoulder widths within the project limits are inadequate on both the coastal side of the highway (due to the steep slope and erosion) and the inland side of the road (due to unpermitted k-rail and fencing which blocks the shoulder and creates a dangerous condition for pedestrians and cyclists). The project proposes to fix the coastal side of the highway in place with one of the two build alternatives (deep piles), which would establish the edge of the roadway and are likely to remain in place for 75-100 years. The project also includes paving the inland highway shoulder in the area currently obstructed by unpermitted k-rail and fencing. Because the project proposes work along the roadway and on both shoulders, the project provides an opportunity to enhance public access and recreation *for all the people*, not only for the people in personal vehicles.

Assembly Bill No. 1396, approved by the Governor in 2007, requires transportation planning agencies such as Caltrans, whose jurisdiction includes property designated for the Coastal Trail, to coordinate with specified agencies regarding development of the California Coastal Trail. Ventura County has planned for the trail along the segment of Pacific Coast Highway where the project is proposed, identified as Segment S1 in LCP figure 4.1-7:

> Segment S1 is a planned, multi-modal trail segment, approximately 10.3 miles long, along Pacific Coast Highway, which is maintained by Caltrans. This trail segment will include Class 2 bike lanes and a Class 1 pathway or natural surface trail for hikers/walkers. Due to the high anticipated demand for most of this segment of the Coastal Trail, future planning efforts (see Program 1) should consider accommodations for the broad range of user groups who visit this area. For example, ADA access improvements could be provided at coastal access points to popular beaches and at scenic resources, such as Point Mugu Rock. Segment S1 also includes several Walking/Hiking Routes, such as an existing hiking trail in Point Mugu State Park and beaches located within the South Coast Subarea.
>
> In this area provide Class 2 bike lanes along PCH. Also provide a Class 1 walking / hiking pathway along one side of PCH. (Type A-2) Alternatively, construct a shared, Class 1 trail facility (Type A-1) on one side of PCH to accommodate all user groups (similar to Segment N1).

The analysis within Section 1.2.1 of the environmental document references the Federal Highway Administration standard regarding *Independent Utility and Logical Termini* as justification for not addressing public access issues and erosion along the inland side of the highway and a related statement is included within Section 2.2.3 *Environmental Consequences*: "installing multi-modal options along the highway would be a financial burden and engineering challenge that is beyond the scope of this project." These statements may be accurate in the context of Caltrans project delivery process for a normal project, but are not acceptable for a project along a scenic highway where dangerous conditions exist for pedestrians and cyclists and have been allowed to persist for more than four years due to unpermitted development. As noted in the environmental document, coastal development permits will be required from Ventura County and from the Coastal Commission. Coastal Act Section 30210 requires:

In carrying out the requirement 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.

VEN-1 Permanent Slope Restoration Project
Coastal Commission staff comments on proposed MND/EA
Page 3 of 5

The environmental document and the project description should be revised to include adequate space for the California Coastal Trail. If full build out of Segment S1 of the trail is not feasible through the subject project, then at a minimum the project should provide a wide shoulder for pedestrians and cyclists on the coastal side of the highway and a shoulder for cyclists and emergency parking on the inland side of the highway. A-3-1 The environmental document should also analyze the potential for the project to connect to existing and planned pedestrian and bicycle facilities on either side of the project limits. A-3-2 Additionally, please analyze the potential for adjacent facilities which are currently substandard in width or inadequately buffered from vehicles traveling at a high rate of speed to be improved, consistent with the Caltrans Complete Streets Program, the public access and recreation policies of the Coastal Act, and the public access and recreation policies of the Ventura County LCP. A-3-3

Sea Level Rise Adaptation
The environmental analysis of potential impacts associated with sea level rise and severe storms in Section 3.4.2 *Project Specific Wave Run-Up Study for Sea Level Rise* is inadequate. The section refers back to Section 2.2.3 *Environmental Consequences*, which states: "a wave run-up study will be prepared, per the request from the Commission. Wave run-up is the maximum vertical height of a wave breaking on a beach or structure, from above the still water level. Wave run-up depends on the local water level, incident wave conditions, and dimensions of the beach or structure the wave breaks against." If this document has been completed it should be included as an appendix to the MND/EA. A-3-4

Coastal Commission staff comments on the Scoping Notice provided guidance on a study which was to be prepared by TranSystems to assist with project analysis for several Caltrans projects in the vicinity of PM 4.0 – 5.0. A problematic statement from that document has been repeated in the subject environmental document: "redictions of changes in sea level rise based on various numerical models indicate that the increase in sea level rise over the coming 100 years would be between 0.6 ft and 1.6 ft." Please note that Caltrans 2011 Guidance on Incorporating Sea Level Rise includes a chart with a range of sea level rise projections up to the year 2100. The "Selecting Sea Level Rise Value(s) for Design" section of Caltrans SLR Guidance provides:

> *When selecting a future design life date up to and including year 2050, use the initial target value from the column titled "Average of Models." For projects with design life consideration of 2070 or beyond, use the range of the three "Average of Models" values. For design life dates not specifically listed in Table 2 interpolate using an assumption of linear progression for dates between those listed in Table 2 (e.g. 2037 or 2080).*
>
> *When using the range of the three average values for time periods of 2070 or beyond, it is up to the discretion of the PDT to determine a value to use for the project. There is no specific "right" or "wrong" value, and it is anticipated that as future climate research and studies are completed that these values will change. It is expected that most resource agencies will lean toward the higher indicated values, and expect entities seeking permits to show that such levels can be accommodated or addressed. The PDT will need to confer with the resource agencies in question and reach agreement on an appropriate target value for design purposes.*

A-3-1: The paved northbound shoulder will be closed to vehicular access after construction is complete for the reasons described in Section 1.4. The width of the roadway is extremely limited due to the coastal cliff on the west and mountains on the east. Any widening of the highway would require grading of the mountain face which would conflict with the natural appearance and allure of PCH. However, paving of the northbound shoulder does allow the potential for a future project whose purpose is to increase bicycle facilities through PCH.

A-3-2: Currently no existing pedestrian or bicycle facilities exist directly adjacent to either side of the project limits. The potential to connect to planned pedestrian and bicycle facilities exists by paving the northbound shoulder. Although the northbound shoulder would be closed to traffic, it did increase the paved width of the highway and can be used for bicycle facilities in a future planned project that creates bicycle facilities throughout PCH.

A-3-3: The purpose of this project is to stabilize the roadway from erosion within the specified project limits. Analyzing adjacent facilities beyond of the project limits is outside the scope of this project. However, arming the slope and roadway in this area would allow for PCH to be preserved in place for the consideration of future enhancements. See response to Comment A-3-2.

A-3-4: The wave run-up study is included in the appendices of this document in Appendix G.

VEN-1 Permanent Slope Restoration Project
Coastal Commission staff comments on proposed MND/EA
Page 4 of 5

Consistent with Caltrans Sea Level Rise Guidance and the Coastal Commission's Sea Level Rise Policy Guidance (2015), the sea level rise scenarios should be based on the best available science, which is provided in two reports – the Ocean Protection Council's April 2017 Rising Seas in California: An Update of Sea-Level Rise Science and its 2018 State Sea-Level Rise Guidance. The environmental document should include analysis of a low, medium, high, and extreme sea level rise scenario, in addition to effects of an extreme high tide and a 100 year storm. A-3-5

Section 3.4.2 *Project Specific Wave Run-Up Study for Sea Level Rise* appears to rely on Ocean Protection Council Guidance from 2013, which has since been updated to include the best available science and new severe sea level rise projects. The analysis states that "the projected sea level rise for year 2100 is an estimated increase of 0.42 m–1.67 m." This section and Section 2.2. should both be updated to include a severe (H++) sea level rise scenario from the current OPC guidance. The CalAdapt models in the environmental document should be updated with dynamic modeling accounting for a severe sea level rise scenario in conjunction with a high tide and a 100 year storm. A-3-6 Please also analyze design treatments that may be included in the project to minimize hazards associated with sea level rise, as well as adaptation measures that may be implemented in the future if sea level rise is severe. A-3-7

The analysis concludes: "because of the project area's vulnerability to sea level rise, the wave run-up study will analyze wave impacts on the secant walls to better understand and address future impacts of sea level rise on the project. Results from the completed wave run-up study will be included in the final environmental document." Results from the study should guide the project design and the adaptation measures analyzed in the final environmental document.

Environmentally Sensitive Habitat and Fill of Coastal Waters – Alternatives Analysis

The document states that environmentally sensitive habitat has not been identified on the site. Please note that additional analysis of the slope between the beach and the highway adjacent to PM 4.0 may be required during the coastal development permit application phase of the project. Even if the slope has been disturbed by Caltrans activities and natural processes in the past, it appears to support primarily native plans and may be identified as environmentally sensitive habitat. Impacts to environmentally sensitive habitat must be avoided. Coastal Act Section 30240 provides that only uses dependent on environmentally sensitive habitat areas shall be allowed in those areas; highways are not a dependent use. Likewise, Coastal Act Section 30235 prohibits construction altering the natural shoreline for non-coastal-dependent uses. Coastal Act Section 30253 requires that development not contribute significantly to erosion, geologic instability, or destruction of the site or the surrounding area…" Should the Coastal Commission approve a project which is in conflict with these policies, mitigation will be required and the project must still be identified as a least environmentally damaging alternative. Based on the referenced policies, as well Section 30230 (Marine Resources) and Section 30231 (Biological Productivity), Alternative 3 (No Build) appears to be most consistent with Coastal Act Policies. Alternative 1 (Cantilever Option) appears to be less environmentally damaging than Alternative 2 (Ground Anchor Option) because it would avoid re-grading the hillside and there would be less potential for additional sediment to enter the marine environment during construction. The final environmental document should provide additional analysis of the three alternatives with respect to the referenced Coastal Act policies. A-3-8

A-3-5: The sea level rise scenarios mentioned in Section 2.2.3 and Section 3.4.2 have been updated to represent the scenarios described in the most updated Ocean Protection Council Guidance entitled, State of California Sea-Level Rise Guidance 2018. This includes the high emissions scenarios for 2050, 2070, 2095, and extreme sea level rise, with extreme high tide and a 100-year storm. The high emissions scenario was selected per AB-2800 which states, "For highly vulnerable, long-lived infrastructure, State agencies should consider climate change impacts associated with a high emissions scenario".

A-3-6: A discussion of H++ extreme sea level rise scenario was included in Section 3.4.2.

A-3-7: The confined space between the roadway and the edge of the cliffside allowed for only limited options to stabilize the slope while also minimally altering the natural landscape of the cliff. The Wave Run-Up Study identified that placing the secant walls closest to the edge of the cliff will reduce interference with beach processes such as sand retention and wave energy dissipation. Also maintaining the large boulders in front of the secant wall at PM 4.0 and the soft sandy slope in front of the secant wall at PM 4.2 will also aid in wave dissipation and minimize potential impacts on natural beach processes. These design treatments were suggested in the Wave Run-Up Study and included in the selected alternative.

A-3-8: The three proposed alternatives are analyzed in reference to Coastal Act Sections: 30240, 30235, and 30253 in Section 2.2 Coastal Zone of the final environmental document.

Please note that the comments provided herein are preliminary in nature. More specific comments may be appropriate as the project develops. Coastal Commission staff requests notification of any future activity associated with this project or related projects. Thank you for the opportunity to comment on the proposed Mitigated Negative Declaration/Environmental Assessment. You may contact me at 562-590-5071 with any questions.

Sincerely,

ZBRehm

Zach Rehm
Senior Transportation Program Analyst

Cc: Ron Kosinski, Deputy District Director, Caltrans District 7
Nick Pisano, CCC Liaison, Caltrans District 7
Tami Grove, Statewide Development and Transportation Program Manager, CCC
Jacqueline Phelps, South Central Coast District Supervisor, CCC

A-4

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

November 26, 2018

Ron Kosinski, Deputy District Director
Division of Environmental Planning
Caltrans, District 7
100 South Main Street, Suite 100
Los Angeles, California 90012

Subject: Draft Initial Study with Proposed Mitigated Negative Declaration/Environmental Assessment for the VEN-1 Permanent Slope Restoration Project, Ventura County, California

Dear Mr. Kosinski:

The U.S. Environmental Protection Agency (EPA) has reviewed the above-referenced document. Our review is pursuant to the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations (40 CFR Parts 1500-1508), and our NEPA review authority under Section 309 of the Clean Air Act. EPA provides the following comments and recommendations to assist the California Department of Transportation (Caltrans) in determining whether a "Finding of No Significant Impact" will result at the completion of the Environmental Assessment (EA) process. We also encourage Caltrans to adopt these recommendations in other potential shoreline protection projects along State Route 1 (SR-1), such as the Big Sycamore Creek Bridge Slope Restoration and Seawall Project.

Impacts to Waters of the U.S.

The proposed project would construct secant walls along two segments of southbound SR-1 in Ventura County in order to prevent coastal erosion and fortify the roadway. Alternative 2 would require slope excavation to install ground anchors that would stabilize the walls. Project Features BIO-1 and WQ-1 would attempt to reduce impacts to waters by requiring the use of a debris blanket and silt fencing (p. 75-76) and incorporating design and construction Best Management Practices (BMPs) (p. 50); however, based on the information included in the Draft EA, it is unclear whether the proposed features would adequately prevent erosion during construction.

Recommendation: Due to the potential impacts to waters associated with Alternative 2, we recommend that Caltrans pursue Alternative 1. A-4-1

Installing secant walls along the coast may propagate erosion in adjacent coastal areas. Section 2.2.3 notes that a wave run-up study will be conducted to fulfill California Coastal Development Permit requirements.

Recommendations:

- Include the wave run-up study in the Final EA in order to assist relevant agencies in determining whether the project could result in secondary impacts to the shoreline. A-4-2
- Include requisite wave run-up studies in draft environmental documents for any other planned coastal hardscaping projects. A-4-3

A-4-1: The commenter's support for construction of Alternative 1 versus Alternative 2 has been noted and incorporated into the project file.

A-4-2: The findings from the wave run-up study is incorporated in this final environmental document and included in Appendix G. The draft wave-run up study was also submitted to CCC and ACOE for their review during the circulation of the draft environmental document.

A-4-3: It is Caltrans' intention to feature the findings from the wave run-up study in draft environmental documents and will continue to do so for future planned coastal hardscaping projects. Please refer to comment A-4-2 for coordination efforts with partnering agencies.

Air Quality
Section 2.5.3 of the Draft EA states that the shoulder of northbound SR-1, which is currently unpaved and prohibits motor vehicle access, would be paved and used to maintain traffic flow during the project's construction phase. Northbound traffic would be temporarily routed to the newly paved shoulder, and southbound traffic would be routed to the current northbound lane. The Draft EA notes that additional coordination would take place between Caltrans and regulatory agencies to determine whether to allow motorists to continue to use the shoulder after construction is completed (p. 35).

> ***Recommendation:*** In the Final EA, clarify whether this project component could expand the operational capacity of this portion of SR-1, and, if so, describe the process that would be undertaken to ensure that impacts from this increased capacity are fully analyzed and disclosed. A-4-4

Construction Emissions
In addition to Project Features AQ-2- AQ-4, EPA suggests that Caltrans consider the following mitigation measures to further reduce the project's construction emissions:

Recommendations: A-4-5

- Prohibit engine tampering to increase horsepower, except when meeting manufacturer's recommendations;
- Solicit bids that include use of energy and fuel-efficient fleets;
- Use cement blended with the maximum feasible amount of fly ash or other materials that reduce greenhouse gas emissions from cement production;
- Reduce construction-related trips of workers and equipment, including trucks; and
- Develop a construction traffic and parking management plan that minimizes traffic interference and maintains traffic flow.

We appreciate the opportunity to review this Draft EA and are available to discuss our comments. Please send one electronic copy of the Final EA when it becomes available to this office at the address above (mail code ENF-4-2). If you have any questions, please contact Morgan Capilla, the lead reviewer for this project, at 415-972-3504 or capilla.morgan@epa.gov.

Sincerely,

Connell Dunning

Connell Dunning, Transportation Team Supervisor
Environmental Review Section

Electronic copy: Brenda Powell-Jones, Caltrans
Kelly Dunlap, Caltrans
Lourdes Ortega, Caltrans

2

A-4-4: Paving the northbound shoulder of PCH would not expand operational capacity. The shoulder would not be used as a travel through lane and therefore, would not expand operational capacity. Clarification on the vehicular access of the northbound shoulder following construction was added to Section 2.5.3.

A-4-5: The recommended measures to reduce the project's construction emissions will be considered as the project is further defined. In addition to considering the measures listed in Comment A-4-5, Caltrans will comply with air quality requirements and implement measures described in Comment Letter A-2. Best management practices available to Caltrans will be incorporated into the project as part of Caltrans' standards to address short term related construction emissions.

A-5

U.S. Department of Homeland Security
FEMA Region IX
1111 Broadway, Suite 1200
Oakland, CA. 94607-4052

FEMA

November 20, 2018

Lourdes Ortega, Senior Environmental Planner
Division of Environmental Planning
CalTrans District 7
100 South Main Street, MS16A
Los Angeles, California 90012

Dear Ms. Ortega:

This is in response to your request for comments regarding VEN-1 Permanent Slope Restoration Project VEN-1 PM 4.0/4.2 EA: 07-31820 SCH #: 2017101045.

Please review the current effective Flood Insurance Rate Maps (FIRMs) for the County of Ventura (Community Number 060413), Maps revised April 4, 2018. Please note that the County of Ventura, California is a participant in the National Flood Insurance Program (NFIP). The minimum, basic NFIP floodplain management building requirements are described in Vol. 44 Code of Federal Regulations (44 CFR), Sections 59 through 65.

A summary of these NFIP floodplain management building requirements are as follows:

- All buildings constructed within a riverine floodplain, (i.e., Flood Zones A, AO, AH, AE, and A1 through A30 as delineated on the FIRM), must be elevated so that the lowest floor is at or above the Base Flood Elevation level in accordance with the effective Flood Insurance Rate Map. A-5-1

- If the area of construction is located within a Regulatory Floodway as delineated on the FIRM, any ***development*** must not increase base flood elevation levels. **The term *development* means any man-made change to improved or unimproved real estate, including but not limited to buildings, other structures, mining, dredging, filling, grading, paving, excavation or drilling operations, and storage of equipment or materials.** A hydrologic and hydraulic analysis must be performed *prior* to the start of development, and must demonstrate that the development would not cause any rise in base flood levels. No rise is permitted within regulatory floodways. A-5-2

www.fema.gov

A-5-1: Per the map and discussion in section 2.8.2, the project will occur in Zone X and not in the riverine floodplain as listed in the comment.

A-5-2: The proposed project is found in Zone X which the FIRM in section 2.8.2 does not delineate as a Regulatory Floodway.

Lourdes Ortega, Senior Environmental Planner
Page 2
November 20, 2018

- All buildings constructed within a coastal high hazard area, (any of the "V" Flood Zones as delineated on the FIRM), must be elevated on pilings and columns, so that the lowest horizontal structural member, (excluding the pilings and columns), is elevated to or above the base flood elevation level. In addition, the posts and pilings foundation and the structure attached thereto, is anchored to resist flotation, collapse and lateral movement due to the effects of wind and water loads acting simultaneously on all building components. A-5-3

- Upon completion of any development that changes existing Special Flood Hazard Areas, the NFIP directs all participating communities to submit the appropriate hydrologic and hydraulic data to FEMA for a FIRM revision. In accordance with 44 CFR, Section 65.3, as soon as practicable, but not later than six months after such data becomes available, a community shall notify FEMA of the changes by submitting technical data for a flood map revision. To obtain copies of FEMA's Flood Map Revision Application Packages, please refer to the FEMA website at http://www.fema.gov/business/nfip/forms.shtm. A-5-4

Please Note:

Many NFIP participating communities have adopted floodplain management building requirements which are more restrictive than the minimum federal standards described in 44 CFR. Please contact the local community's floodplain manager for more information on local floodplain management building requirements. The Ventura County floodplain manager can be reached by calling Jeff Pratt, Director of Public Works Department, at (805) 654-2018. A-5-5

If you have any questions or concerns, please do not hesitate to call me at (510) 627-7186.

Sincerely,

Gregor Blackburn, CFM, Branch Chief
Floodplain Management and Insurance Branch

cc:
Jeff Pratt, P.E., Director, Public Works/FPA, Ventura County
Garret Tam Sing, State of California, Department of Water Resources, Southern Region Office
Gregor Blackburn, CFM, Branch Chief, Floodplain Management and Insurance Branch, DHS/FEMA Region IX
Alessandro Amaglio, Environmental Officer, DHS/FEMA Region IX

www.fema.gov

A-5-3 and A-5-4: As stated in section 2.8.2, the project will not occur in a "V" Flood Zone or Special Flood Hazard Area (SFHA) as delineated by the FIRM. The project location lies in Zone X which is not considered a "V" Flood Zone or a SFHA.

A-5-5: Please see responses to A-5-3 and A-5-4. Caltrans will contact the Ventura County floodplain manager when future building projects are being analyzed.

A-6

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, LOS ANGELES DISTRICT
60 SOUTH CALIFORNIA STREET, SUITE 201
VENTURA, CALIFORNIA 93001-2598

December 14, 2018

SUBJECT: Comments on Initial Study with Proposed Mitigated Negative Declaration/Environmental Assessment (IS/MND/EA) for the VEN-1 Permanent Slope Restoration at Post Mile 4.0-4.2 (Caltrans File No. 381200/0715000286; Corps File No. SPL-2018-00713-TS)

Lourdes Ortega, Senior Environmental Planner
California Department of Transportation
District 7, Division of Environmental Planning
100 South Main Street, MS 16-A
Los Angeles, California 90012

Dear Ms. Ortega:

The U.S. Army Corps of Engineers Los Angeles District Regulatory Division is in receipt of a Notice of Availability dated October 24, 2018 to provide comments on the Initial Study with Proposed Mitigated Negative Declaration/Environmental Assessment (IS/MND/EA) for the VEN-1 Permanent Slope Restoration at Post Mile 4.0-4.2. The document was prepared in accordance with the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). We appreciate the opportunity to provide the following pre-application comments.

Global comments: 1) The title page indicates the U.S. Army Corps of Engineers is a cooperating agency under NEPA on this document, however, the Los Angeles District Corps of Engineers has no record of being invited to participate as a cooperating agency on this NEPA document. A-6-1 2) Caltrans should include the highest astronomical tide and mean high tide elevations on all plan view, typical cross section and profile drawings (also include the datum used). A-6-2

Comment #1: The project evaluates installation of secant walls at two locations on State Route 1 (SR-1) to address bank erosion. The secant walls (seawalls) would be installed in addition to existing rock slope protection (RSP) and would be approximately 100 feet high (mostly underground) and 600 feet long (PM 4.0) and 100 feet high (mostly underground) and 200 feet long (PM 4.2). Placement of a secant wall structure in the road shoulder or under the southbound lane could avoid or minimize impacts to navigable waters of the U.S. and should be considered as the design moves forward. It is unclear as to whether RSP would be placed seaward of the secant walls so as to buffer the wave. Design drawings that provide an adequate level of detail for assessing impacts is required for a Corps permit application. A-6-3

A-6-1: There is not a formal scoping requirement for an EA however, a scoping letter was sent on October 18, 2018 to inform Army Corps of the proposed project. ACOE was listed as a cooperating agency in the front cover of the draft environmental document because of the potential for the proposed project to impact ACOE's jurisdictional waters. ACOE fits the criteria to serve as a cooperating agency. It was an oversight of Caltrans not to send a letter specifically requesting ACOE to serve as a cooperating agency.

A-6-2: Figures 3-6 through 3-9 reflect the detailed cross section and profile drawings recommended by the commenter.

A-6-3: The RSP measures that are currently in place within the project area will remain as they are during and after construction. After construction of the secant walls, the RSP measures would lie on the seaward side of the secant walls. The RSP measures would serve as stability for the slope and aid in dissipating wave energy.

Comment #2: Figures 1-19 and 1-20 show that soil would be packed onto the slope after secant wall construction. Soil is likely to erode during high tide and wave events and storm surge. It is unclear as to whether RSP, if placed seaward of the secant walls, would be covered with sand or soil. Design drawings that provide an adequate level of detail for assessing impacts associated with RSP in jurisdictional waters is required for a Corps permit application. A-6-4

Comment #3: Figure 1-20 describes ground anchors. It is unclear as to whether the anchors would be set into bedrock. A-6-5

Comment #4: Page 12, paragraph 2 indicates soil would be excavated for the purpose of installing the secant wall piles (Build Alternative #2) and the ground anchors; it would then be disposed of. What is the rationale for disposing of the excavated soil? We believe beneficial reuse of excavated soil, on site would be less impactful than importing new fill material to the project site. If fill material would be imported, we recommend a grain size analysis be conducted to ensure the imported fill is compatible with the grain size, color and the like at the receiver beach. A-6-6

Comment #5: Table 1.5 (first row) suggests three secant walls would be constructed (600 feet long, 100 feet long, 200 feet long). This is different than the project description. Please clarify the proposed project description and revise the document for internal consistency. A-6-7

Comment #6: Table 1.2 appears after Table 1.5 in the document. Table 1.2 suggests two permits from the Corps are required. To clarify, the Corps would evaluate the project under section 404 Clean Water Act and section 10 Rivers and Harbors Act authorities (if the latter authority is applicable). When more than one federal statute is applicable, a combined Corps authorization letter or permit is prepared to reduce duplication of effort and paperwork. A-6-8

Comment #7: Page 26 (last paragraph) and Page 27 (first paragraph) indicates a wave run-up study is being prepared at the request of the California Coastal Commission, and the findings of the study will identify potential impacts of waves on the proposed secant walls. However, Caltrans has selected and is now evaluating the build alternatives in the absence of the wave run-up study results. Once the run-up study is complete, the alternatives contained in this document should be thoroughly updated, modified, and/or changed to reflect study results. This is the only way in which the study results will have a positive impact on the project. Please confirm the above understanding. A-6-9

Comment #8: Section 2.3.2 fails to objectively evaluate how the secant walls may effect sand retention on the beach, slope erosion and wave deflection or how these physical processes may affect the Thornhill Broome state park visitor serving areas and coastal access. Please revise the environmental analysis to address impacts on the public. A-6-10

A-6-4: See response to A-6-3. The soil that is currently underneath or surrounding the RSP will remain in place during construction. The secant walls will be drilled behind the current RSPs.

A-6-5: The ground anchors would be long enough to be imbedded into bedrock.

A-6-6: The Alternative 2 – Ground Anchor Option is not the preferred alternative and will not be carried into the final design phase. However, the soil was proposed to be disposed of offsite because fill material was not needed for construction.

A-6-7: Table 1.5 erroneously read “100 feet long” and has now been corrected to, “100 feet high”. Only 2 secant walls are proposed: 200 and 600 feet long.

A-6-8: The commenter’s statement is noted and the clarification is appreciated for future Caltrans projects.

A-6-9: Caltrans understands the intention behind the comment and the Wave Run-Up Study was submitted to the structural design engineer to review and consider.

A-6-10: Sand retention and wave deflection is discussed in Section 2.2.3. Slope erosion is found to be minimal under Alternative 1 – Cantilever Option since no slope excavation is needed. The secant walls will also be placed as close to the cliffside as possible to reduce impacts to the coastline. See response to comment A-6-13.

-3-

Comment #9: Page 49 (Section 401 permitting) suggests only section 404 permits trigger a section 401 water quality certification requirement. In the Los Angeles Regional Water Quality Control Board area of responsibility, section 401 water quality certifications are also required when a Rivers and Harbors Act section 10 permit application is being processed by the Corps. A-6-11

Comment #10: In Section 2.9.3, there is no indication as to where the impacts would occur (i.e., north bound lanes, southbound lanes, uplands, the beach, etc.). Further there is a reference to "downstream channel stability" which is confusing because this project involves construction of seawalls on beaches rather than a tributary project. Please revise and clarify section 2.9.3. A-6-12

Comment #11: Section 2.10.2 indicates the Geotechnical Report findings were used to develop the build alternatives. This was done in the absence of the wave run-up study results, as noted in our Comment #7. The Geotechnical Report and the wave run-up study should be used together to develop practicable alternatives that would then be evaluated under CEQA and NEPA. Neither build alternative addresses the ongoing problems of sand retention or wave energy dissipation at the project location in the vicinity. A-6-13

Comment #12: On page 55 the first paragraph suggests Big Sycamore Canyon (BSC) would not be impacted by the proposed secant walls. This is a premature conclusion as to potential impacts, especially in light of the fact that BSC was not studied nor does it appear to be included in the wave run-up study area. BSC delivers sediment/sand to the littoral cell, which should be retained in the system to the maximum extent practicable. The secant walls may exacerbate erosion of sand from the littoral system as wave energy is deflected off the secant walls. The wave run up study should address this potential impact and allow for other less impactful alternatives or modifications to the build alternatives to include measures to retain sediment and dissipate wave energy. A-6-14

Comment #13: Section 2.15.1 includes references to "ordinary high water mark" (OHWM). In the project area, the Corps' geographical jurisdictional limits are defined by the highest astronomical tide elevation (HTL, section 404 of the Clean Water Act) and mean high tide level (section 10 of the Rivers and Harbors Act), respectively. Therefore, references to non-tidal waters, wetlands and OHWM in this document do not apply. In addition, Executive Order 11990 (Protection of Wetlands) is not relevant to the project, as wetlands do not occur in the project area. Further the discussion of state agency jurisdiction and process is similarly focused on freshwater systems that do not occur in the project area and may be confusing to the public. Please revise the regulatory discussion for accuracy. A-6-15

Comment #14: Section 2.15.2 states that the proposed project is 100 feet from the shoreline (at PM 4.0) and 175 feet from the shoreline (at PM 4.2). However, earlier photos and narrative describe the road embankments on the southbound lane/seaward side of the road as eroded to the point of dangling road barriers. The secant walls appear to be much closer to the "shoreline" A-6-16

A-6-11: The following sentence was added to Section 2.15.1, "A 401 permit certification is also required when a Rivers and Harbors Act section 10 permit application is processed by USACE."

A-6-12: Additional detail was added to help orient the reader as to where the impacts would occur. "Downstream channel stability" was removed from Section 2.9.3 and the language was replaced with emphasis on stormwater runoff.

A-6-13: The boulders present along PM 4.0 would aid in wave energy dissipation and the secant wall will be constructed behind this RSP. The location at PM 4.2 is more vulnerable to erosion because the slope is a soft surface with a toe slope. The secant wall would be constructed behind the dirt slope. The current coastal side that is impacted by wave action will not be changed. The secant wall installation is buried as far as possible into the existing shoreline under the edge of the highway. The placement of the secant wall minimizes its potential impact on beach processes including effects on sand retention and wave energy dissipation.

A-6-14: The Wave Run-Up Study considered the sediments from Big Sycamore Canyon. As discussed in Section 2.2.3 and the Wave Run-Up Study.

A-6-15: The regulatory language cannot be removed per Caltrans Headquarters guidance, however the clarifications and instructions the commenter provided have been added to Section 2.15.1.

A-6-16: The distance between the shoreline and the secant walls was updated based on information provided by the Wave Run-Up Study.

than suggested here. Please consider updating the language to eliminate confusion. As well, per the above, discussion of wetlands is unnecessary for this project and should be deleted.

Comment #15: Section 2.15.2 (under RWQCB jurisdiction) suggests a section 404 permit is required from the Corps. Please provide elevation information on all drawings that show clearly the elevation of HTL and mean high tide. Once this information is provided, the Corps would be in a position to affirm the statutes under which a permit application would be processed/evaluated. A-6-17

Comment #16: Section 2.15.3 provides a clear statement as to the need for a Department of the Army permit; however, the drawings provided in this document do not support this assertion because they do not include HTL or mean high tide elevations. A-6-18

Comment #17: Section 2.17.1 (Animal Species Regulatory Setting) addresses regulatory requirements associated with wildlife protection, and mentions NEPA for the first time. NEPA requires disclosure and analysis of impacts associated with a federal action for many issue areas, so it is not clear why NEPA is brought up in this section in particular. This section fails to mention the federal Endangered Species Act or Magnuson-Stevens Fishery Conservation and Management Act or any state wildlife protection statutes. Note that the federal Fish and Wildlife Coordination Act requires coordination among federal and state resource agencies but has no protective value for species per se. A-6-19

Comment #18: Section 2.17.3 (California grunion) includes mitigation measure BIO-2, which would prohibit commencement of construction activities during a full moon or high tide to protect grunion. If grunion come in and spawn on the beach during a high tide, and then heavy equipment uses the area of the beach in which grunion spawned, there could be reproductive failure on the beach if egg masses are disturbed or crushed prior to hatching. The document needs to consider this potential impact and revise BIO-2. A-6-20

Comment #19: Mitigation measure BIO-15, as written, is potentially a very costly mitigation measure with only a limited chance of success. Caltrans and NOAA/NMFS should disclose successes and potential pitfalls in doing such manipulations. To this end, the Corps recommends an interagency meeting to discuss inclusion of this mitigation measure in a permit application. A-6-21

Comment #20: Page 98 (Alternative 2) last paragraph suggests direct impacts of sedimentation in black abalone habitat may require mitigation. Please note that the natural processes of wave and tidal action may remove sediment associated with an unexpected depositional event. In the event slope failure occurs and buries nearshore black abalone habitat, monitoring should be implemented, and an assessment should be made as to whether more active measures (e.g., intentional sediment removal) are warranted. We understand that black abalone prefer low intertidal to shallow subtidal habitats where there is a lot of wave action, so such wave

A-6-17: The elevation of the high astronomical tide line and mean high tide line is shown in Figures 3-6 through Figure 3-9. This information was provided to USACE during consultation and it was determined a Section 404 permit was not required for Alternative 1 – Cantilever Option.

A-6-18: The statement made in Section 2.15.3 concerning the need for a Section 404 permit has been revised.

A-6-19: Section 2.17.1 mentions that project impacts relating to the Federal Endangered Species Act will be discussed in Section 2.18 Threatened and Endangered Species. Project impacts relating to the Magnuson-Stevens Fishery Conservation and Management Act can also be found in Section 2.18, as stated in Section 2.14.2 Natural Communities Affected Environment.

A-6-20: The measure BIO-2 was removed after Alternative 1 – Cantilever Option was selected for construction which does not require slope excavation and will not compromise the stability of the slope. Also it was confirmed no construction equipment would utilize the beach, therefore there would be not potential impact on the California grunion.

A-6-21: The mitigation measure BIO-15 was removed from the final environmental document after consultation with USACE and review of the selected alternative, Alternative 1 – Cantilever Option.

action may be effective in removing sediment deposits from abalone habitats. To this end, the Corps recommends an interagency meeting to discuss the practicability of this action (intentional sediment removal) as a mitigation measure in a permit application. A-6-22

Comment #21: Section 2.20 (Cumulative Impacts) needs to evaluate the cumulative impact of additional hard structures (secant walls) installed along the coastline to up-coast and down-coast resources, marine terrace and near-shore erosion, sediment retention and transport process, wave deflection and the like. A-6-23

Comment #22: Page 138 discusses state efforts to address sea level rise (SLR) and paragraph 2 mentions a report prepared during the Schwarzenegger administration, and EO S-13-08 which resulted in a SLF guidance document. Please provide additional information/analysis. Did these documents recommend secant walls/seawalls as a means to address SLR and resilience of coastal infrastructure? Did these documents address use of coastal structures (e.g., groins) or beach nourishment to retain/augment sand on the beach and in the littoral system, or other coastal measures to reduce erosion and dissipate wave energy? Or did these reports more generally recommend additional hardening of coastal infrastructure? A-6-24

Again, thank you for the opportunity to comment on this project prior to submitting an application. We look forward to your response and the ongoing coordination between our agencies as a means to a more effective permit application process. If you have any questions about this letter, please contact Theresa Stevens, Ph.D. at (805) 585-2146 or via e-mail at theresa.stevens@usace.army.mil. Please help me to evaluate and improve the regulatory experience for others by completing the customer survey form at http://corpsmapu.usace.army.mil/cm_apex/f?p=regulatory_survey.

Sincerely,

Mark D. Cohen

Digitally signed by COHEN.MARK.D.1239558450
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=COHEN.MARK.D.1239558450
Date: 2018.12.14 13:27:46 -08'00'

Mark Cohen
Deputy Chief
Regulatory Division

A-6-22: The commenter’s concern was addressed in the interagency meeting with USACE and it was found more suitable for sedimentation associated with construction to be removed with wave action than with human manipulation. Especially because Alternative 1 – Cantilever Option does not involve any slope excavation.

A-6-23: The impacts of additional hard structures on the coastline was discussed in the completed Wave Run-Up Study and added to Section 2.2.3. The Wave Run-Up Study is also included in Appendix G and can be referenced for further discussion.

A-6-24: EO S-13-08 requires a state Climate Adaptation Strategy and requests that the National Academy of Sciences convene an independent panel to produce the first California Sea Level Rise Assessment Report. The order only called for sea level rise to be studied and the findings were shared in the sea level rise guidance document, *Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future*. This document does describe secant walls as the most common human response to armor the cliff base and make the shoreline more resistant to wave attack but mentions that coastal storm damage has increased over the past several decades and prevents beaches from migrating landward. If wave heights continue to increase and sea level rises substantially, the seawalls will eventually be overwhelmed by sea level rise. Seawalls are usually designed for a particular set of wave and sea level condition, so they will provide stability to the coastline until sea level rise eventually becomes so intense that it overtops the structure.

A-7

From: Hausner, Carl T CIV
To: Ortega, Lourdes@DOT
Subject: RE: VEN-01 Permanent Slope Restoration Project
Date: Tuesday, October 30, 2018 7:18:36 AM

Good Morning Lourdes,

Thank you for the information.

The Eleventh Coast Guard District Bridge Office has no further comments on the VEN-1 Permanent Slope Restoration Project, Ventura County, CA. Caltrans District 7-VEN-1 (PM4.0/4.2) 318200/0715000286, Initial Study with Proposed Mitigated Negative Declaration/Environmental Assessment.

Have a great day.

v/r,

Carl Hausner
Chief, Bridge Section
Eleventh Coast Guard District
510-437-3516 Office
510-219-4366 Cell
510-437-5836 Fax
Carl.T.Hausner@uscg.mil

Mailing Address

Commander (dpw)
Eleventh Coast Guard District
Coast Guard Island, BLDG 50-2
Alameda, CA 94501-5100

Attn: Bridge Office

-----Original Message-----
From: Ortega, Lourdes@DOT <lourdes.ortega@dot.ca.gov>
Sent: Monday, October 29, 2018 4:48 PM
To: Hausner, Carl T CIV <Carl.T.Hausner@uscg.mil>
Cc: Velasco, Vanessa@DOT <Vanessa.Velasco@dot.ca.gov>
Subject: [Non-DoD Source] RE: VEN-01 Permanent Slope Restoration Project

Hi Carl,

Sorry I missed your call. You are correct, this project will not affect the CA RT1 Bridge over Big Sycamore Creek.

Let me or Vanessa know if you have any additional questions.

Thanks!

Lourdes Ortega |Senior Environmental Planner California Department of Transportation, District 7 | Division of Environmental Planning
100 S. Main Street, MS16A - Los Angeles, CA 90012 | 213.897.9572

-----Original Message-----
From: Hausner, Carl T CIV <Carl.T.Hausner@uscg.mil>
Sent: Monday, October 29, 2018 3:19 PM
To: Ortega, Lourdes@DOT <lourdes.ortega@dot.ca.gov>
Subject: VEN-01 Permanent Slope Restoration Project

Ms. Ortega:

I have completed my review of the subject draft Environmental Assessment. The project does not appear to be affecting the CA RT 1 Bridge over Big Sycamore Creek, Caltrans bridge number 52 0011, postmile 004.54. Can you confirm this? A-7-1

Thank you,

v/r,

Carl Hausner
Chief, Bridge Section
Eleventh Coast Guard District
510-437-3516 Office
510-219-4366 Cell
510-437-5836 Fax
Carl.T.Hausner@uscg.mil

Mailing Address

Commander (dpw)
Eleventh Coast Guard District
Coast Guard Island, BLDG 50-2
Alameda, CA 94501-5100

Attn: Bridge Office

INTERNET RELEASE NOT AUTHORIZED (i.e. yahoo, gmail, aol, blog, web posting).
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A-7-1: The information was confirmed via email later that day, and the commenter stated on Tuesday, October 30th, 2018 that the Eleventh Coast Guard District had no further comments on the environmental document.

Chapter 5: List of Preparers

The following Caltrans staff members and consultants contributed to the preparation of this draft IS/EA.

5.1 Caltrans Staff

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Nayla E-Shammas, Associate Environmental Planner, Maintenance Biology.
Kelly Ewing-Toledo, Senior Environmental Planner, Cultural.
Ravindra B. Ghate, Project Manager.
Seungwoon Han, Transportation Engineer, Geotechnical.
David Jang, Senior Transportation Engineer, Geology.
Jin Lee, Senior Transportation Engineer, Noise and Vibration.
Hannah Minderhout, Environmental Planner.
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George Olguin, Senior Landscape Architect.
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Prem Rimal, Senior Bridge Engineer, Geotechnical.
Liberty San Agustin, Transportation Engineer, Air Quality.
Shabnam Sheikh, Environmental Planner.
Samia Soueidan, Transportation Engineer, Noise and Vibration.
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Alison Wong, Environmental Planner.
Andrew Yoon, Senior Transportation Engineer, Air Quality.
Robert Wang, Environmental Planner, GIS.

5.2 Consulting Parties

Ayman Salama and Jerald Ramsden, WSP. Contribution: Wave Run-Up Study.
Eddie Stutts, TransSystems/ Fugro Pelagos, Inc. Contribution: Wave Run-Up Study.

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Chapter 6: Distributition List

6.1 Federal Agencies

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Tashia Clemons Federal Highway Administration, California Division 650 Capital Mall, Ste 4-100 Sacramento, CA 95814	Morgan Capilla U.S. Environmental Protection Agency, Region IX US EPA, 75 Hawthorne St. (ENF-4-2) San Francisco, CA 94105
Dawn Afman US Department of Agriculture, Natural Resources Conservation Service 3550 S. Harbor Blvd., Ste 2-202 Oxnard, CA 93035	Anthony Spina National Oceanic and Atmospheric Administration 501 W. Ocean Blvd. Long Beach, CA 90802
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Carl Hausner Eleventh Coast Guard District Coast Guard Island Building 50-2 Alameda, CA 94501-5100	Reid Nelson Advisory Council on Historic Preservation 1100 Pennsylvania Ave. NW, Ste 809 Washington , D.C. 20004
Theresa Stevens, Ph.D U.S. Army Corps of Engineers, LA District Regulatory Division Ventura Field Office 2151 Alessandro Drive, Suite 110 Ventura, CA 93001	Alessandro Amaglio Federal Emergency Management Agency, Region IX 1111 Broadway, Ste 1200 Oakland , CA 94607
Edward Carranza, Jr. Federal Transit Administration 201 Mission St., Ste 1650 San Francisco, CA 94105	

6.2 State Agencies

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Betty J. Courtney Department of Fish and Wildlife South Coast Region 3883 Ruffin Road San Diego, CA 92123	Christina Curry Cal OES 3650 Schriever Avenue Mather, CA 95655-4203
State Water Resources Control Board Los Angeles Region 320 W. 4th Street, Suite 200 Los Angeles, CA 90013	Michael Sabbaghian Department of Water Resources P.O. Box 942836 Sacramento, CA 94236-0001
Cynthia Marvin Transportation and Toxics Division California Air Resources Board P.O. Box 2815 Sacramento, CA 95812	Coastal Division California Highway Patrol 4115 Broad Street, Suite B-10 San Luis Obispo, CA 93401
Chris Beckwith California State Lands Commission 200 Oceangate Long Beach, CA 90802	

6.3 Elected Officials

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Julia Brownley District 26 Representative United States Congress 300 E. Esplanade Dr., Ste 470 Oxnard, CA 90036		Dianne Feinstein United States Senate 11111 Santa Monica Blvd., Ste 915 Los Angeles, CA 90025
Jacqui Irwin California State Assembly, District 44 230 W. 7th St., Ste B Oxnard, CA 93030		Linda Parks District 2 Supervisor Ventura County Board of Supervisors 625 W. Hillcrest Dr. Thousand Oaks, CA 91360

6.4 Regional Agencies

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Kathy Yhip Southern California Edison Environmental Policy and Affairs 2244 Walnut Grove Ave. Rosemead, CA 91770		Naval Base Ventura County 311 Main Road, Bldg. 1 Point Mugu, CA 93042
Dr. Philip Fine South Coast AQMD 21865 Copley Dr. Diamond Bar, CA 91765-4182		Jessica Nguyen Mountains Recreation and Conservation Authority 5810 Ramirez Canyon Road Malibu, CA 90265
Megan Cooper California State Coastal Conservancy South Coast 1515 Clay Street Oakland, CA 94612-1401		

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Appendix A: Title VI Policy Statement

DEPARTMENT OF TRANSPORTATION
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March 2013

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POLICY STATEMENT

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Additionally, if you need this information in an alternate format, such as in Braille or in a language other than English, please contact the California Department of Transportation, Office of Business and Economic Opportunity, 1823 14th Street, MS-79, Sacramento, CA 95811. Telephone: (916) 324-0449, TTY: 711, or via Fax: (916) 324-1949.

MALCOLM DOUGHERTY
Director

"Caltrans improves mobility across California"

Appendix B: Environmental Commitment Record

In order to be sure that all of the environmental measures identified in this document are executed at the appropriate times, the following mitigation program (as articulated on the proposed Environmental Commitments Record [ECR] which follows) would be implemented. During project design, avoidance, minimization, and /or mitigation measures will be incorporated into the project's final plans, specifications, and cost estimates, as appropriate. All permits will be obtained prior to implementation of the project. During construction, environmental and construction/engineering staff will ensure that the commitments contained in this ECR are fulfilled. Following construction and appropriate phases of project delivery, long-term mitigation maintenance and monitoring will take place, as applicable. As the following ECR is a draft, some fields have not been completed, and will be filled out as each of the measures is implemented. Note: Some measures may apply to more than one resource area. Duplicative or redundant measures have not been included in this ECR.

Description of Commitment	Commitment Source	Timing	Responsible Staff
Parks and Recreation			
PAR-1 As required by 1 of the 5 conditions listed in 23 CFR 774.13(d) for temporary occupancy exception, after construction the TCE will be full restored to its original state or better than when the area was acquired for TCE. This shall include installing the appropriate amount of dirt to fill the excavated slope and replanting the slope with native plants. Coordination with the State of California Department of Parks and Recreation will be conducted prior to final design plans in order to ensure the TCE area is fully restored.	Environmental Document	Construction	Resident Engineer
Utilities			
UT-1 Caltrans will coordinate with all affected private and public service utilities during the design phase to identify any potential conflicts with existing utilities. This process will include seeking approval from utility providers on where to relocate utilities following construction if restoring location in-place is not possible.	Environmental Document	Final Design Phase	Project Engineer
UT-2 Emergency services will be informed of any proposed detour routes to avoid any impacts to their response times. Furthermore, the Traffic Management plan described in the following section (Section 2.5 Traffic and Transportation/Pedestrian and Bicycle Facilities), will provide a circulation traffic plan for access through the project site during construction to avoid impacts.	Environmental Document	Pre-Construction	Resident Engineer, Project Engineer
Traffic and Transportation/Pedestrian and Bicycle Facilities			
TRA-1 Traffic operations and access through the project area will remain unrestricted during construction and impacts to motorists would remain minimal to the fullest extent possible through the Traffic Management Plan.	Environmental Document	Construction	Resident Engineer

Description of Commitment	Commitment Source	Timing	Responsible Staff
Cultural Resources			
CUL-1 If cultural materials are discovered during construction, all earth-moving activity within and around the immediate discovery area will be diverted until a qualified archaeologist can assess the nature and significance of the find.	Standard Specifications	Construction	Resident Engineer, Cultural Staff
CUL-2 If human remains are discovered, California Health and Safety Code (H&SC) Section 7050.5 states that further disturbances and activities shall stop in any area or nearby area suspected to overlie remains, and the County Coroner contacted. If the remains are thought by the coroner to be Native American, the coroner will notify the Native American Heritage Commission (NAHC), who, pursuant to PRC Section 5097.98, will then notify the Most Likely Descendent (MLD). At this time, the person who discovered the remains will contact Caltrans District 7 Environmental Branch so that they may work with the MLD on the respectful treatment and disposition of the remains. Further provisions of PRC 5097.98 are to be followed as applicable.	Standard Specifications	Construction	Resident Engineer, Cultural Staff
Water Quality and Stormwater Runoff			
WQ-1 To reduce potential contaminated or sediment-containing runoff from polluting the nearby environment, design BMPs and temporary construction BMPs will be implemented. The types and locations of the design BMPs will be determined in the design plans in the final design phase. The types and locations of the temporary construction BMPs will be described in the Stormwater Pollution Control Plan prior to the start of construction activities.	Environmental Document	Construction	Resident Engineer
Hazardous Waste/Materials			

Description of Commitment	Commitment Source	Timing	Responsible Staff
HAZ-1 A task-specific LCP to prevent or minimize worker exposure to lead while handing soil containing lead will be required. The LCP should be prepared, reviewed, approved, stamped, and signed by a Certified Industrial Hygienist (CIH).	Environmental Document	Pre-Construction	Resident Engineer, Hazardous Waste Staff
HAZ-2 Removal and disposal of metal beam guardrail wood posts shall be managed under CCR Title 22, Division 4.5, Chapter 34, which specifies guidelines for storage, accumulation, shipment/transport, and disposal at approved treated wood facilities. Project funding would be allocated for the management (including handling, storing, transportation, and disposal) of TWW and the Board of Equalization fee.	Environmental Document	Construction	Resident Engineer, Hazardous Waste Staff
HAZ-3 A project-specific Lead Compliance Plan and Debris Containment and Disposal Work Plan will be prepared to address the removal, containment, storage, sampling, and disposal of yellow/white thermoplastic and lead-based painted traffic stripe and/or pavement markings, and to prevent or minimize worker exposure to lead while handling the debris/residue (California Code of Regulations [CCR], Title 8, Section 1532.1, "Lead," and California Occupational Safety and Health Administration [Cal/OSHA] Construction Safety Order).	Environmental Document	Pre-Construction	Resident Engineer, Hazardous Waste Staff
HAZ-4 Prior to starting construction, the contractor shall inspect the existing electrical components to determine if any hazardous materials are present. All electrical equipment requiring disposal shall be handled and transported to an appropriate permitted electrical disposal facility as required by local and state regulatory procedures.	Environmental Document	Pre-Construction	Resident Engineer, Hazardous Waste Staff
HAZ-5 If dewatering of groundwater is required, a site investigation of groundwater will be conducted to determine water quality for discharge/disposal options. As a result of the findings from the site investigation, any proposed construction provisions necessary for dewatering will be included in the final design package prior to project bid.	Environmental Document	Construction	Resident Engineer, Hazardous Waste Staff

Description of Commitment	Commitment Source	Timing	Responsible Staff
Air Quality			
AQ-1 If naturally occurring asbestos, serpentinite, or ultramafic rock is discovered during grading operations Section 93105, Title 17 of the California Code of Regulations requires notification to the Ventura County Air Pollution Control District by the next business day and implementation of dust control measures described in Section 93105 (d)(B).	Environmental Document	Construction	Resident Engineer
AQ-2 In order to minimize dust, the use of watering should be sufficient to confine dust plumes to the project work areas, in addition to covering trucks when hauling dirt. The surface of dirt piles will be stabilized if they are not removed immediately.	Standard Specifications	Construction	Resident Engineer
AQ-3 On Caltrans projects, appropriate Caltrans Standard Specifications 10-Dust Control, 14-Air Quality, and 18-Dust Palliative shall be incorporated into project specifications. The resident engineer shall ensure that all construction equipment is properly tuned and maintained.	Standard Specifications	Final Design Phase	Resident Engineer
AQ-4 Construction equipment idling time will be minimized to 5 minutes, in an effort to save fuel and reduce emissions.	Environmental Document	Construction	Resident Engineer
Biological Environment			
BIO-1 A debris blanket with slit fencing will be deployed along the side of the cliff of both secant wall locations to hold sedimentation on the cliff and prevent loading onto the ocean or beach below.	Environmental Document	Construction	Resident Engineer, Biologist
BIO-2 The cable net mesh shall be installed between October and end of March which is the time period outside of the breed/pup season.	Environmental Document	Construction	Resident Engineer, Biologist
BIO-3 No construction work or equipment shall directly impact the rock formation adjacent to PM 4.2 on the southbound shoulder of PCH.	Environmental Document	Construction	Resident Engineer, Biologist
BIO-4 Biological monitoring during installation of the cable net mesh will be required to ensure no direct impacts or encroachment upon the aforementioned bat habitat.	Environmental Document	Construction	Resident Engineer, Biologist

Description of Commitment	Commitment Source	Timing	Responsible Staff
BIO-5 Prior to project construction, a Caltrans biologist shall conduct bat surveys within and immediately adjacent to the project impact areas to identify the presence of bats and/or bat pups. If bat pups are confirmed, work shall be delayed until the bat pups are able to fly or forage.	Environmental Document	Construction	Resident Engineer, Biologist
BIO-6 Should night work be needed, work shall commence 1 hour after sunset after all the bats have vacated the project impact areas to forage and cease 2 hours before dawn when bats return to roost.	Environmental Document	Construction	Resident Engineer, Biologist
BIO-7 The cable net mesh shall be installed over a series of nights starting from 1 hour after sunset after all the bats have vacated the project impact areas to forage and cease 2 hours before dawn when bats return to roost.	Environmental Document	Pre-Construction	Resident Engineer, Biologist
BIO-8 The cable net mesh shall have a square weave with 6-inch or large opening size.	Environmental Document	Construction	Resident Engineer, Biologist
BIO-9 Equipment noise control should be applied to revising old equipment and designing new equipment to meet specified noise levels.	Environmental Document	Construction	Resident Engineer, Biologist
BIO-10 In-Use Noise Control should be applied where existing equipment is not permitted to produce noise levels in excess for specified limits.	Environmental Document	Construction	Resident Engineer, Biologist
BIO-11 Site restrictions should be applied as an attempt to achieve noise reduction through modifying the time, place, or method of operation of a particular source.	Environmental Document	Construction	Resident Engineer, Biologist
BIO-12 Personal training of operators and supervisors is needed to become more aware of the construction site noise problems.	Environmental Document	Construction	Resident Engineer, Biologist
BIO-13 Preconstruction bird surveys for the California least tern and Western snowy plovers will be performed by a qualified biologist on Sycamore Cove Beach to determine whether the species are present.	Environmental Document	Construction	Resident Engineer, Biologist
BIO-14 All equipment and materials will be inspected for the presence of invasive species prior to use. In compliance with the EO 13112 and guidance from FHWA, replanting for landscaping and erosion control will not be done with any species listed as invasive. Furthermore, the area will be replanted with natives when appropriate, in order to promote healthy coastal sage scrub habitat.	Environmental Document	Construction	Resident Engineer, Biologist

Description of Commitment	Commitment Source	Timing	Responsible Staff
BIO-15 All construction equipment shall be thoroughly washed at the construction yard before being transported to the project site to avoid spreading invasive to the project site.	Environmental Document	Construction	Resident Engineer, Biologist

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Appendix C: List of Acronyms

ADL	aerially deposited lead
APE	Area of Potential Effects
AQMD	Air Quality Management District
ARB	California Air Resources Board
ASR	Archaeological Survey Report
bgs	Below ground surface
BMPs	Best Management Practices
BSA	Biological Study Area
Caltrans	California Department of Transportation
CDFW	California Department of Fish and Wildlife
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
CH4	methane
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CO	carbon monoxide
CO2	carbon dioxide
CO-CAT	Coastal Ocean Climate Action Team
County	Ventura County
CTC	California Transportation Commission
CTP	California Transportation Plan
CWA	Clean Water Act
dBA	A-weighted decibels
DP	(Caltrans) Director's Policy
EO	Executive Order
EPA	United States Environmental Protection Agency
FCAA	Federal Clean Air Act
FESA	Federal Endangered Species Act
FHWA	Federal Highway Administration
FOE	Finding of Effect
FONSI	Finding of No Significant Effect
FSTIP	Federal Statewide Transportation Improvement Program
FTA	Federal Transit Administration
FTIP	Federal Transportation Improvement Program
GHG	greenhouse gas
GIS	Geographic Information System
Guidelines	Section 404(b)(1) Guidelines
H_2S	hydrogen sulfide
HCP	Habitat Conservation Plan
HPSR	Historic Preservation Survey Report

IPaC	Information, Planning, and Conservation System
IPCC	Intergovernmental Panel on Climate Change
kV	kilovolts
LCP	Lead Compliance Plan
LEDPA	least environmentally damaging practicable alternative
m	meters
MBTA	Migratory Bird Treaty Act
mi	mile/miles
MOA	Memorandum of Agreement
mph	miles per hour
MPO	Metropolitan Planning Organization
MS4	Municipal Separate Storm Sewer Systems
MSAT	mobile source air toxics
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAHC	Native American Heritage Commission
NEPA	National Environmental Policy Act
NES	Natural Environment Study
NHPA	National Historic Preservation Act
NHTSA	National Highway Traffic Safety Administration
NO2	nitrogen dioxide
NOAA Fisheries Service	National Oceanic and Atmospheric Administration’s National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
O_3	ozone
OSHA	Occupational Safety and Health Act
OSTP	Office of Science and Technology Policy
PA	Section 106 Programmatic Agreement
Pb	lead
PCH	Pacific Coast Highway
PM	Post Mile *or* particulate matter
PM_{10}	particulate matter less than 10 microns in size
$PM_{2.5}$	particulate matter less than 2.5 microns in size
Porter-Cologne Act	Porter-Cologne Water Quality Control Act
PRC	Public Resources Code
proposed project	VEN – 01 Permanent Slope Restoration Project
RCRA	Resource Conservation and Recovery Act of 1976
Resources Agency	California Natural Resources Agency
RTP/SCS	Regional Transportation Plan/Sustainable Communities Strategy
RWQCB	Regional Water Quality Control Board
SB	Senate Bill
SCAG	Southern California Association of Governments
SCS	Sustainable Communities Strategy
SF_6	sulfur hexafluoride
SHOPP	State Highway Operation and Protection Program
SHPO	State Historic Preservation Officer

SHS	State Highway System
SIP	State Implementation Plan
SO_2	sulfur dioxide
sq ft	square feet
sq mi	square miles
SSPs	Standard Special Provisions
STIP	State Transportation Improvement Program
SWMP	Storm Water Management Plan
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TSCA	Toxic Substances Control Act
TWW	treated wood waste
USACE	United States Army Corps of Engineers
USC	United States Code
USDOT	United States Department of Transportation
USFWS	United States Fish and Wildlife Service
VEN 01	State Route 1 in Ventura County
WDR	Waste Discharge Requirement
WPCP	Water Pollution Control Plan

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Appendix D: Construction Emissions Calculations

Input into Road Construction Emissions Model for Alterative 1 – Cantilever Option

Road Construction Emissions Model **Version 8.1.0**

Data Entry Worksheet

Note: Required data input sections have a yellow background.
Optional data input sections have a blue background. Only areas with a yellow or blue background can be modified. Program defaults have a white background.
The user is required to enter information in cells D10 through D24, E28 through G35, and D38 through D41 for all project types.
Please use "Clear Data Input & User Overrides" button first before changing the Project Type or begin a new project.

To begin a new project, click this button to clear data previously entered. This button will only work if you opted not to disable macros when loading this spreadsheet.

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Input Type

Project Name	Case 2, Without Anchor	
Construction Start Year	2020	Enter a Year between 2014 and 2025 (inclusive)
Project Type	3	1) New Road Construction : Project to build a roadway from bare ground, which generally requires more site preparation than widening an existing roadway 2) Road Widening : Project to add a new lane to an existing roadway 3) Bridge/Overpass Construction : Project to build an elevated roadway, which generally requires some different equipment than a new roadway, such as a crane 4) Other Linear Project Type: Non-roadway project such as a pipeline, transmission line, or levee construction
Project Construction Time	12.00	months
Working Days per Month	22.00	days (assume 22 if unknown)
Predominant Soil/Site Type: Enter 1, 2, or 3 (for project within "Sacramento County", follow soil type selection instructions in cells E18 to E20 otherwise see instructions provided in cells J18 to J22)	1	1) Sand Gravel : Use for quaternary deposits (Delta/West County) 2) Weathered Rock-Earth : Use for Laguna formation (Jackson Highway area) or the Ione formation (Scott Road, Rancho Murieta) 3) Blasted Rock : Use for Salt Springs Slate or Copper Hill Volcanics (Folsom South of Highway 50, Rancho Murieta)
Project Length	0.20	miles
Total Project Area	2.00	acres
Maximum Area Disturbed/Day	2.00	acres
Water Trucks Used?	1	1. Yes 2. No

Please note that the soil type instructions provided in cells E18 to E20 are specific to Sacramento County. Maps available from the California Geologic Survey (see weblink below) can be used to determine soil type outside Sacramento County.

http://www.conservation.ca.gov/cgs/information/geologic_mapping/Pages/googlemaps.aspx#regionalseries

Material Hauling Quantity Input

Material Type	Phase	Haul Truck Capacity (yd^3) (assume 20 if unknown)	Import Volume (yd^3/day)	Export Volume (yd^3/day)
Soil	Grubbing/Land Clearing	20.00	0.00	269.00
	Grading/Excavation	20.00	0.00	1010.00
	Drainage/Utilities/Sub-Grade	20.00	0.00	0.72
	Paving	20.00	0.00	971.00
Asphalt	Grubbing/Land Clearing	20.00	0.00	329.00
	Grading/Excavation	20.00	0.00	198.00
	Drainage/Utilities/Sub-Grade	20.00	0.00	0.00
	Paving	20.00	971.00	0.00

Mitigation Options

On-road Fleet Emissions Mitigation		Select "2010 and Newer On-road Vehicles Fleet" option when the on-road heavy-duty truck fleet for the project will be limited to vehicles of model year 2010 or newer
Off-road Equipment Emissions Mitigation		Select "20% NOx and 45% Exhaust PM reduction" option if the project will be required to use a lower emitting off-road construction fleet. The SMAQMD Construction Mitigation Calculator can be used to confirm compliance with this mitigation measure (http://www.airquality.org/ceqa/mitigation.shtml). Select "Tier 4 Equipment" option if some or all off-road equipment used for the project meets CARB Tier 4 Standard

Input into Road Construction Emissions Model for Alterative 2 – Ground Anchor Option

Road Construction Emissions Model **Version 8.1.0**

Data Entry Worksheet

Note: Required data input sections have a yellow background.
Optional data input sections have a blue background. Only areas with a
yellow or blue background can be modified. Program defaults have a white background.
The user is required to enter information in cells D10 through D24, E28 through G35, and D38 through D41 for all project types.
Please use "Clear Data Input & User Overrides" button first before changing the Project Type or begin a new project.

To begin a new project, click this button to clear data previously entered. This button will only work if you opted not to disable macros when loading this spreadsheet.

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Input Type

Project Name	Case 1, With Anchor	
Construction Start Year	2020	Enter a Year between 2014 and 2025 (inclusive)
Project Type	3	1) New Road Construction : Project to build a roadway from bare ground, which generally requires more site preparation than widening an existing roadway 2) Road Widening : Project to add a new lane to an existing roadway 3) Bridge/Overpass Construction : Project to build an elevated roadway, which generally requires some different equipment than a new roadway, such as a crane 4) Other Linear Project Type: Non-roadway project such as a pipeline, transmission line, or levee construction
Project Construction Time	12.00	months
Working Days per Month	22.00	days (assume 22 if unknown)
Predominant Soil/Site Type: Enter 1, 2, or 3 (for project within "Sacramento County", follow soil type selection instructions in cells E18 to E20 otherwise see instructions provided in cells J18 to J22)	1	1) Sand Gravel : Use for quaternary deposits (Delta/West County) 2) Weathered Rock-Earth : Use for Laguna formation (Jackson Highway area) or the Ione formation (Scott Road, Rancho Murieta) 3) Blasted Rock : Use for Salt Springs Slate or Copper Hill Volcanics (Folsom South of Highway 50, Rancho Murieta)
Project Length	0.20	miles
Total Project Area	2.00	acres
Maximum Area Disturbed/Day	2.00	acres
Water Trucks Used?	1	1. Yes 2. No

Please note that the soil type instructions provided in cells E18 to E20 are specific to Sacramento County. Maps available from the California Geologic Survey (see weblink below) can be used to determine soil type outside Sacramento County.

http://www.conservation.ca.gov/cgs/information/geologic_mapping/Pages/googlemaps.aspx#regionalseries

Material Hauling Quantity Input

Material Type	Phase	Haul Truck Capacity (yd³) (assume 20 if unknown)	Import Volume (yd³/day)	Export Volume (yd³/day)
Soil	Grubbing/Land Clearing	20.00	0.00	694.00
	Grading/Excavation	20.00	0.00	12380.00
	Drainage/Utilities/Sub-Grade	20.00	0.00	0.72
	Paving	20.00	0.00	971.00
Asphalt	Grubbing/Land Clearing	20.00	0.00	329.00
	Grading/Excavation	20.00	0.00	198.00
	Drainage/Utilities/Sub-Grade	20.00	0.00	0.00
	Paving	20.00	971.00	0.00

Mitigation Options

On-road Fleet Emissions Mitigation		Select "2010 and Newer On-road Vehicles Fleet" option when the on-road heavy-duty truck fleet for the project will be limited to vehicles of model year 2010 or newer
Off-road Equipment Emissions Mitigation		Select "20% NOx and 45% Exhaust PM reduction" option if the project will be required to use a lower emitting off-road construction fleet. The SMAQMD Construction Mitigation Calculator can be used to confirm compliance with this mitigation measure (http://www.airquality.org/ceqa/mitigation.shtml). Select "Tier 4 Equipment" option if some or all off-road equipment used for the project meets CARB Tier 4 Standard

Output received from the Road Construction Emissions Model for Alterative 1 – Cantilever Option

Road Construction Emissions Model, Version 8.1.0

Daily Emission Estimates for -> Case 2, Without Anchor Project Phases (Pounds)	ROG (lbs/day)	CO (lbs/day)	NOx (lbs/day)	Total PM10 (lbs/day)	Exhaust PM10 (lbs/day)	Fugitive Dust PM10 (lbs/day)	Total PM2.5 (lbs/day)	Exhaust PM2.5 (lbs/day)	Fugitive Dust PM2.5 (lbs/day)	SOx (lbs/day)	CO2 (lbs/day)	CH4 (lbs/day)	N2O (lbs/day)	CO2e (lbs/day)
Grubbing/Land Clearing	1.31	10.81	15.83	20.77	0.77	20.00	4.74	0.58	4.16	0.05	5,353.10	0.59	0.13	5,406.40
Grading/Excavation	10.61	79.03	120.52	25.50	5.50	20.00	8.94	4.78	4.16	0.22	21,723.51	4.65	0.36	21,945.73
Drainage/Utilities/Sub-Grade	7.27	57.88	76.63	23.60	3.60	20.00	7.47	3.31	4.16	0.11	10,483.34	2.69	0.10	10,580.66
Paving	1.64	15.41	21.27	1.36	1.36	0.00	0.88	0.88	0.00	0.12	12,335.25	0.58	0.36	12,456.75
Maximum (pounds/day)	10.61	79.03	120.52	25.50	5.50	20.00	8.94	4.78	4.16	0.22	21,723.51	4.65	0.36	21,945.73
Total (tons/construction project)	0.95	7.29	10.53	2.74	0.49	2.24	0.90	0.43	0.47	0.02	1,946.23	0.39	0.03	1,965.57

Notes:

Project Start Year ->	2020
Project Length (months) ->	12
Total Project Area (acres) ->	2
Maximum Area Disturbed/Day (acres) ->	2
Water Truck Used? ->	Yes

	Total Material Imported/Exported Volume (yd^3/day)		Daily VMT (miles/day)			
Phase	Soil	Asphalt	Soil Hauling	Asphalt Hauling	Worker Commute	Water Truck
Grubbing/Land Clearing	269	329	420	510	200	40
Grading/Excavation	1,010	198	1,530	300	1,120	40
Drainage/Utilities/Sub-Grade	1	0	30	0	720	40
Paving	971	971	1,470	1,470	320	40

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns G and H. Total PM2.5 emissions shown in Column I are the sum of exhaust and fugitive dust emissions shown in columns J and K.

CO2e emissions are estimated by multiplying mass emissions for each GHG by its global warming potential (GWP), 1 , 25 and 298 for CO2, CH4 and N2O, respectively. Total CO2e is then estimated by summing CO2e estimates over all GHGs.

Total Emission Estimates by Phase for -> Case 2, Without Anchor Project Phases (Tons for all except CO2e. Metric tonnes for CO2e)	ROG (tons/phase)	CO (tons/phase)	NOx (tons/phase)	Total PM10 (tons/phase)	Exhaust PM10 (tons/phase)	Fugitive Dust PM10 (tons/phase)	Total PM2.5 (tons/phase)	Exhaust PM2.5 (tons/phase)	Fugitive Dust PM2.5 (tons/phase)	SOx (tons/phase)	CO2 (tons/phase)	CH4 (tons/phase)	N2O (tons/phase)	CO2e (MT/phase)
Grubbing/Land Clearing	0.02	0.14	0.21	0.27	0.01	0.26	0.06	0.01	0.05	0.00	70.66	0.01	0.00	64.74
Grading/Excavation	0.56	4.17	6.36	1.35	0.29	1.06	0.47	0.25	0.22	0.01	1,147.00	0.25	0.02	1,051.20
Drainage/Utilities/Sub-Grade	0.34	2.67	3.54	1.09	0.17	0.92	0.35	0.15	0.19	0.01	484.33	0.12	0.00	443.46
Paving	0.03	0.31	0.42	0.03	0.03	0.00	0.02	0.02	0.00	0.00	244.24	0.01	0.01	223.75
Maximum (tons/phase)	0.56	4.17	6.36	1.35	0.29	1.06	0.47	0.25	0.22	0.01	1147.00	0.25	0.02	1,051.20
Total (tons/construction project)	0.95	7.29	10.53	2.74	0.49	2.24	0.90	0.43	0.47	0.02	1946.23	0.39	0.03	1,783.15

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns G and H. Total PM2.5 emissions shown in Column I are the sum of exhaust and fugitive dust emissions shown in columns J and K.

CO2e emissions are estimated by multiplying mass emissions for each GHG by its global warming potential (GWP), 1 , 25 and 298 for CO2, CH4 and N2O, respectively. Total CO2e is then estimated by summing CO2e estimates over all GHGs.

The CO2e emissions are reported as metric tons per phase.

Output received from the Road Construction Emissions Model for Alterative 2 – Ground Anchor Option

Road Construction Emissions Model, Version 8.1.0

Daily Emission Estimates for -> Case 1, With Anchor Project Phases (Pounds)	ROG (lbs/day)	CO (lbs/day)	NOx (lbs/day)	Total PM10 (lbs/day)	Exhaust PM10 (lbs/day)	Fugitive Dust PM10 (lbs/day)	Total PM2.5 (lbs/day)	Exhaust PM2.5 (lbs/day)	Fugitive Dust PM2.5 (lbs/day)	SOx (lbs/day)	CO2 (lbs/day)	CH4 (lbs/day)	N2O (lbs/day)	CO2e (lbs/day)
Grubbing/Land Clearing	1.40	11.32	17.86	20.91	0.91	20.00	4.80	0.64	4.16	0.07	7,535.61	0.60	0.20	7,610.31
Grading/Excavation	13.13	92.82	175.49	29.36	9.36	20.00	10.45	6.29	4.16	0.78	80,752.41	4.77	2.30	81,556.24
Drainage/Utilities/Sub-Grade	7.27	57.88	76.63	23.60	3.60	20.00	7.47	3.31	4.16	0.11	10,483.34	2.69	0.10	10,580.66
Paving	1.64	15.41	21.27	1.36	1.36	0.00	0.88	0.88	0.00	0.12	12,335.25	0.58	0.36	12,456.75
Maximum (pounds/day)	13.13	92.82	175.49	29.36	9.36	20.00	10.45	6.29	4.16	0.78	80,752.41	4.77	2.30	81,556.24
Total (tons/construction project)	1.08	8.03	13.46	2.94	0.70	2.24	0.98	0.51	0.47	0.05	5,091.76	0.40	0.14	5,142.10

Notes: Project Start Year -> 2020

Project Length (months) -> 12

Total Project Area (acres) -> 2

Maximum Area Disturbed/Day (acres) -> 2

Water Truck Used? -> Yes

	Total Material Imported/Exported Volume (yd^3/day)		Daily VMT (miles/day)			
Phase	Soil	Asphalt	Soil Hauling	Asphalt Hauling	Worker Commute	Water Truck
Grubbing/Land Clearing	694	329	1,050	510	200	40
Grading/Excavation	12,380	198	18,570	300	1,120	40
Drainage/Utilities/Sub-Grade	1	0	30	0	720	40
Paving	971	971	1,470	1,470	320	40

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns G and H. Total PM2.5 emissions shown in Column I are the sum of exhaust and fugitive dust emissions shown in columns J and K.

CO2e emissions are estimated by multiplying mass emissions for each GHG by its global warming potential (GWP), 1 , 25 and 298 for CO2, CH4 and N2O, respectively. Total CO2e is then estimated by summing CO2e estimates over all GHGs.

Total Emission Estimates by Phase for -> Case 1, With Anchor Project Phases (Tons for all except CO2e. Metric tonnes for CO2e)	ROG (tons/phase)	CO (tons/phase)	NOx (tons/phase)	Total PM10 (tons/phase)	Exhaust PM10 (tons/phase)	Fugitive Dust PM10 (tons/phase)	Total PM2.5 (tons/phase)	Exhaust PM2.5 (tons/phase)	Fugitive Dust PM2.5 (tons/phase)	SOx (tons/phase)	CO2 (tons/phase)	CH4 (tons/phase)	N2O (tons/phase)	CO2e (MT/phase)
Grubbing/Land Clearing	0.02	0.16	0.24	0.28	0.01	0.26	0.06	0.01	0.05	0.00	99.47	0.01	0.00	91.13
Grading/Excavation	0.69	4.90	9.27	1.55	0.49	1.06	0.55	0.33	0.22	0.04	4,263.73	0.25	0.12	3,906.53
Drainage/Utilities/Sub-Grade	0.34	2.67	3.54	1.09	0.17	0.92	0.36	0.15	0.19	0.01	484.33	0.12	0.00	443.46
Paving	0.03	0.31	0.42	0.03	0.03	0.00	0.02	0.02	0.00	0.00	244.24	0.01	0.01	223.76
Maximum (tons/phase)	0.69	4.90	9.27	1.55	0.49	1.06	0.55	0.33	0.22	0.04	4263.73	0.25	0.12	3,906.53
Total (tons/construction project)	1.08	8.03	13.46	2.94	0.70	2.24	0.98	0.51	0.47	0.05	5091.76	0.40	0.14	4,664.88

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns G and H. Total PM2.5 emissions shown in Column I are the sum of exhaust and fugitive dust emissions shown in columns J and K.

CO2e emissions are estimated by multiplying mass emissions for each GHG by its global warming potential (GWP), 1 , 25 and 298 for CO2, CH4 and N2O, respectively. Total CO2e is then estimated by summing CO2e estimates over all GHGs.

The CO2e emissions are reported as metric tons per phase.

Appendix E: USFWS Species List

IPaC Information for Planning and Consultation **U.S. Fish & Wildlife Service**

Last login August 30, 2018 01:03 PM MDT

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Project information

NAME

Secant Sea Wall (Post mile 4.0 and 4.2)

LOCATION

Ventura County, California

DESCRIPTION

Caltrans Division of Maintenance Engineering proposes to construct 2 secant walls adjacent to the road on the southbound/coastal side of SR-1 at post mile 4.0 and 4.2 to stabilize the roadway foundation. The secant wall at post mile 4.0 is proposed at 601 feet long and up to 75 feet deep. The second secant wall at post mile 4.2 is proposed at 202 feet long and up to 75 feet deep.

Local office

Ventura Fish And Wildlife Office

(805) 644-1766
(805) 644-3958

2493 Portola Road, Suite B
Ventura, CA 93003-7726

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Log in to IPaC.
2. Go to your My Projects list.
3. Click PROJECT HOME for this project.
4. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Birds

NAME	STATUS

California Least Tern *Sterna antillarum browni* No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/8104	Endangered
Coastal California Gnatcatcher *Polioptila californica californica* There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/8178	Threatened
Least Bell's Vireo *Vireo bellii pusillus* There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/5945	Endangered
Light-footed Clapper Rail *Rallus longirostris levipes* No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/6035	Endangered
Marbled Murrelet *Brachyramphus marmoratus* There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/4467	Threatened
Southwestern Willow Flycatcher *Empidonax traillii extimus* There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/6749	Endangered
Western Snowy Plover *Charadrius nivosus nivosus* There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/8035	Threatened

Amphibians

NAME	STATUS
California Red-legged Frog *Rana draytonii* There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/2891	Threatened

Fishes

NAME	STATUS

Tidewater Goby Eucyclogobius newberryi
There is final critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/57

Endangered

Crustaceans

NAME	STATUS
Riverside Fairy Shrimp Streptocephalus woottoni There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/8148	Endangered
Vernal Pool Fairy Shrimp Branchinecta lynchi There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/498	Threatened

Flowering Plants

NAME	STATUS
California Orcutt Grass Orcuttia californica No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4923	Endangered
Gambel's Watercress Rorippa gambellii No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4201	Endangered
Marsh Sandwort Arenaria paludicola No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/2229	Endangered
Salt Marsh Bird's-beak Cordylanthus maritimus ssp. maritimus No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/6447	Endangered
Spreading Navarretia Navarretia fossalis There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/1334	Threatened

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD

BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)

Black-vented Shearwater Puffinus opisthomelas This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Clark's Grebe Aechmophorus clarkii This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Red-throated Loon Gavia stellata This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Scripps's Murrelet Synthliboramphus scrippsi This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Feb 20 to Jul 31

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season ( )

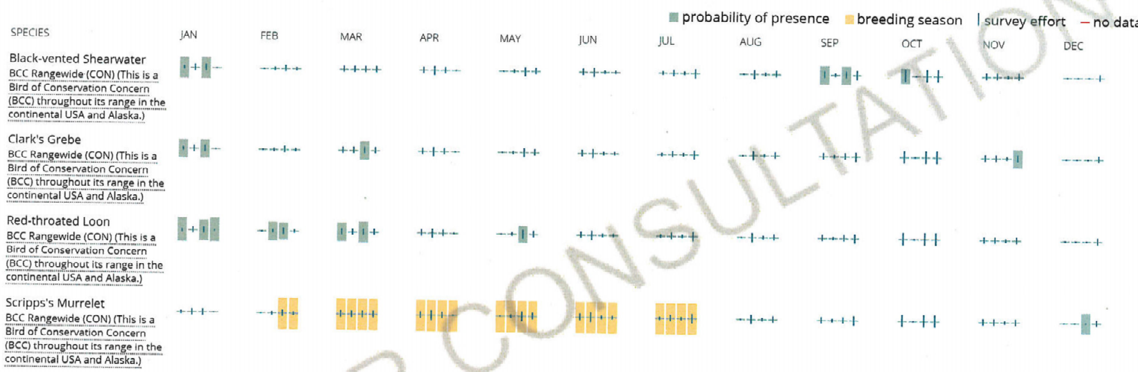
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the E-bird Explore Data Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

Wildlife refuges and fish hatcheries

REFUGE AND FISH HATCHERY INFORMATION IS NOT AVAILABLE AT THIS TIME

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

ESTUARINE AND MARINE WETLAND

- M2USN
- M2RSNr
- M2USP

A full description for each wetland code can be found at the National Wetlands Inventory website

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Appendix F: NMFS Species List

August 31, 2018

Quad Name **Point Mugu (digital)**
Quad Number **34119-A1**

ESA Anadromous Fish

SONCC Coho ESU (T) -
CCC Coho ESU (E) -
CC Chinook Salmon ESU (T) -
CVSR Chinook Salmon ESU (T) -
SRWR Chinook Salmon ESU (E) -
NC Steelhead DPS (T) -
CCC Steelhead DPS (T) -
SCCC Steelhead DPS (T) -
SC Steelhead DPS (E) - **X**
CCV Steelhead DPS (T) -
Eulachon (T) -
sDPS Green Sturgeon (T) - **X**

ESA Anadromous Fish Critical Habitat

SONCC Coho Critical Habitat -
CCC Coho Critical Habitat -
CC Chinook Salmon Critical Habitat -
CVSR Chinook Salmon Critical Habitat -
SRWR Chinook Salmon Critical Habitat -
NC Steelhead Critical Habitat -
CCC Steelhead Critical Habitat -
SCCC Steelhead Critical Habitat -
SC Steelhead Critical Habitat - **X**
CCV Steelhead Critical Habitat -
Eulachon Critical Habitat -
sDPS Green Sturgeon Critical Habitat -

ESA Marine Invertebrates

Range Black Abalone (E) - **X**
Range White Abalone (E) - **X**

ESA Marine Invertebrates Critical Habitat

August 31, 2018

Black Abalone Critical Habitat -

ESA Sea Turtles

East Pacific Green Sea Turtle (T) - X
Olive Ridley Sea Turtle (T/E) - X
Leatherback Sea Turtle (E) - X
North Pacific Loggerhead Sea Turtle (E) - X

ESA Whales

Blue Whale (E) - X
Fin Whale (E) - X
Humpback Whale (E) - X
Southern Resident Killer Whale (E) - X
North Pacific Right Whale (E) - X
Sei Whale (E) - X
Sperm Whale (E) - X

ESA Pinnipeds

Guadalupe Fur Seal (T) - X

Essential Fish Habitat

Coho EFH -
Chinook Salmon EFH -
Groundfish EFH - X
Coastal Pelagics EFH - X
Highly Migratory Species EFH - X

MMPA Species (See list at left)

ESA and MMPA Cetaceans/Pinnipeds
See list at left and consult Monica DeAngelis
monica.deangelis@noaa.gov
562-980-3232

MMPA Cetaceans - X

August 31, 2018

MMPA Pinnipeds - **X**

List of Technical Studies (bound separately)

Air Quality Review Memorandum
Archaeological Survey Report
Bioacoustics Study Report
Hazardous Waste Assessment for IS/EA Preparation
Hazardous Waste Assessment for PAED
Historic Property Survey Report
Location Hydraulic Study
Natural Environment Study
Natural Environment Study (Amended)
Preliminary Foundation Report
Visual Impact Assessment
Wave Run-Up Study (included in Appendix G)

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Appendix G: Wave Run-Up Study

TRANSYSTEMS CORPORATION

WAVE RUNUP STUDY FOR SYCAMORE COVE BEACH

FINAL

MAY 17, 2019

REGISTERED PROFESSIONAL ENGINEER
RICHARD S. BOTTCHER
No. 47080
Exp. 12/31/2019
CIVIL
STATE OF CALIFORNIA

wsp

WAVE RUNUP STUDY FOR SYCAMORE COVE BEACH

TRANSYSTEMS CORPORATION
6 Hutton Centre Drive, Suite 1250, Santa Ana, CA 92707

FINAL

PROJECT NO.: 28110A
CLIENT REF:07A4062
DATE: APRIL 23, 2019

WSP
401 B STREET, SUITE 1650
SAN DIEGO, CA 92101

T: +1 619-338-9376
WSP.COM

May 17, 2019

TranSystems Corporation
6 Hutton Center Drive
Suite 1250
Santa Ana, CA 92707

Attention: Ayman Salama, Ph.D., P.E.
Subject: Wave Runup Study for Sycamore Cove Beach (FINAL)
Client Ref.: 07A4062

Dear Mr. Salama,

The Wave Runup Study Final Report for Sycamore Cove Beach is attached for your use. Thank you for the opportunity to provide our services on this important project for the California Department of Transportation (Caltrans) District 7.

Yours sincerely,

Richard S. Bottcher

Richard S. Bottcher, P.E.
Senior Engineering Manager

WSP ref.: 28110A

REVISION HISTORY

FIRST ISSUE

Sept. 7, 2018	DRAFT			
Prepared by	Reviewed by	Approved By		
Jerald Ramsden, PhD Senior Coastal Engineer	Yanling Li, PhD, PE Senior Water ResourcesEngineer	Richard Bottcher, PE Senior Engineering Manager		

SECOND ISSUE

April 23, 2019	DRAFT FINAL			
Prepared by	Reviewed by	Approved By		
Jerald Ramsden, PhD Senior Coastal Engineer	Richard Bottcher, PE Senior Engineering Manager	Richard Bottcher, PE Senior Engineering Manager		

THIRD ISSUE

May 17, 2019	FINAL			
Prepared by	Reviewed by	Approved By		
Jerald Ramsden, PhD Senior Coastal Engineer	Richard Bottcher, PE Senior Engineering Manager	Richard Bottcher, PE Senior Engineering Manager		

SIGNATURES

PREPARED BY

5/16/2019

Jerald Ramsden, PhD
Senior Coastal Engineer

Date

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Exp. 12/31/2019
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REVIEWED BY

5/16/2019

Richard Bottcher, PE
Senior Engineering Manager

Date

APPROVED[1] BY

5/16/2019

Richard Bottcher, PE
Senior Engineering Manager

Date

WSP prepared this report solely for the use of the intended recipient, TranSystems Corporation, in accordance with the professional services agreement. The intended recipient is solely responsible for the disclosure of any information contained in this report. The content and opinions contained in the present report are based on the observations and/or information available to WSP at the time of preparation. If a third party makes use of, relies on, or makes decisions in accordance with this report, said third party is solely responsible for such use, reliance or decisions. WSP does not accept responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken by said third party based on this report. This limitations statement is considered an integral part of this report. The original of this digital file will be conserved by WSP for a period of not less than 10 years. As the digital file transmitted to the intended recipient is no longer under the control of WSP, its integrity cannot be assured. As such, WSP does not guarantee any modifications made to this digital file subsequent to its transmission to the intended recipient.

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CONTRIBUTORS

CLIENT

TranSystems, Contract Manager	Name: Ayman Salama

WSP

Coastal Engineering Lead	Jerald Ramsden, PhD
Coastal Modeling	Yanling Li, PhD, PE
Project Manager & Engineer of Record	Richard Bottcher, PE

SUBCONSULTANTS, N/A

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FIGURES

APPENDICES

1 INTRODUCTION

Erosion and bankline deterioration has threatened California State Route One (SR-1) at several locations in the Sycamore Cove Beach area. The California Department of Transportation (Caltrans) proposes installation of secant pile walls at two of these locations. The project site is located in Point Mugu State Park and is shown Figure 1. The site is located between Malibu and Oxnard within Ventura County. This report presents the results of a wave runup study for Caltrans' use in project planning, environmental studies, and engineering to support design of the proposed secant pile walls.

Figure 1: Vicinity map.

The roadway embankment protection is exhibiting erosion in two areas near the southeast end of Sycamore Cove Beach on each side of the headland feature. The erosion is threatening the roadway embankments and adjacent utilities. Caltrans is proposing installation of Secant Pile Foundations to support the highway and backfill at Post Mile (PM) 4.0 and 4.2, as shown on the following page in Figure 2. The Secant Pile Foundations have an assumed design life of 75 years. Other highway stabilization options were considered, but were rejected as infeasible due to the steep slopes immediately adjacent to the highway at PM 4.0 and 4.2. The original scope for this study included the area near the bridge at the northwest end of Sycamore Cove Beach, but the work in this area has been deferred and scoped separately. The field work conducted for the original project will be presented and includes data collected at both ends of the beach. However, the analysis for the area at the northwest end of the beach will be provided later, in a second wave runup study report.

Figure 2: Site location map.

This study is part of the project documentation required by the California Coastal Commission for proposed work on the California coast. The studies in this report were prepared in accordance with the California Coastal Commission (1999) Beach Erosion and Response Guidance Document in addition to other relevant guidance such as the U.S. Department of Homeland Security, Federal Emergency Management Agency (FEMA) guidance for Flood Insurance Studies, and the U.S. Army Corps of Engineers (USACE) among others.

Field data was collected for this study including bathymetry along selected transects, beach topography, sediment grab samples and gradation analysis and two site visits corresponding with summer (October) and winter (March) beach profile conditions. The studies included in this report were conducted to identify water levels, wave conditions, existing and seasonal beach profiles, short term storm induced beach erosion and long term beach trends, tsunami related effects, and wave and runup effects on the various coastal structures.

2 FIELD INVESTIGATIONS AND DATA COLLECTION

As noted above this section includes the field work conducted for the originally scoped study that included the project sites at both ends of Sycamore Cove Beach. For ease of reference, all the field work from both ends of the beach are reported here.

2.1 SITE VISITS

2.1.1 SITE VISIT IN OCTOBER 2017

A two-day site visit was conducted by WSP senior engineers beginning noon on October 18th with completion at 6 pm on October 19th. The weather conditions were sunny with minor clouds. Temperature ranges were from 54°F to 73°F, and wind was approximately 15 to 17 mph from WSW for both days.

Wind conditions during both field visit days were calm. Breaking waves appeared to be 4 to 6 feet high during high tide with a period of approximately 5 to 6 seconds. Breaking waves run under the bridge, but not through it (i.e. at the Big Sycamore Creek Bridge site) and significant reflections from the sea wall were observed. At the southeast end of the beach waves reached the scour induced escarpment near PM 4.2 during high tide.

There are no NOAA tide gauges in the vicinity of the project site. The two nearest long-term stations are Santa Barbara (NOAA Station No. 9411340) and Santa Monica (NOAA Station No. 9410840). Since the Santa Monica Gauge is closest to the site, it will be used for tides in this study per the California Coastal Commission (1999) guidance manual. The daytime high/low tides from the Santa Monica NOAA Station No. 9410840 are listed in Table 2.1 below for the duration of the site visit. The water levels in Table 2.1 are reported on the North American Vertical Datum of 1988 (NAVD88) which is the vertical datum used for the project. The maximum and minimum predicted tides and their times are shown along with the measured tides that occurred at the same time.

Table 2.1: Tide table during the October 2017 site visit.

Station	Day	Time (LST/LDT)	Predicted Water Level (feet, NAVD88)	Verified Water Level (feet, NAVD88)
Santa Monica	18-Oct	8:06	5.6	5.8
Santa Monica	18-Oct	14:24	0.2	0.4
Santa Monica	18-Oct	20:24	4.9	5.0
Santa Monica	19-Oct	8:30	5.6	5.8
Santa Monica	19-Oct	15:00	0.0	0.3
Santa Monica	19-Oct	21:06	4.6	4.9

The average water level variance between high/low tides at these stations is approximately 5.5 feet representing a typical tide condition with high tides approximately equal to Mean Higher High Water (MHHW) and low tides near Mean Lower Low Water (MLLW).

The nearest offshore wave buoy is operated by NOAA, Buoy No. 46025, and is located approximately 21 miles due south of the project site. For the duration of the two-day site visit, the significant wave height ranged from 2.7 feet to 5.4 feet, the dominant wave period ranged from 14 sec. to 17 sec., and the average wave periods ranged from 5.6 sec. to 7.0 sec.

During the site visit, the engineers evaluated the existing revetment and structures, observed the low tide / high tide conditions, and recorded the findings with site photos and notes. In addition, the team also visited five adjacent sites with shore protection structures for performance comparison and reference purposes. In Figure 3, three photos near the bridge are provided showing the seawall, bridge and the eroding rock slope protection beginning at the east abutment of the bridge. The bottom left photo shows the seawall. The damaged crest of the seawall is evident where the water is spilling out from behind the seawall. At the Big Sycamore Creek Bridge, sea water propagates under the bridge during high tide, but during low tide, wave action remains well offshore of the bridge as illustrated in the photos below. The bottom right photo was taken from a location approximately 600 feet west of the bridge, looking east toward Sycamore Cove Beach. The two large rocks in the surf are visible in most of the aerial photos shown later in this report and are located approximately 150 feet to the west of the proposed west end of the seawall repair portion of the project.

Figure 3: Big Sycamore Creek Bridge photos (Br. No. 52-0011) on Oct. 18, 2017 near PM 4.6.

The two top photos in Figure 4 show the active erosion in the repaired slope resulting in the exposed geotextile, mesh and fill behind the rock protection at the toe of the slope. The morning of October 19th, wave action reaching the toe of the eroding area was evident due to the wetted surface. However, during lower tide conditions, water levels and associated wave wash remained well offshore of the toe of this slope. The bottom right photo is from the shoulder of the highway on the curve immediately southeast of the rocky headland seen in the top right and bottom left photos. This location is near the west end of the proposed 600 foot section of secant wall from PM 4.00 to 4.11. The overly steepened bankline with eroding sediments can be seen between the guard rail and the rock slope protection below.

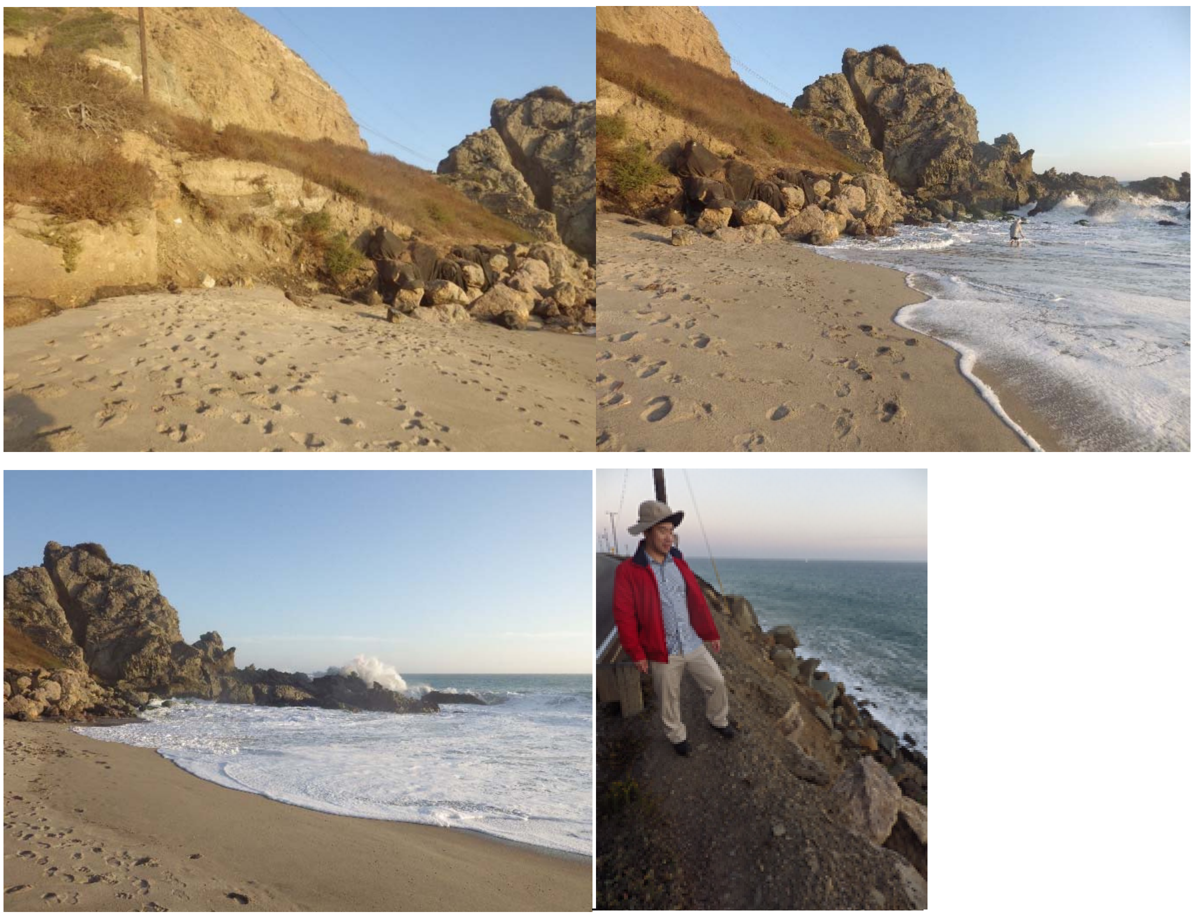


Figure 4: Photos of the southeast end of Sycamore Cove Beach near PM 4.2 on Oct. 18, 2017.

2.1.2 SITE VISIT IN MARCH 2018

A field visit was also conducted on the afternoon of March 14, 2018 and from mid-morning through early afternoon on March 15th, coinciding with a meeting including Caltrans personnel, WSP environmental specialists and coastal engineer, and several agency representatives from the California Coastal Commission, Ventura County and the Los Angeles Regional Water Quality Control Board. The weather conditions were mostly clear. Temperature ranges were from 65°F for daily highs to 48°F for an evening low, wind speed ranged from approximately 5 mph to 25 mph with lower wind speed in the night. The maximum wind speeds were about 12 mph on the 14th and 26 mph on the 15th and were generally from the west.

Maximum and minimum tides measured at the Santa Monica gauge are provided in Table 2.2.

Table 2.2: Tide table during the March 2018 site visit.

Station	Day	Time (LST/LDT)	Predicted Water Level (feet, NAVD88)	Verified Water Level (feet, NAVD88)
Santa Monica	14-Mar	7:18	4.9	5.1
Santa Monica	14-Mar	14:00	-0.6	-0.3
Santa Monica	14-Mar	20:18	3.9	4.2
Santa Monica	15-Mar	7:48	5.1	5.4
Santa Monica	15-Mar	14:30	-0.6	-0.4
Santa Monica	15-Mar	20:42	4.2	4.4

Wave conditions during the site visit, from NOAA Buoy 46025 located 21 miles south of the project site, indicate the significant wave height ranged from 3.9 feet to 7.9 feet, the dominant wave period ranged from 11 sec. to 15 sec., and the average wave period ranged from 5.3 sec. to 8.0 sec.

Photos taken in March, 2018 are shown in Figure 5 and Figure 6. The photos were taken on March 14th and clearly show the seasonal movement of sand at the bridge in comparison with the summer conditions in the photos shown in Figure 3. Of particular note are the exposed rocks at the northwestern end of the beach. These rocks are evident in historic aerial photos during the winter and spring seasons, whereas in the summer and fall, this location typically has sufficient sand to cover the exposed boulders along the shoreline and in the vicinity of the creek bed. In addition, review of the historic aerial photos from this area indicate many of the same rocks being exposed from one winter season to the next, illustrating the summer/winter migration of sand to and from this area. There is a difference of about 4 feet to 5 feet in the ground elevation near the south bridge abutment between October 2017 and March 2018 due to the seasonal movement of sand. This is also evident in plots shown below in this report and from historic lidar surveys that include summer and winter condition profiles at this location.

The top two photos in Figure 6 show the eroding bankline and adjacent rock toe protection along the southeast end of Sycamore Cove Beach. The bottom four photos show the bankline as seen from the shoulder of the road along the proposed Secant Pile Wall close to PM 4.0. The middle left photo is from the extreme eastern end of the proposed wall and shows an erosion escarpment that is adjacent to the highway guard rail. The middle right photo shows the straight section of road along the proposed wall. The bottom left photo shows another erosion escarpment within two feet of the highway shoulder, near the middle of the proposed wall. The bottom right photo shows the bankline in the vicinity of the western end of the proposed wall.

Figure 5: Photos of the northwest end of Sycamore Cove Beach near PM 4.5 on March 14, 2018.

Figure 6: Photos of Sycamore Cove Beach near PM 4.2 and 4.0 on March 14, 2018.

Based on the two field visits, there appears to be active erosion at the proposed project sites including: 1) PM 4.0, 2) PM 4.2, and 3) the proposed rock slope protection repair at PM 4.5. At PM 4.6, the seawall is in a deteriorating state.

2.2 FIELD INVESTIGATIONS

2.2.1 BATHYMETRIC SURVEY

A bathymetric survey was conducted by Gahagan & Bryant Assoc., Inc. along transects defined for this study and as shown below in Figure 7. The surveys were collected to document current conditions along five key transects for the project site. These are used later in this report for comparison against historic lidar surveys available in this area. The transects were extended offshore well beyond the depth of closure (i.e. at the waterward extent of significant sand movement due to storm induced sediment transport).

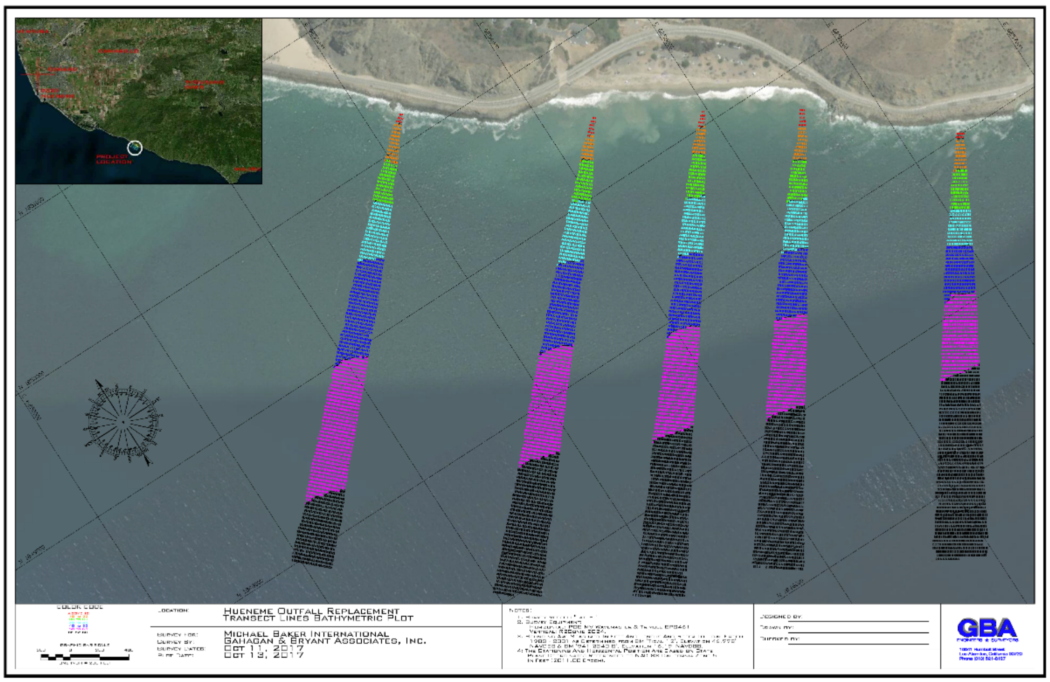


Figure 7: Multibeam hydrographic survey along five transects, Oct. 11-13, 2017.

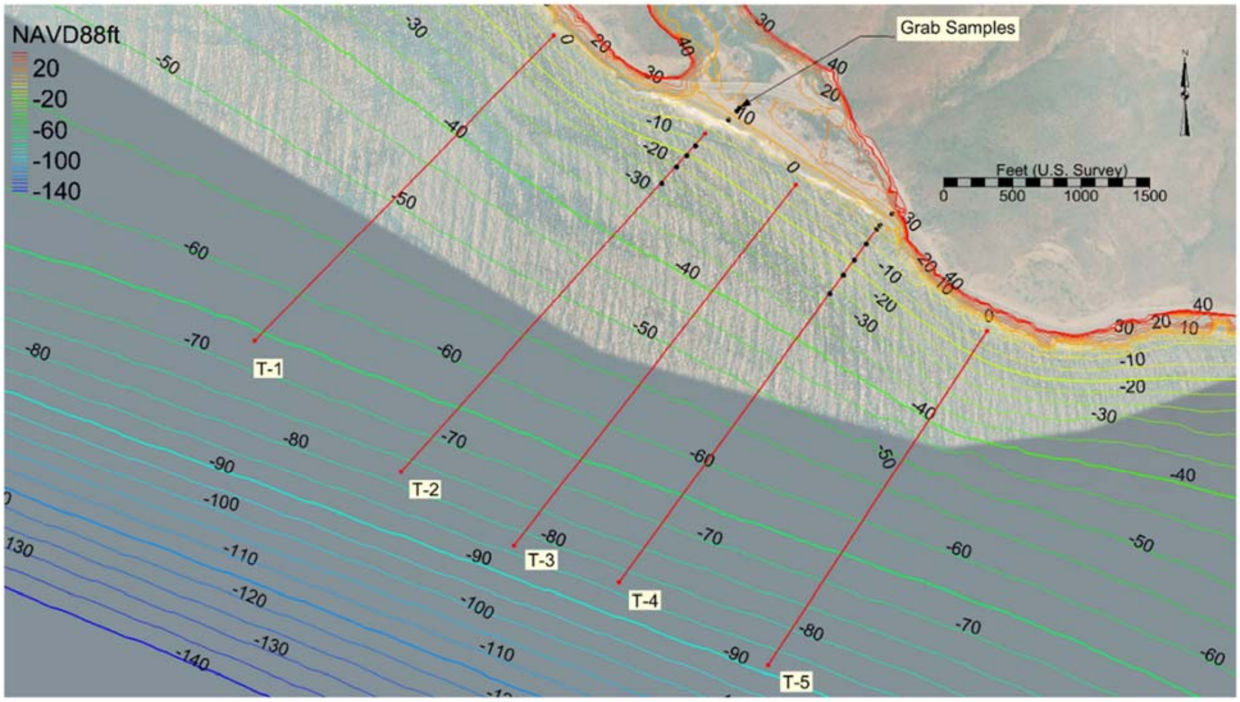


Figure 8: Bathymetric contours close to the project site/ location of bathymetric transects T-1 through T-5.

2.2.2 TOPOGRAPHIC SURVEY

Michael Baker International conducted a topographic survey of the beach in July, 2018 to augment data collected earlier by Caltrans. Twenty-two beach profiles were surveyed as shown in Figure 9. The topography and bathymetry close to the beach and adjacent headlands are shown in Figure 10. The regional digital elevation models used for the wave modeling portion of this study were updated for the beach topography collected during this study. The resulting digital elevation model was used to create the contours shown in Figure 8 and Figure 10.

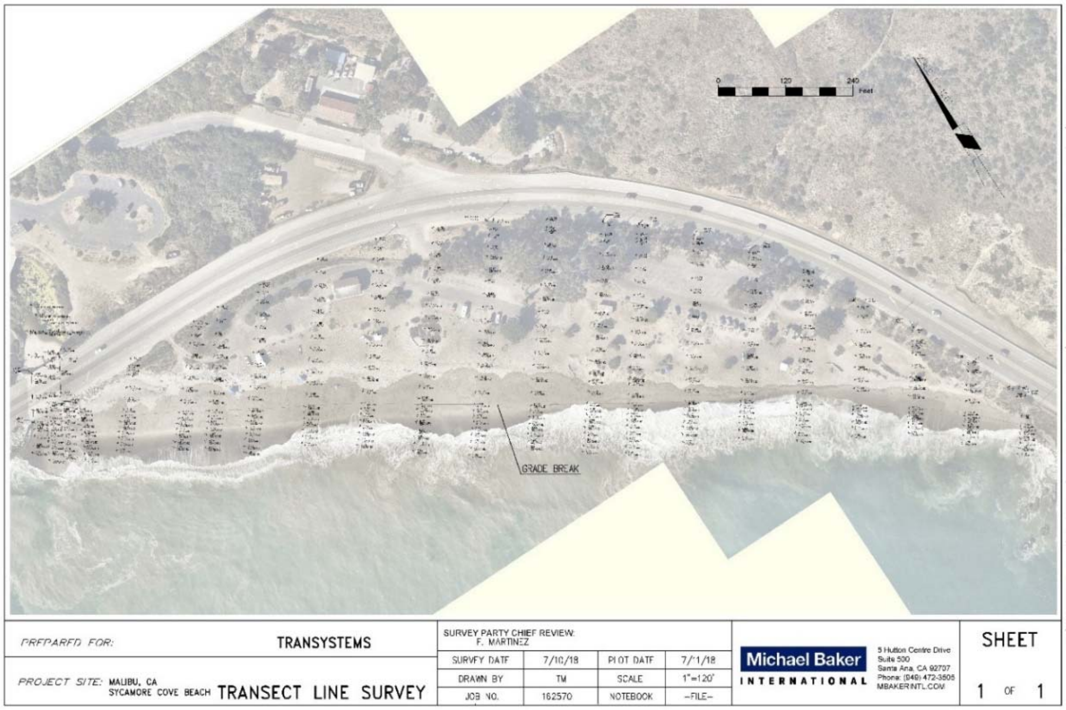


Figure 9: **Bathymetric and topographic contours adjacent to project area.**

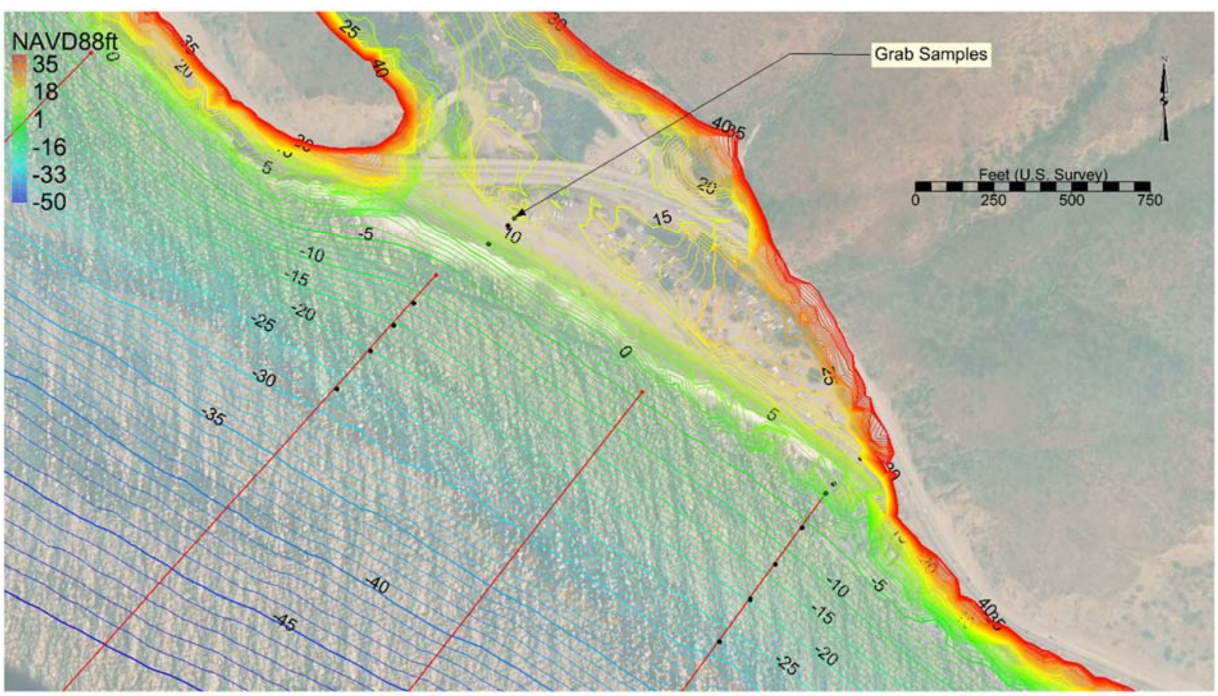


Figure 10: **Bathymetric and topographic contours adjacent to the project.**

2.2.3 SEDIMENT GRADATIONS

Sediment grab samples were collected from the locations shown above in Figure 10 at depths of +6’, 0’, -6’, -12’, -18’, -24’ and -30’ MSL to identify the gradation of the material across the beach and out to depths that approximate the depth of closure. The resulting gradations are provided in Table 2.3 below in values corresponding to the particle diameter for which 50 percent of the material by weight is smaller (D50). The results show the beach is dominated by medium sand and transitions to fine sand for depths of 12 feet MSL and deeper.

Table 2.3: Sediment size along transects T-2 and T-4.

Transect	Elev. (ft, MSL)	D50 (mm)	Transect	Elev. (ft, MSL)	D50 (mm)
T-2	6	(Boulders)	T-4	6	0.52
T-2	0	0.42	T-4	0	0.49
T-2	-6	0.31	T-4	-6	0.39
T-2	-12	0.20	T-4	-12	0.20
T-2	-18	0.19	T-4	-18	0.19
T-2	-24	0.15	T-4	-24	0.15
T-2	-30	0.14	T-4	-30	0.14

3 TECHNICAL STUDIES

3.1 WATER LEVELS

3.1.1 TIDE

There are no tide gauges in the immediate vicinity of the project site. The closest National Oceanographic and Atmospheric Administration (NOAA) tide gauges are shown in Figure 1 and include Santa Barbara, Rincon Island and Santa Monica. There is some historic data from a gauge that was mounted in Mugu Lagoon, but this data was limited to about 4 months in the late 1970's and does not include tidal datums. Thus, the tidal datum data are provided for the three gauges shown below in Table 3.1.

Table 3.1: Tidal datum information for regional NOAA tide gauges.

	NOAA Tide Stations		
Level	Santa Barbara No. 9411340 Local Standard Time (feet, NAVD88)	Rincon Island No. 9411270 Local Standard Time (feet, NAVD88)	Santa Monica No. 9410840 Local Standard Time (feet, NAVD88)
MHHW	5.31	5.36	5.24
MHW	4.55	4.60	4.50
MTL	2.72	2.75	2.62
MSL	2.70	2.73	2.60
MLW	0.89	0.89	0.74
NAVD88	0.00	0.00	0.00
MLLW	-0.09	-0.10	-0.19
Maximum	7.54	7.71	8.31
Max. date and time	12/13/2012 8:36	1/27/1983 7:30	11/29/1982 23:54
Minimum	-2.98	-2.42	-3.03
Min. date and time	12/17/1933 0:00	1/16/1965 0:00	12/17/1933 7:42
HAT	7.14		7.08
HAT date and time	12/2/1990 8:24		12/2/1990 8:12
LAT	-2.09		-2.16
LAT date and time	12/31/1986 16:18		12/31/1986 16:00

The acronyms in Table 3.1 are defined below:

MHHW - Mean Higher High Water

MHW - Mean High Water

MTL - Mean Tide Level

MSL - Mean Sea Level

MLW - Mean Low Water

MLLW - Mean Lower Low Water

HAT - Highest Astronomic Tide

LAT - Lowest Astronomic Tide

3.1.2 STORM SURGE AND EL NIÑO

Storm surge is the increase in water levels due to atmospheric and the resulting hydrodynamic effects due to the storms. Detailed regional studies have been conducted in the area including the currently effective FEMA (2015a) and Preliminary FEMA (2016b) Flood Insurance Studies and the Coastal Storm Modeling System (CoSMoS) study, Erickson et al. (2017). However, wave runup is reported in these references with no detail of the starting still water levels. Still water levels including the effects of tide, storm surge, and El Niño which can be obtained from regional tide gauges in accordance with FEMA (2016a) guidance for coastal water levels. Extreme high water events are calculated and provided by NOAA for the longer-term gauges. The results for the Santa Monica gauge are shown in Figure 11 below. The results include tide as well as the other phenomena leading to high water level such as storm surge and El Niño effects.

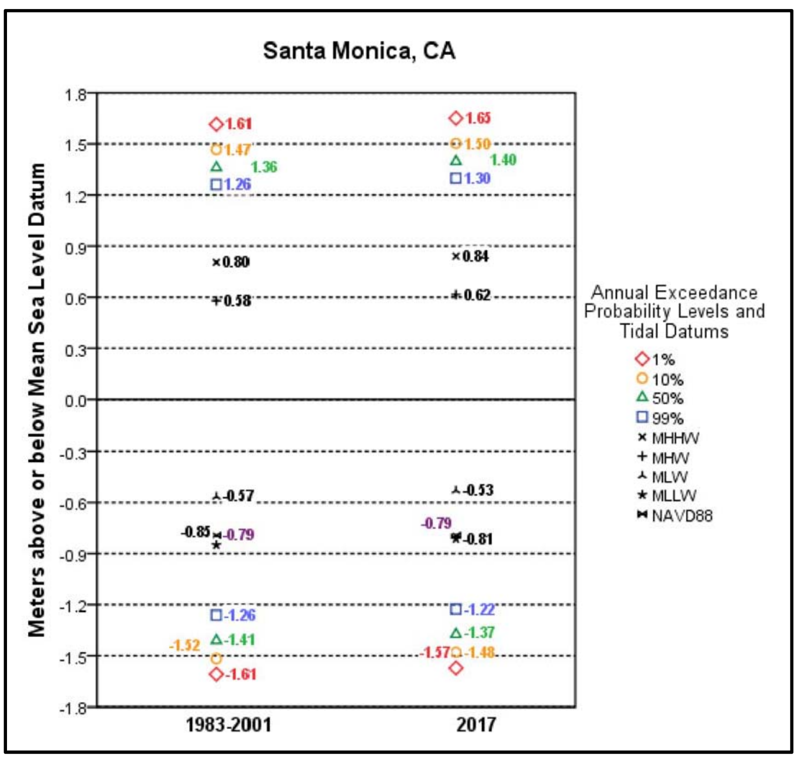


Figure 11: Extreme water levels from NOAA for the Santa Monica tide gauge.

The difference between the values shown for 1983-2001 (the current tidal epoch, centered on 1992) and the results shown for 2017 in Figure 11 account for sea level rise measured at the gauge.

A recent wave setup analysis conducted for Las Tunas Beach, CWE (2014), shows the results of fitting the Gumbel and Log-Pearson Type III extreme probability distributions to the annual maxima water levels measured at the Santa Monica Tide gauge. The result from the recommended distribution per the USACE (2002) Coastal Engineering Manual, Log-Pearson Type III, yielded a 100-year extreme water level of 5.28 feet, MSL. NOAA results shown above yield a 100-year water level for the 1992 base year of 5.28 feet, MSL (1.61 m, MSL). Thus, the results from the NOAA gauge will be used for this study for extreme water levels accounting for tides, seasonal variations, storm surge and El Niño effects. The variation from the 50% (2 year) to the 1% (100 year) water level is 0.8 feet. Thus, the results are plotted on a probability scale shown below in Figure 12. Since the variation in the water levels is quite small, the 2% (50 year) water level was interpolated between the 10% and 1% value and is 5.15 ft, MSL (7.75 ft, NAVD88).

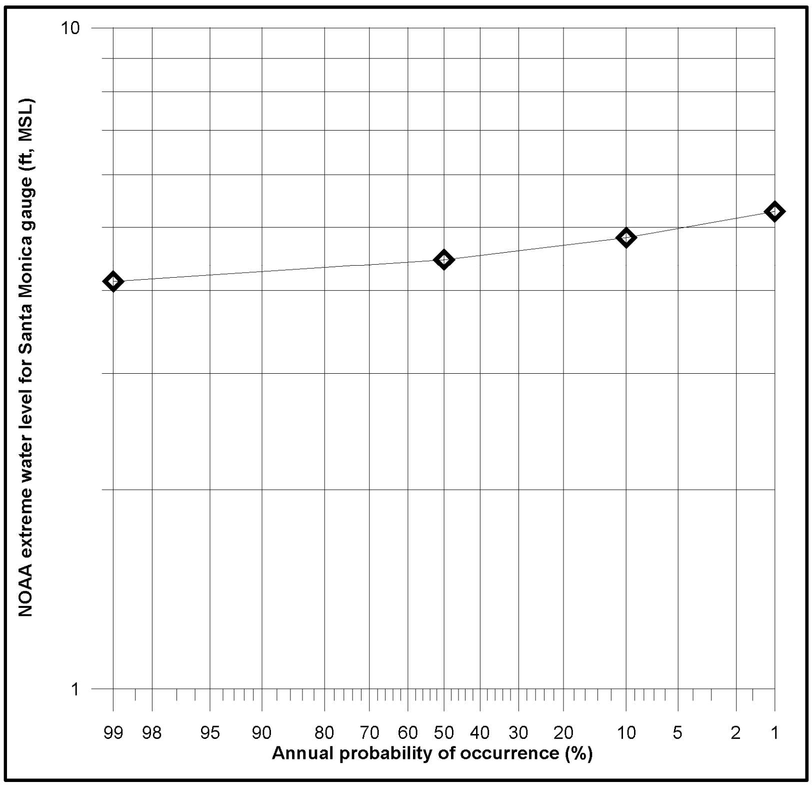


Figure 12: Probability plot of extreme water levels.

Barnard et al. (2017) discusses the 2015-2016 El Niño event in the context of the historical evidence based on the Multivariate ENSO Index (MEI) that was re-constituted dating back to 1871. Based on this record, the El Niño events from 1982-83, 1997-98 and 2015-16 rank as the three highest over that 145-year record, although one event in about 1878 had the same magnitude of bi-monthly MEI that occurred in 2015-2016. Of the top 15 monthly water levels from the period of record for the Santa Monica gauge (1974-present), four of these values coincided with one of the three highest El Niño events noted above, including the largest recorded value in November 1982 coinciding with the 1982-83 El Niño event which was the strongest one based on the MEI. Thus, as noted in the FEMA (2005a) guidance, "For most purposes, the El Niño contribution may be assumed to be part of the surge estimate obtained from the tide gage residuals.” El Niño events are not considered separately in this report since they have been reflected in the extreme water levels calculated by NOAA from the tide gauge record.

3.1.3 SEA LEVEL RISE

Sea level rise is documented at various rates worldwide, through tide gauge measurements and other methods. Sea level rise at a specific site is altered by regional effects and more localized ground subsidence or uplift. NOAA provides measured sea level trends for its longer-term tide gauges including the Santa Monica gauge shown in Figure 13.

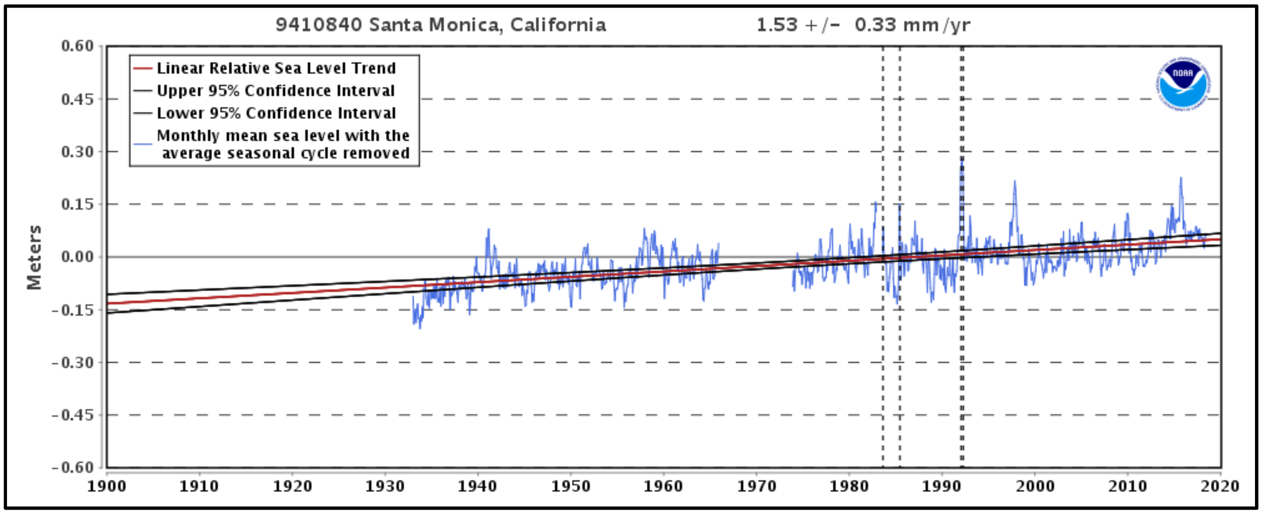


Figure 13: NOAA sea level trend from the Santa Monica tide gauge.

Several guidance documents and estimates of future sea level rise for the California coast exist, including documents by the NRC (2012), the California Coastal Commission (2015) and the State of California (2018a), i.e. Cal-Adapt, State of California (2018b), among others.

The latest statewide sea level rise guidance for California, the State of California (2018b), is shown below in Figure 14 for the Santa Monica area. Caltrans has recommended use of the “Medium-High Risk Aversion” values for the proposed project based on the “High” emission scenario. The emission scenarios are referred to as Representative Concentration Pathways (RCPs). The high and low scenarios are based on the RCP 8.5 and RCP 2.4 emission scenarios, respectively. In addition, the California Coastal Commission recommends consideration of the sea level rise associated with the “Extreme Risk Aversion” shown in the right most column of Figure 14. This extreme scenario is based on the H++ sea level rise scenario proposed by Griggs, et al. (2017) and is based in part on work by Sweet et al. (2017) and others in recognition of the potential for marine ice-sheet instability in the latter part of this century. Additional details on these RCP values and the H++ scenario, mentioned in Figure 14, are discussed in detail in the following guidance documents: State of California (2018b) and Griggs, et al. (2017).

In this report, the year 2020 is included along with the 2050, 2070 and 2095 sea level rise scenarios. The 2020 value is considered as the current condition at the start of the project life. The 2095 value is provided to represent the project life, 75 years, of the proposed secant piles. The sea level trend from NOAA, shown in Figure 13, is used to correct elevations based on the current tidal epoch (1982 through 2001, with base year 1992) to the year 2020. Sea level rise over this period is 0.14 ft. The NOAA sea level trend is used to adjust the sea level rise values from Figure 14, calculated using a baseline year of 2000, to the tidal datums for the current tidal epoch.

Projected Sea-Level Rise (in feet) for Santa Monica

Probabilistic projections for the height of sea-level rise shown below, along with the H++ scenario (depicted in blue in the far right column), as seen in the Rising Seas Report. The H++ projection is a single scenario and does not have an associated likelihood of occurrence as do the probabilistic projections. Probabilistic projections are with respect to a baseline of the year 2000, or more specifically the average relative sea level over 1991 - 2009. High emissions represents RCP 8.5; low emissions represents RCP 2.6. ***Recommended projections for use in low, medium-high and extreme risk aversion decisions are outlined in blue boxes below.***

		Probabilistic Projections (in feet) (based on Kopp et al. 2014)					H++ scenario (Sweet et al. 2017) *Single scenario
		MEDIAN	LIKELY RANGE		1-IN-20 CHANCE	1-IN-200 CHANCE	
		50% probability sea-level rise meets or exceeds...	66% probability sea-level rise is between...		5% probability sea-level rise meets or exceeds...	0.5% probability sea-level rise meets or exceeds...	
				Low Risk Aversion		Medium - High Risk Aversion	Extreme Risk Aversion
High emissions	2030	0.4	0.3 -	0.5	0.6	0.8	1
	2040	0.6	0.4 -	0.8	0.9	1.2	1.7
	2050	0.8	0.6 -	1.1	1.3	1.9	2.6
Low emissions	2060	0.9	0.6 -	1.2	1.5	2.3	
High emissions	2060	1.1	0.8 -	1.4	1.8	2.6	3.8
Low emissions	2070	1.0	0.7 -	1.4	1.9	3.0	
High emissions	2070	1.3	1.0 -	1.8	2.3	3.4	5.1
Low emissions	2080	1.2	0.8 -	1.7	2.3	3.8	
High emissions	2080	1.7	1.1 -	2.3	2.9	4.4	6.5
Low emissions	2090	1.3	0.8 -	2.0	2.7	4.6	
High emissions	2090	2.0	1.3 -	2.8	3.5	5.5	8.1
Low emissions	2100	1.5	0.9 -	2.3	3.1	5.5	
High emissions	2100	2.3	1.5 -	3.3	4.3	6.8	10.0
Low emissions	2110*	1.6	1.0 -	2.4	3.3	6.1	
High emissions	2110*	2.5	1.8 -	3.5	4.5	7.2	11.7
Low emissions	2120	1.7	1.0 -	2.7	3.8	7.3	
High emissions	2120	2.9	2.0 -	4.0	5.2	8.5	14.0
Low emissions	2130	1.9	1.1 -	3.0	4.2	8.3	
High emissions	2130	3.2	2.2 -	4.5	5.9	9.8	16.3
Low emissions	2140	2.0	1.1 -	3.2	4.7	9.4	
High emissions	2140	3.5	2.4 -	5.1	6.7	11.3	18.9
Low emissions	2150	2.2	1.1 -	3.6	5.3	10.8	
High emissions	2150	3.9	2.6 -	5.7	7.6	12.9	21.7

**Most of the available climate model experiments do not extend beyond 2100. The resulting reduction in model availability causes a small dip in projections between 2100 and 2110, as well as a shift in uncertainty estimates (see Kopp et al. 2014). Use of 2110 projections should be done with caution and with acknowledgement of increased uncertainty around these projections.*

Figure 14: State of California (2018) sea-level rise guidance for the Santa Monica region.

3.1.4 WATER LEVELS FOR ANALYSIS

All analyses for this study will be conducted assuming the 100-year high water event is combined with the various sea level rise estimates for future years. This assumption is based on the annual probability of extreme water levels in Figure 12 which shows that the difference between the 100-year and 50-year water level is only 0.2 feet. The table of still water levels used for this study are shown below in Table 3.2.

The sea level rise values provided by Caltrans are obtained from Figure 14 and denoted for the years 2050, 2070 and 2095. These sea level rise values are those requested by the California Coastal Commission and correspond to the Medium-High Risk Aversion in Figure 14 which has a probability of exceedance of only 0.5%. In addition, the California Coastal Commission requested a reference in the report text to the H++ scenario, corresponding to Extreme Risk Aversion. Water levels corresponding to both scenarios in combination with the 100-year storm surge are provided below in Table 3.2.

Table 3.2: Water levels used for analysis.

Year	100 year (1%) storm surge water level (SS) (ft, NAVD88)	Sea Level Rise RCP 8.5 0.5% exceedance (SLR) (ft)	Water level for analysis (SS+SLR) (ft, NAVD88)	Sea Level Rise H++ (SLR) (ft)	Water level for discussion (SS+SLR) (ft, NAVD88)
2020*	7.88	0.14	8.0	-	-
2050	7.88	1.94	9.8	2.64	10.5
2070	7.88	3.44	11.3	5.14	13.0
2095	7.88	6.19	14.1	9.09	17.0

* 2020 SLR is from NOAA Linear SLR trend, Santa Monica Gauge

The wave setup must be included in the initial water level for the various analyses described later in this report such as scour and wave runup analyses. Since this is dependent on the type of analysis being conducted, as well as the location where the wave setup needs to be calculated, these values will be provided in the context of the various analyses.

3.2 BEACH CONDITIONS

3.2.1 EXISTING CONDITION

Sycamore Cove Beach is an example of a small pocket beach contained within two headland features with a source of sediment from Big Sycamore Creek at the northwest end of the beach. Current conditions on the beach include a quantity of sand sufficient to cover almost all rock within the main stretch of beach. Historic photos from winter months and spring illustrate the exposure of large quantities of rock at the mouth of Big Sycamore Creek. The photos shown below in Figure 15 illustrate two examples of winter/spring conditions with rock exposed and one of summer/early fall conditions with sufficient sand present to cover the rock. This is a demonstration of the typical seasonal beach profile change on the Pacific Coast with winter storms tending to move sediment offshore of the beach and milder summer season conditions tending to move sediment back onshore.

Figure 15: Aerial photos (Google) at the bridge top to bottom: 4/26/11, 8/26/2012, and 12/9/13.

The graphical representation of longshore transport by Patsch and Griggs (2007) illustrates minimal transport in the small pocket beaches in the vicinity of Point Mugu and southeasterly to Sycamore Cove Beach relative to locations further east. As one approaches Dume Point, the study indicates a sediment transport rate of about 8,000 cy/year most of which is lost to Dume Canyon based on several studies discussed in the report. Point Mugu and Point Dume are located 3.0 miles WNW and 12.8 miles ESE of Sycamore Cove Beach, respectively, as illustrated below in Figure 20 located in Section 3.3.1 of this report. In the region containing Sycamore Cove Beach, the study indicates the littoral drift direction is southeasterly from Mugu Point to Dume Point and beyond to Redondo Canyon near the end of the Santa Monica Cell. Based on analysis of sediment at Sycamore Cove Beach, adjacent beaches both updrift and downdrift, as well as sediments from Big Sycamore Canyon, Azmon (1961) concludes there is longshore transport through this region.

The California Coast was included in the National Assessment of Shoreline Change, Hapke, et al. (2006). Although the study did not include specific information for the immediate vicinity of Sycamore Cove Beach or immediately adjacent beaches, they did note that one of the most rapidly eroding locations in Southern California is Ormond Beach, located approximately 8 miles northwest of the project site, with a short-term erosion rate in excess of 5 m/yr. However, the long-term trend from this location is slightly accretional. Since Ormond Beach is separated from the project site by Mugu Lagoon entrance and Mugu Canyon, the similarities between the two locations are significant. The study did include analysis from the series of beaches southeast of Sycamore Cove Beach beginning at Solromar. The series of pocket beaches between Solromar and Point Dume were included in the analysis and show a couple of locations with short term erosion rates of up to 2 m/yr. However, along this entire stretch, the long-term erosion & accretion rates are less than 0.3 m/year with the areas closer to Solromar being erosional. Note, this would be consistent with a possible erosional trend at Sycamore Cove Beach discussed above, and the areas nearer to Point Dume being accretional.

A significant shore term erosion event occurred in 2014 during Hurricane Marie, with the loss of the life guard structure at the southeasterly end of the beach as shown in Figure 16 below. The photo from the southeast end of the beach illustrates the potential for acute short term erosion. This was documented with numerous photos from various sources such as the Los Angeles Times as well as a Lidar survey that is discussed later in this report. The area near the bridge did not sustain significant loss of material or exposure of the underlying rock during this event.

This event was unusual, due to the occurrence of southerly waves with offshore wave heights in excess of 10 feet and wave periods in the 13 to 16 second range (per NOAA's NDBC Buoy 46025 located approx. 22 miles south of Sycamore Cove Beach, NOAA (2017b)). In accordance with the U. S. Army Corps of Engineers (2017) Wave Information Study, data from the nearest offshore hindcast station, No. 83097 located about 10 miles south of Sycamore Cove Beach, an assessment of the 32 year hindcast indicates that only two events with waves in excess of 6.6 feet (2 m) out of a total of 281 events over this period had waves arriving from angles of less than 200 degrees. Thus, the waves generated by Hurricane Marie between Aug. 27 and 29th were quite unusual due to their approach angle. This southerly approach angle caused the waves to propagate over a 300 foot deep shoal about 5 miles south of Sycamore Cove Beach. Due to the large period of these waves, there is a likelihood this shoal may have modified the waves causing unusual effects at the shoreline relative to more typical storm waves (i.e. those with approach angles ranging from SSW to WNW). Another effect with waves arriving from such southerly angles is they may have a higher propensity to drive sediment transport from southeast to northwest along the shoreline of Sycamore Canyon Beach relative to typical storm wave directions. These waves may have caused not only offshore migration of sediments due to storm conditions but a northwesterly transport of material as well. The adjacent headland may prevent transport of sufficient material from the southeast to replace the material transported offshore and to the northwest thereby exacerbating the erosion in the immediate vicinity of the beach house due to a short-term sediment deficit.

Figure 16: Aerial photos (Google), top and bottom, of the northwest and southeast ends of the beach, respectively during Hurricane Marie, 8/27/2014.

3.2.2 SUMMER AND WINTER BEACH PROFILES

Several historic lidar surveys were obtained online, NOAA (2018), and used to create profiles along the five offshore transects shown above in Figure 8. These profiles include data over a 19-year period and include both summer and winter profiles. The data also include a survey conducted soon after Hurricane Marie in 2014 and one conducted in 2016 to document the effect of the 2015-2016 El Niño event. The data along all five of the profiles are shown below in Figure 17 and Figure 18. The nearshore profiles illustrate seasonal and storm related impacts to the beach. The bottom plot in Figure 17 shows the agreement in the profiles for depth greater than approx. 30 feet.

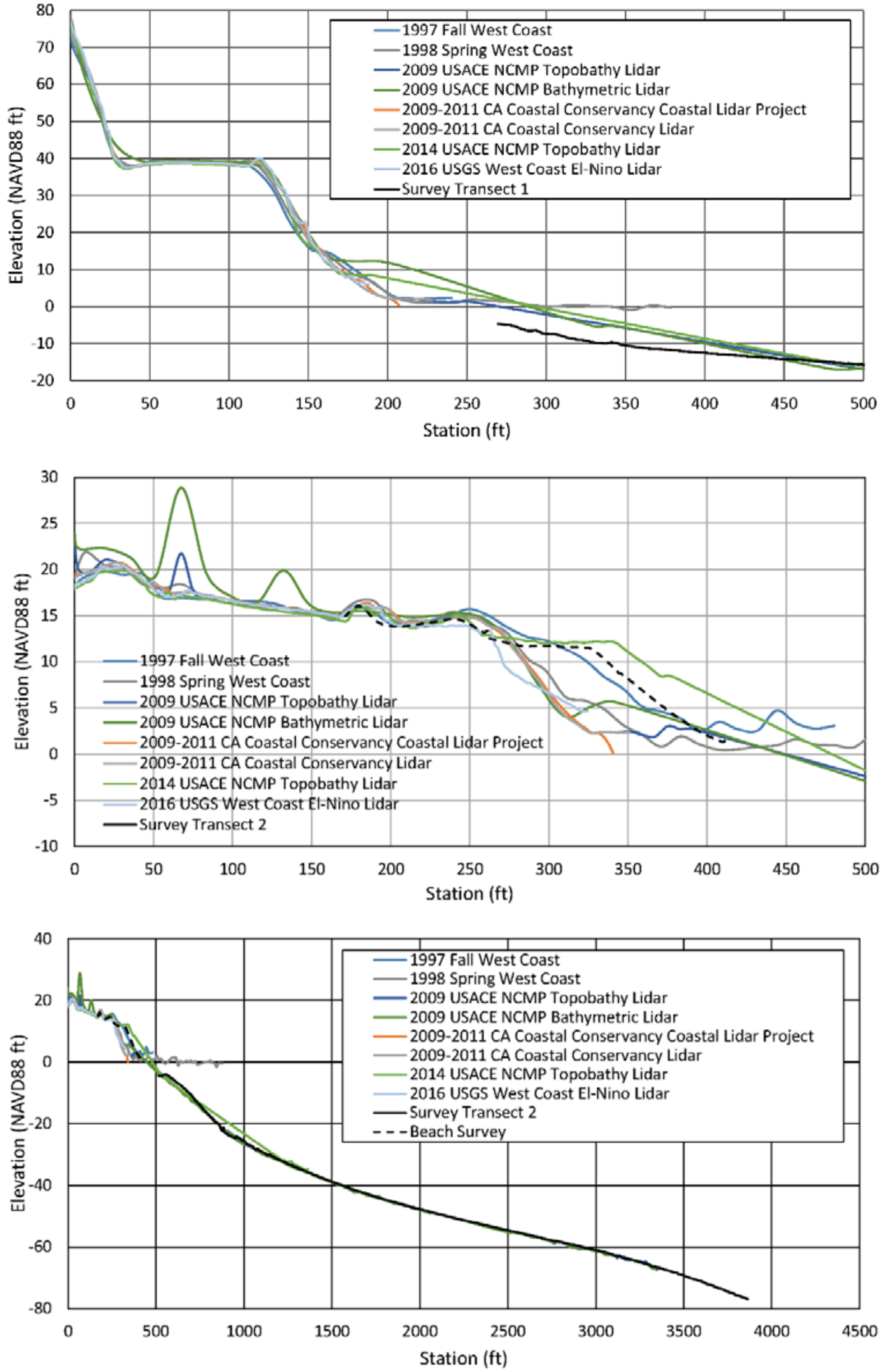


Figure 17: Shoreline profiles based on lidar surveys and the surveys for this study. Top and middle show transects T-1 and T-2, respectively. The bottom shows the whole transect for T-2.

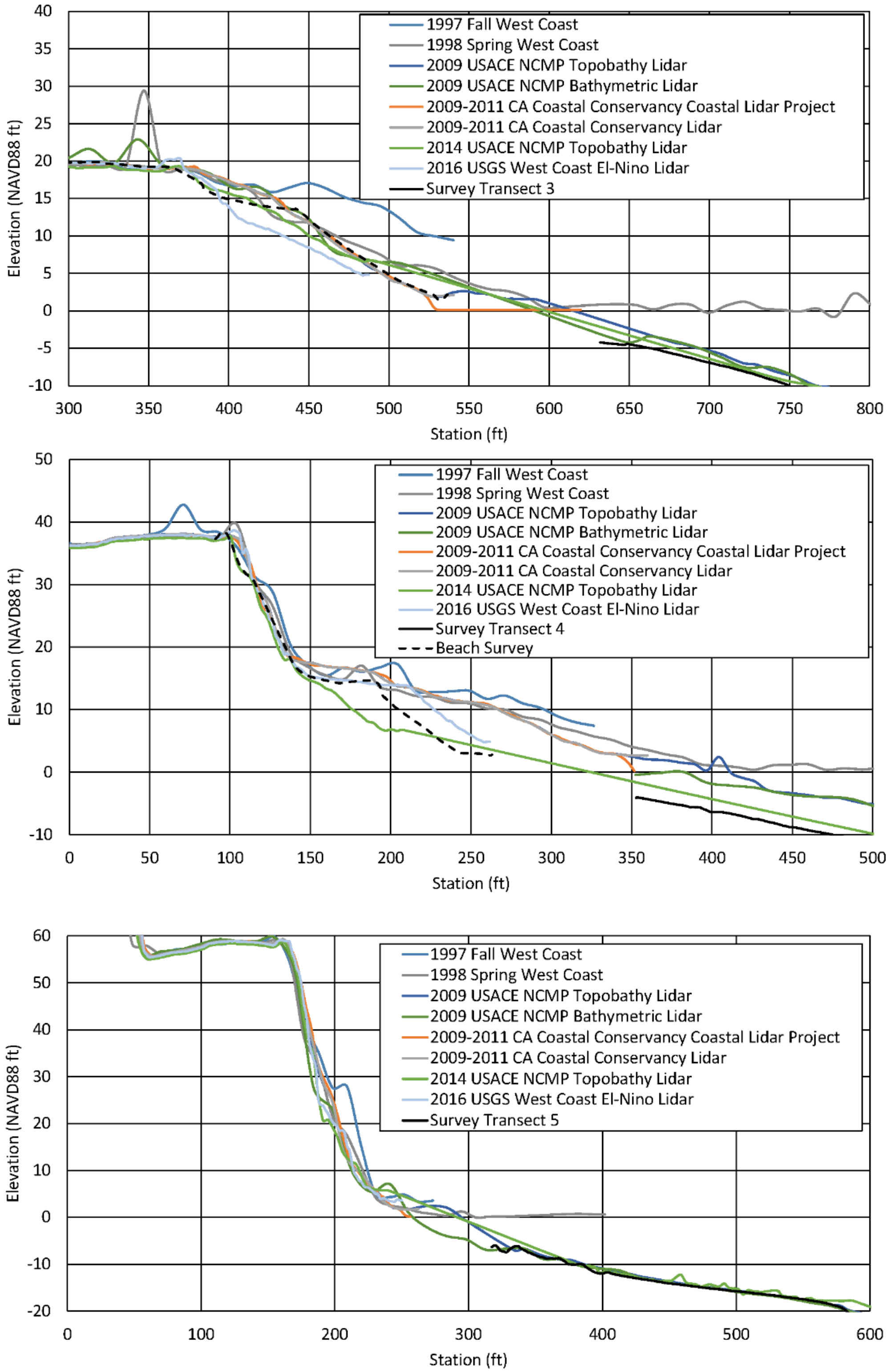


Figure 18: Shoreline profiles based on lidar surveys and the surveys for this study. Top to bottom show transects T-3, T-4 and T-5.

The remainder of these plots for the other profiles (T-1 and T-3 through T-5 for the profile out to the seaward end of the measured transects) are provided in the Appendix. Note the apparent accretion of sediment at T-2 and the erosion at T-4 during Hurricane Marie in 2014. The previous survey in 2009 shows approximately 90 feet of additional beach at the +10-foot contour. At Transect T-2, Hurricane Marie caused the largest accumulation of sand at this transect than during any of the other surveys. At Transect T-2, the winter and 2015-2016 El Niño profiles exhibit about 50 to 60 feet of shoreline retreat at the +10-foot contour level. In general, the vertical variation of the profile data appear to be about 10 feet for T-1, T-2 and T-4, whereas for the beach profile T-5, the vertical variations appear to be limited to about 5 feet between surveys. For the profiles at T-3 near the center of the beach vertical variation of the profiles on the beach is a bit less than for the two transects at either end of the beach.

3.2.3 LONG TERM BEACH TREND

Historic aerials UCSB (2018) and Google (2018) listed below in Table 3.3 are shown in the Appendix. For each aerial photo the water line was approximated with a straight line as shown in the photos provided in the Appendix. These photos were analyzed for shadow orientation to estimate the time of day. The estimated time was then used to determine the observed tide level at the time the photo was taken. The composite of the various lines are shown below in Figure 19 overlain on the most recent Google aerial photo available.

A qualitative comparison of the composited lines indicates the possibility of a long term erosional trend at this beach based on the four oldest lines including 1945, 1946, 1959, and 1963 generally lying seaward of most of the more recent lines other than 1982. The two most shoreward lines are from 2007 and 2012 although 2007 is at the highest tide of all the photos with tide estimate.

Table 3.3: Historic aerial photo dates and estimated tide levels at the time of the photo.

Source	Aerial photo (date)	Estimated time (LST)	Measured tide Santa Monica gauge (9410840) (ft, MSL)
UCSB (2018)	10/23/1945	12:00 PM	No tide data
	12/31/1946	3:00 PM	No tide data
	8/2/1959	12:00 PM	No tide data
	1/6/1963	12:00 PM	No tide data
	1/31/1977	2:00 PM	-2.9
	2/28/1982	1:00 PM	-1.7
	5/29/2001	12:00 PM	-1.1
Google Earth (2018)	06/19/1989	10:00 AM	0.5
	09/02/1994	12:00 PM	-0.5
	8/31/2007	11:00 AM	3.1
	8/26/2012	12:30 PM	0.5
	12/31/2017	12:00 PM	-1.9

Figure 19: **Composite of the water lines from the historic aerial photos shown on a Google Aerial photo dated 12/31/17.**

3.3 WAVE TRANSFORMATION

3.3.1 OFFSHORE WAVE CONDITIONS

Wave information is available through the U.S. Army Corps of Engineers Wave Information System (WIS) and a system of offshore buoy locations. The buoy locations shown in Figure 20 include those operated by NOAA through the National Data Buoy System (NDBS) and those operated by Scripps Institute of Oceanography. Some of these buoys have long deployment history of decades but many shown on the figure may have a few months to a few years of data. Other regional studies including the CosMoS, Erickson et al. (2017) and the two available FEMA Flood Insurance Studies for Ventura County, FEMA (2015a) and FEMA (2016b), utilized wave information but it is either not available or not in a suitable form for the purposes of this study. Thus, the WIS hindcast wave data is used for this study.

The USACE implemented the WIS program to provide hindcast products for all U.S. coastlines with results at stationing intervals that allow identification of offshore wave conditions along the entire coastline including the Sycamore Cove project site. The WIS hindcasts have been calibrated against local and regional wave buoy data and thus are suitable for use in assessing offshore wave conditions for the project site.

The WIS station located southwest of Sycamore Cove shown in Figure 20 is Sta. 83096. A curve has been fitted through annual peak WIS wave heights for the 32-year period of record as illustrated below and can be used to calculate the wave height for an event with some annual probability of occurrence or, equivalently, an Average Return Interval (ARI). An example of this plot obtained from the WIS data repository is shown below in Figure 21.

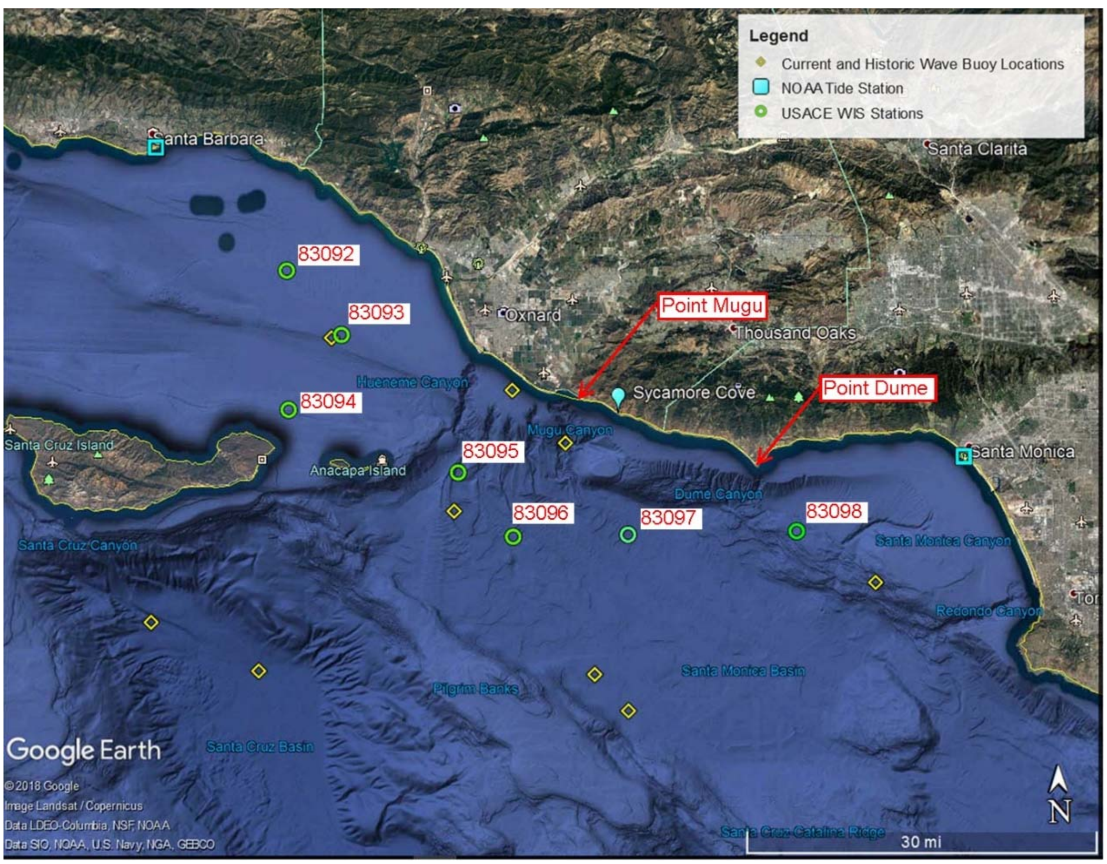


Figure 20: Regional map showing the location of offshore buoy data and USACE WIS stations.

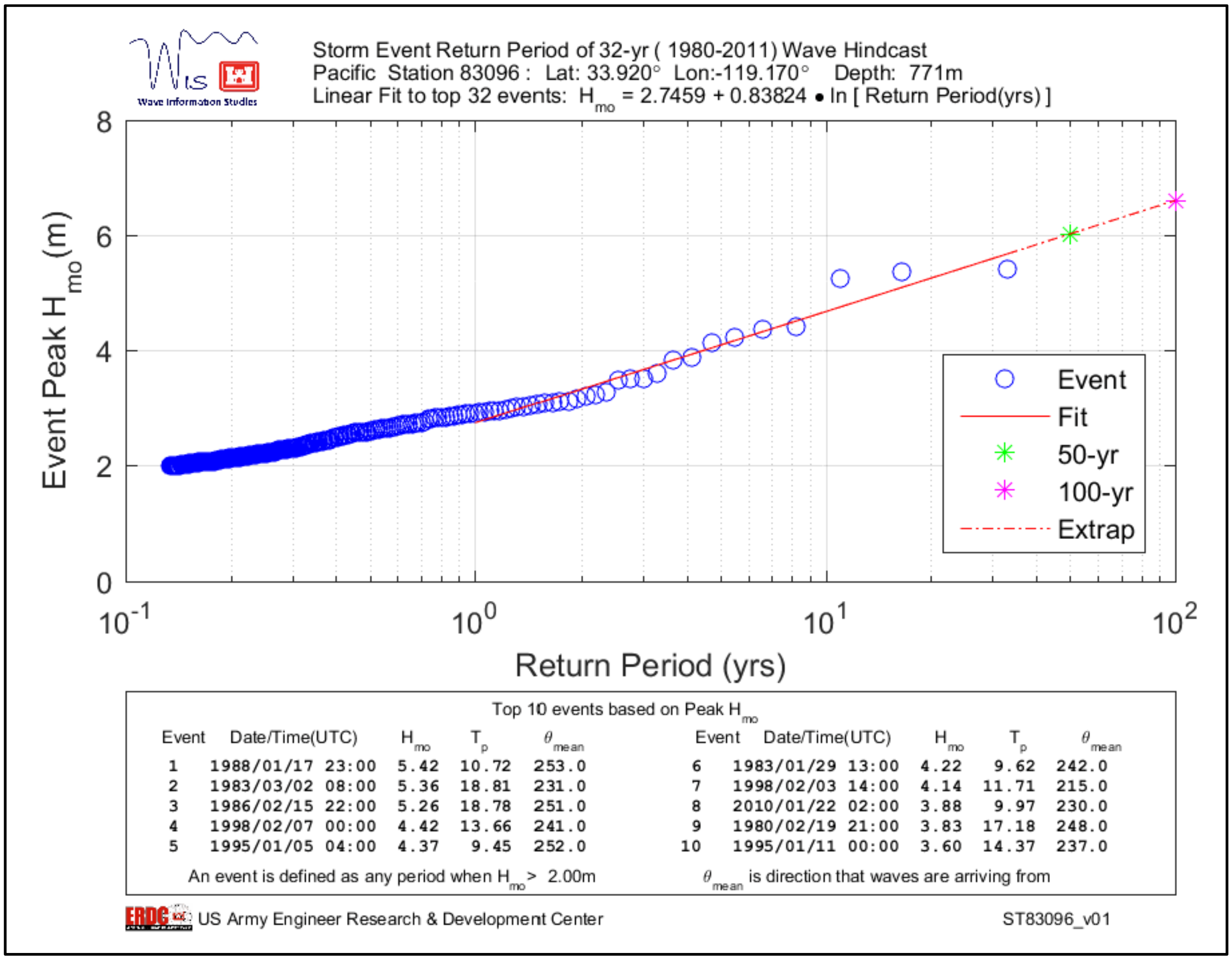


Figure 21: Probability of a given deep water offshore wave height in a given year.

Curves for ARI vs. wave height were obtained from several of the adjacent WIS stations and used to calculate wave heights for a variety of ARI values as shown below in Table 3.4. As can be seen, the largest recurrence interval waves are at Stations 83096 and 83097 southwest and south of the project site, respectively.

Table 3.4: Probability in terms of ARI for extreme offshore wave heights.

ARI (yr)	100	50	20	10	5	2	1
WIS Sta.	Hmo(ft)						
83092	18.6	17.2	15.4	14.0	12.6	10.8	9.4
83093	17.7	16.5	14.9	13.7	12.5	11.0	9.8
83094	14.2	13.3	12.2	11.3	10.4	9.2	8.3
83095	17.3	15.9	14.1	12.7	11.3	9.5	8.1
83096	21.7	19.8	17.2	15.3	13.4	10.9	9.0
83097	21.6	19.8	17.3	15.5	13.6	11.2	9.3
83098	20.9	19.2	16.8	15.0	13.2	10.8	9.0

Wave directions are illustrated below in Figure 22 with the wave rose from WIS station 83096. Wave roses for Stations 83095 through 83098 are all very similar. Moving northward into the Santa Barbara channel, the wave roses indicated most of the wave energy arrives from the west and adjacent directions (e.g. WNW and WSW) due to the protected location at the western end of the Santa Barbara Channel. Based on these wave roses, in combination with the list of top wave events for Station 83096, the wave directions selected for nearshore wave analysis include 180 degrees through 300 degrees in 15 degree increments. For wave directions from 180 degrees through 240 degrees, wave conditions are based on results from Station 83096. For 255 degree waves, wave conditions are based on results from Sta. 83095. For waves from 270 degrees through 300 degrees, wave conditions are based on Sta. 83093. Although Sta. 83094 is nearly due west of Sycamore Cove Beach, this station is protected somewhat within the shadow of Santa Cruz Island. The wave conditions from due west were based on Station 83093, since it has slightly larger wave heights than Station 83095.

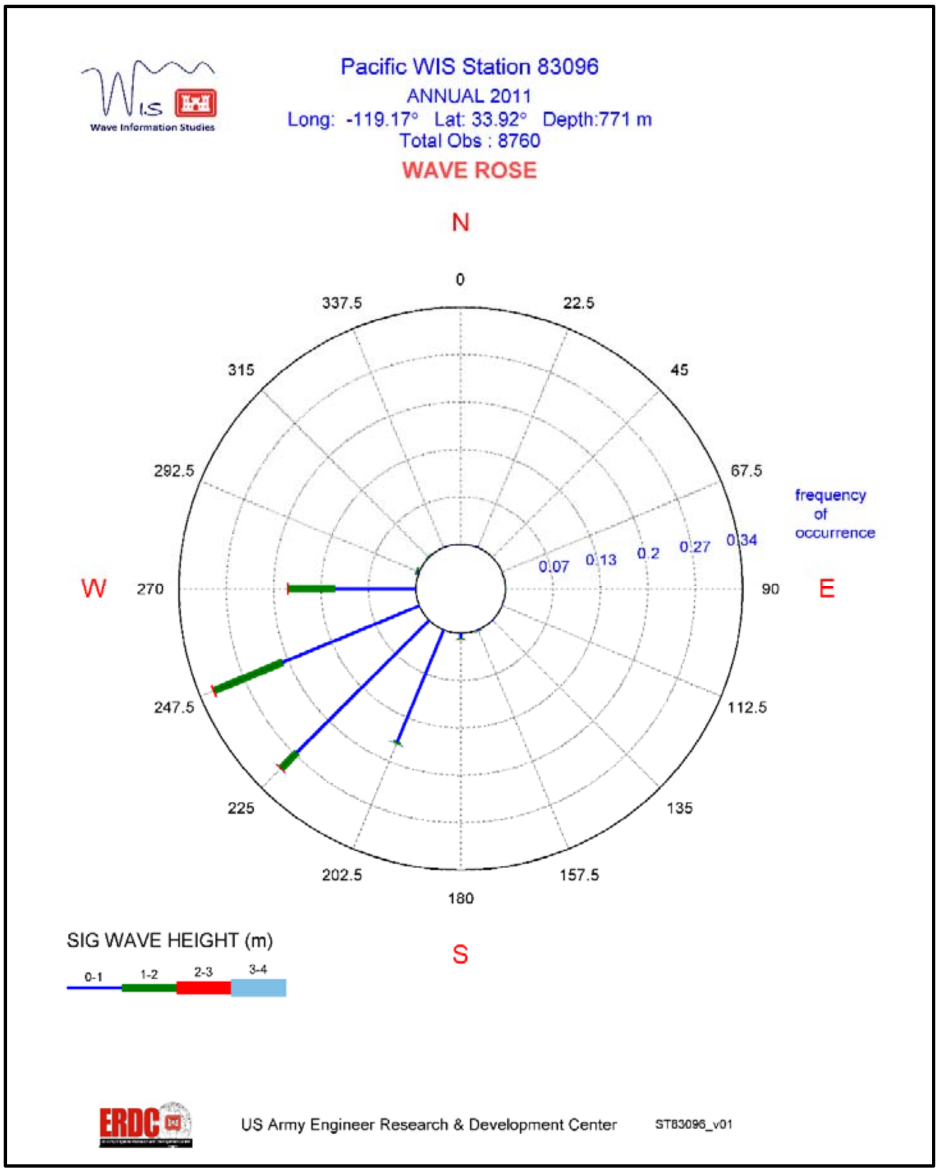


Figure 22: Wave rose for WIS Station 93096 located southwest of the project site.

The 32 year hindcast data from WIS Sta. 93096 was queried for all wave heights in excess of 9.8 feet (3.0 m) and the scatter of the resulting 534 hourly records is plotted in Figure 23. For the maximum wave heights over the 32-year hindcast, peak wave periods ranging from about 10 seconds to in excess of 19 seconds are evident with significantly more of the largest wave heights being associated with wave periods in the range of 17 seconds to 19 seconds. The top ten wave events are shown above in Figure 21, including wave height, period, and wave direction. Although the largest event appears to have a fairly low wave period of 10.7 seconds, a query of the time series during the storm resulted in a peak wave period of 17.1 seconds, with a wave height of 17.4 feet (5.30 m) which is just slightly less than the peak wave height of 17.8 feet (5.42 m). Based on this information, a range of wave periods will be used for the nearshore wave modeling including 8 sec., 12 sec., 16 sec., and 20 sec.

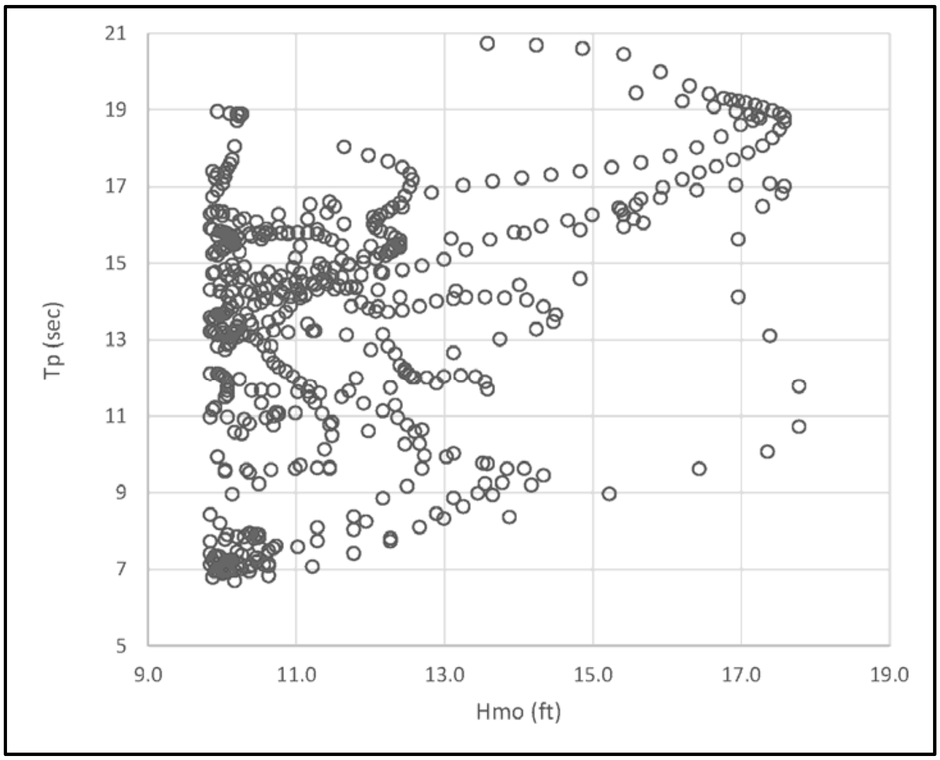


Figure 23: Scatter plot of wave height vs. wave period for all waves in excess of 10 feet at WIS Station 83096.

3.3.2 SWAN WAVE MODELING

Developed at the Delft University of Technology in the Netherlands, SWAN is a one- and two-dimensional numerical model for estimating wave parameters in coastal areas, lakes, and estuaries from given wind, bathymetric, and current conditions. The wave action balance equation with sources and sinks, Holthuijsen et al. (2003) and Delft (2018), forms the basis of the model. Wave propagation processes represented include propagation through geographic space, refraction due to spatial variations in bottom and current, shoaling due to spatial variations in bottom and current, blocking and reflections by opposing currents, and transmission through, blockage by, or reflection against obstacles. Wave generation and dissipation processes represented include generation by wind; dissipation by whitecapping, depth-induced wave breaking, and bottom friction; and wave-wave interactions. The model contains both stationary and non-stationary operational modes formulated for Cartesian, curvilinear, or spherical coordinate systems. The inputs to the SWAN model include a bathymetric/topographic unstructured mesh, hindcasted wind field, water surface elevation, and currents. SWAN does not model wave reflections where waves must propagate backward through the computational domain. Thus, the model is not suitable for highly reflective environments such as a harbor with reflective perimeters. The latest version, 41.20 A, of the SWAN model was used.

For this study the offshore wave conditions were used as boundary conditions at the seaward side of the modeling domain. The model grid was created using the Digital Elevation Models shown below for Santa Barbara and Santa Monica in Figure 24. The south boundary of the south coarse grid is aligned with the WIS stations as is the west boundary for the west coarse grid. Figure 25 shows the extent of the model grids and bathymetry between the WIS stations and the project site.

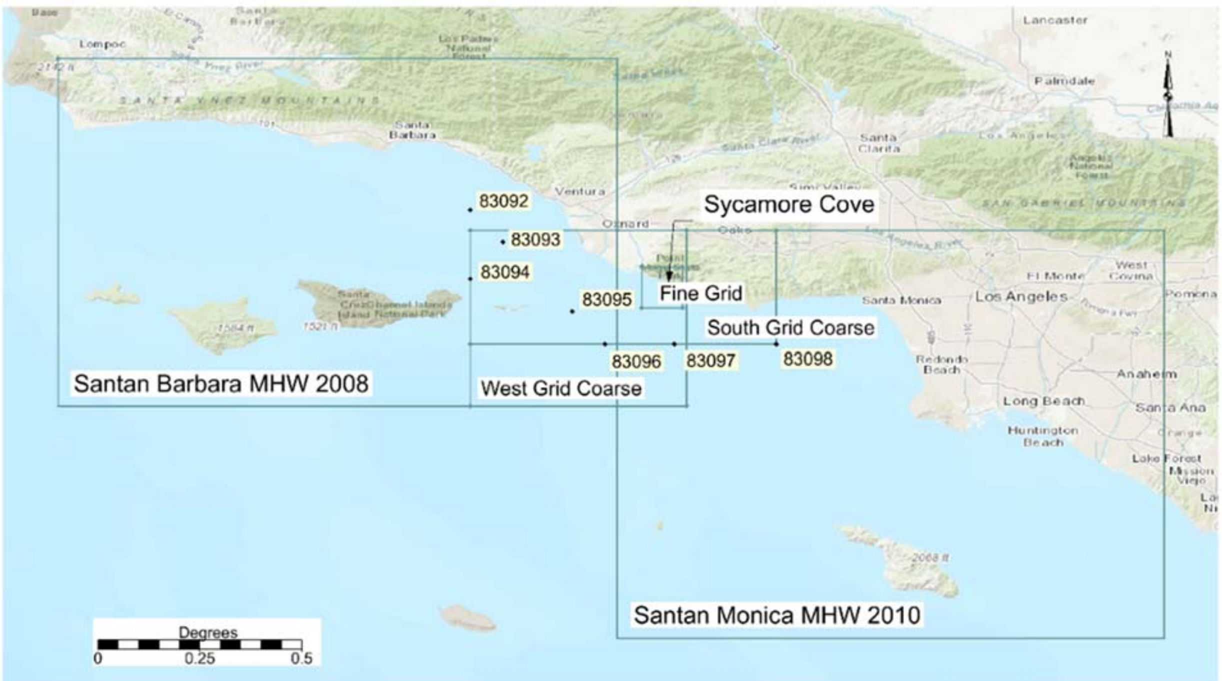


Figure 24: Regional digital elevation models used to develop the two coarse grids and the fine grid used in the SWAN model.

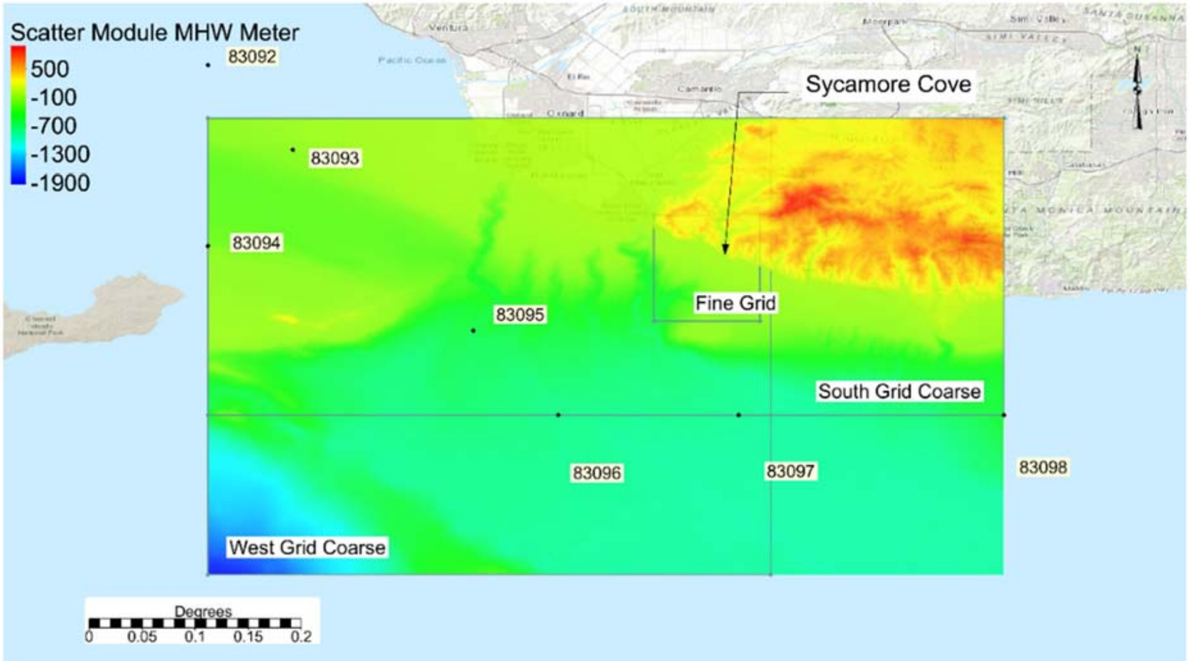


Figure 25: The coarse and fine grids along with the bathymetry and WIS stations.

The SWAN model has been extensively applied within the Southern California coastal region including the CosMos study, Erickson, et al. (2017) and a study by Rogers et al. (2007). The extensive validation work conducted by Rogers et al. (2007) was utilized by Erickson et al. (2017) and for this study by setting the SWAN modeling parameter to those used by Rogers et al. An example input file for the south and west coarse grid model runs as well as the fine grid model run are provided in the Appendix. The SWAN model was run for a matrix of conditions including 9 wave directions from 180 to 300 in 15 deg. increments and four wave periods, 8 sec., 12 sec., 16 sec., and 20 sec. for each assumed wave height and water level. Two cases were run consisting of a 50-year wave height and 2050 water level and another case with 2100 high water level and 100-year wave height. An example of SWAN run results for the significant wave height, Hs, are shown below in Figure 26 and Figure 27 for a model run with the 100 year wave height, 2100 high water level, 240 deg. (approx. WSW) wave direction and wave period of 16 sec. Another SWAN model result is shown in Figure 28 and Figure 29 for the 100 year wave from 300 deg. (approx. WNW). The 2100 high water level noted above is based on the draft report and is 12.5 ft, NAVD88. For this final version of the report the project life of 2095 was used, in lieu of 2100, and the sea level rise was modified. Thus, the 2095 high water level is 14.1 feet or 1.6 feet higher than during the draft reporting stage of this project. The wave modelling was not redone as the 1.6 foot difference in water level will not significantly affect the resulting nearshore wave climate. This is particularly true given the waves at the shorelines are depth limited under all cases of interest for the analyses conducted.

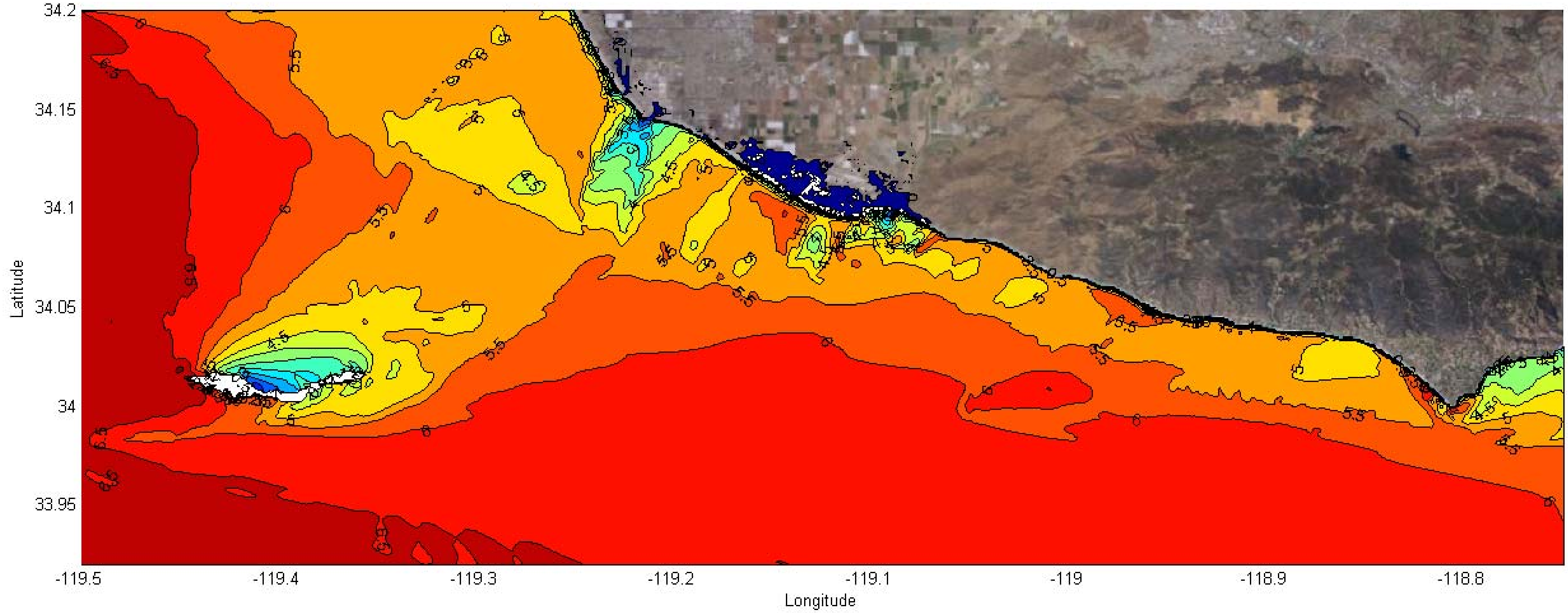


Figure 26: **SWAN model results on the south coarse grid showing contours of Hs (m) with initial conditions of 100 year wave height (21.7 feet), wave direction of 240 deg. and a peak wave period 16 sec.**

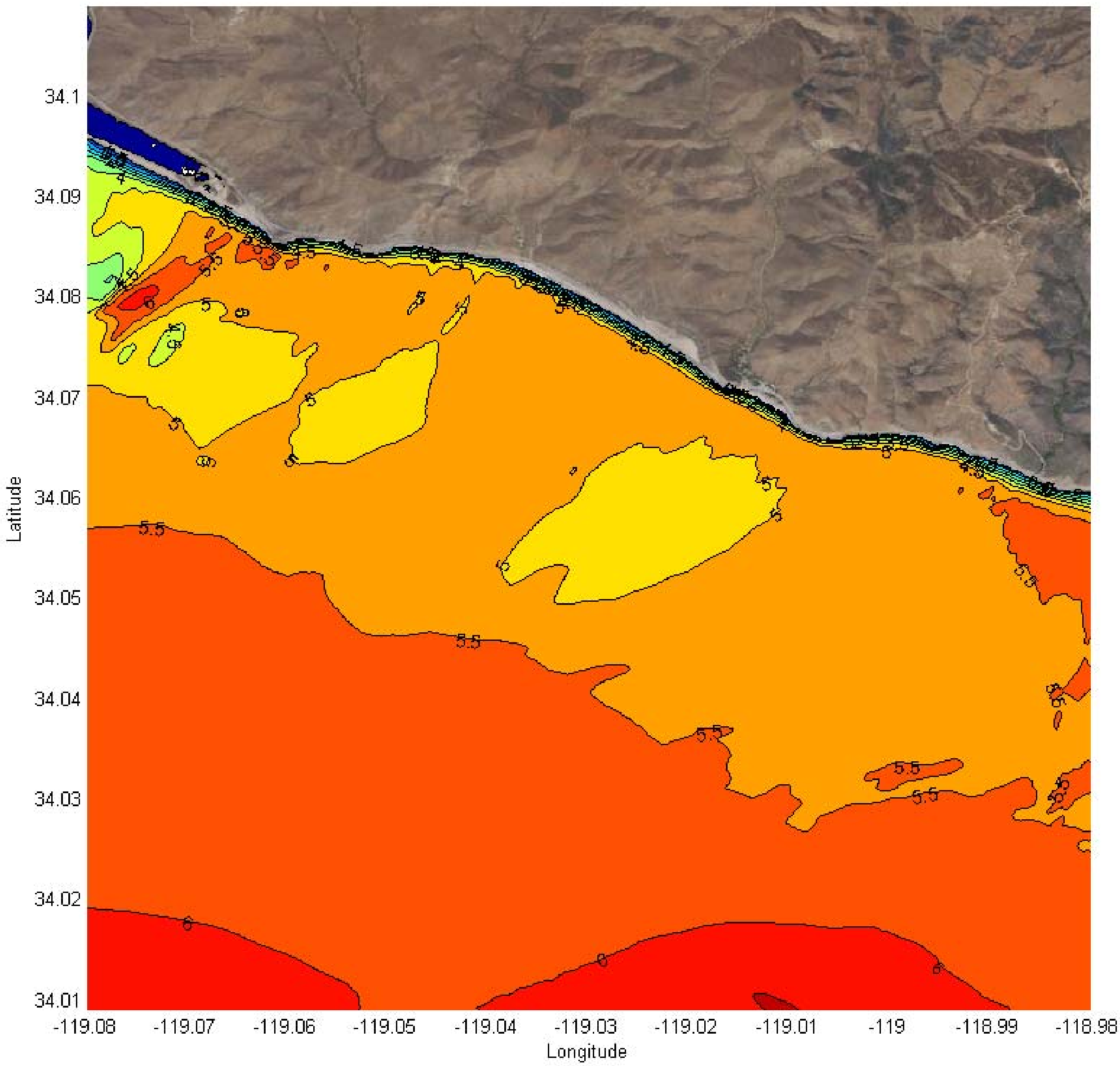


Figure 27: SWAN model results on the fine grid showing contours of Hs (m) with initial conditions of 100 year wave height (21.7 feet), wave direction of 240 deg. and a peak wave period 16 sec.

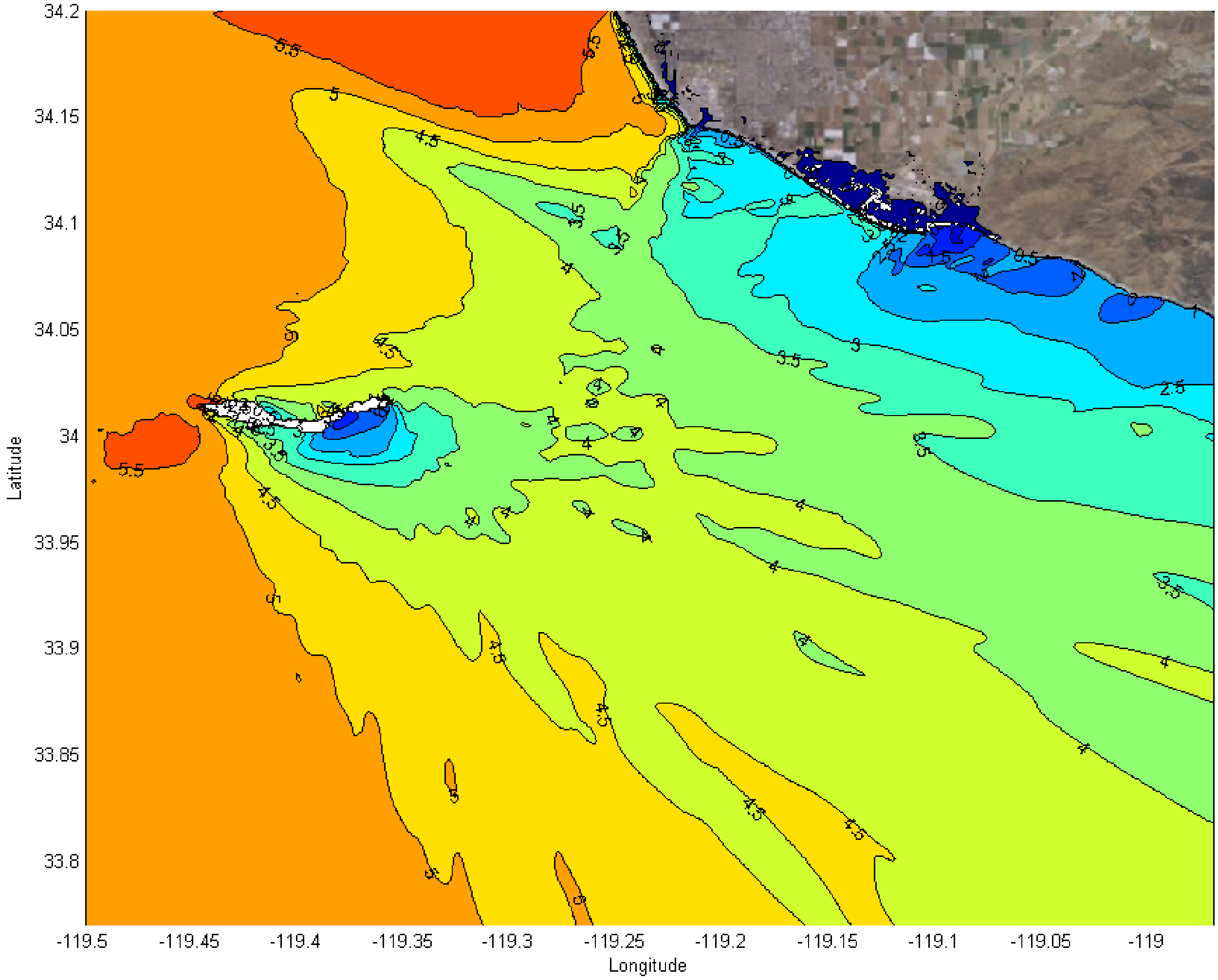


Figure 28: SWAN model results on the west coarse grid showing contours of Hs (m) with initial conditions of 100 year wave height (17.7 feet), wave direction of 330 deg. and a peak wave period 16 sec.

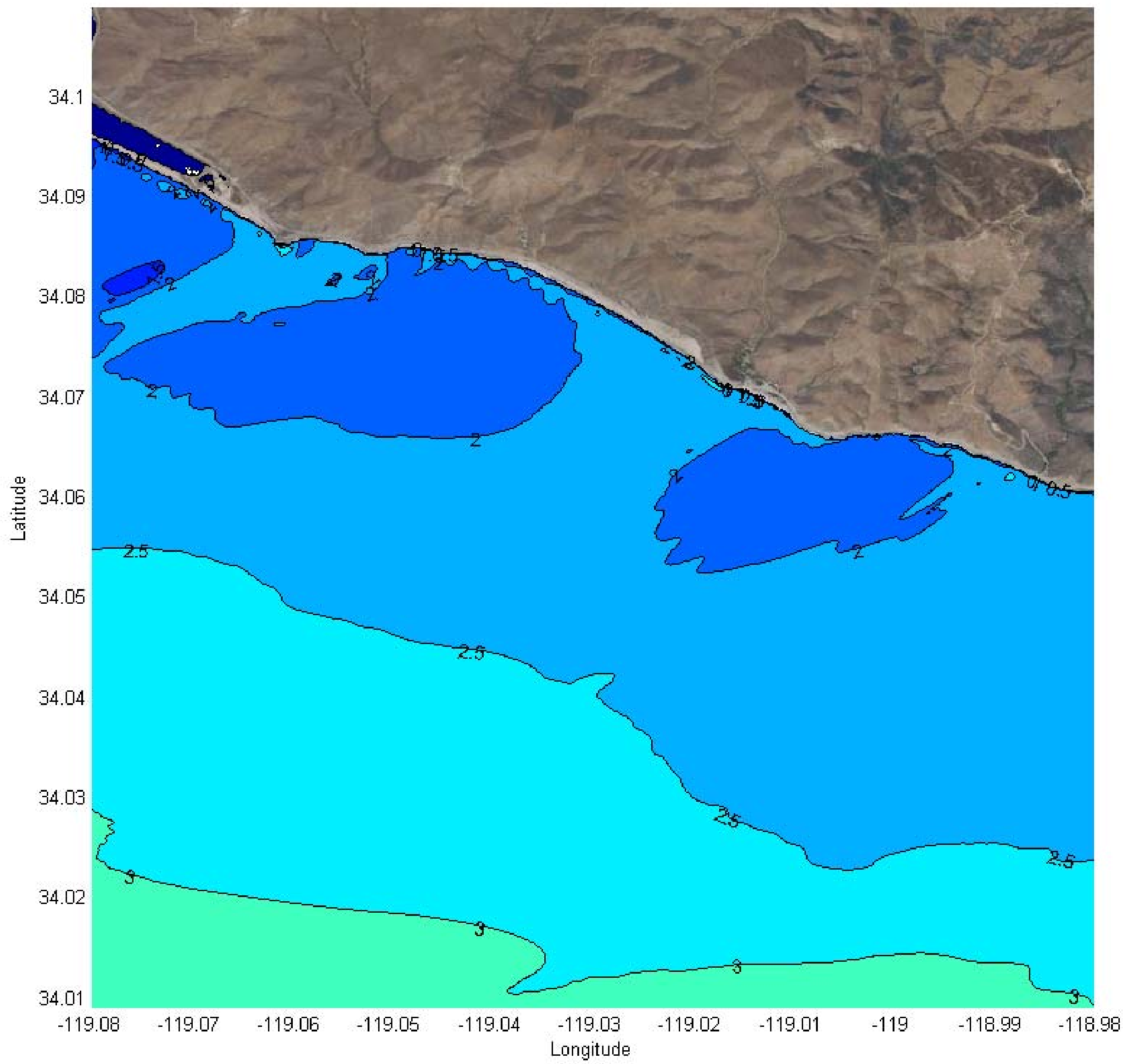


Figure 29: SWAN model results on the fine grid showing contours of Hs (m) with initial conditions of 100 year wave height (17.7 feet), wave direction of 330 deg. and a peak wave period 16 sec.

A Matlab routine was developed to automate the model runs and identify the maximum wave height and associated wave period from the 36 different runs for a given initial wave height and water level. The resulting wave condition along the five profiles shown in Figure 8 are shown below in Figure 30 and Figure 31 for the resulting maximum wave height and associated wave period, respectively, across all 36 SWAN runs.

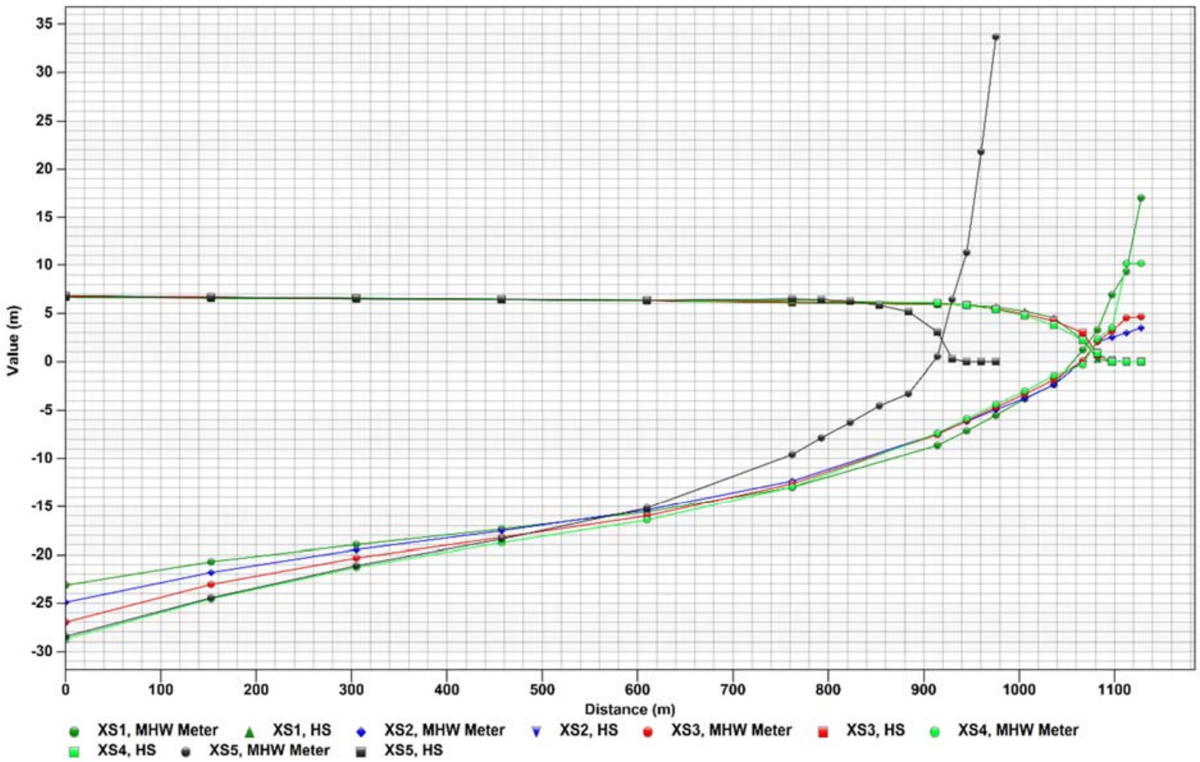


Figure 30: Plot of the significant wave height Hs and depth relative to MHW (i.e. SWAN model datum) for 100 year wave and 2100 high water level scenario.

The incident wave height arriving from offshore for all the transects is very close to the wave height applied at the SWAN model boundary based on WIS station 83096. Once the wave nears the shore to the point where the depth will limit the wave height due to breaking the wave height starts decreasing in accordance with this limitation. The results show that the waves from the southwest that arrive almost perpendicular to the shoreline result in almost no change in the wave height until breaking depths are reached. Therefore, the waves at the shoreline for all structures and locations of interest at the project site will be controlled by depth limited breaking waves. For most shoreline impacts, such as scour and wave runup, the longer wave lengths lead to larger impacts. Thus, the peak wave period of 20 seconds will be used for all analyses.

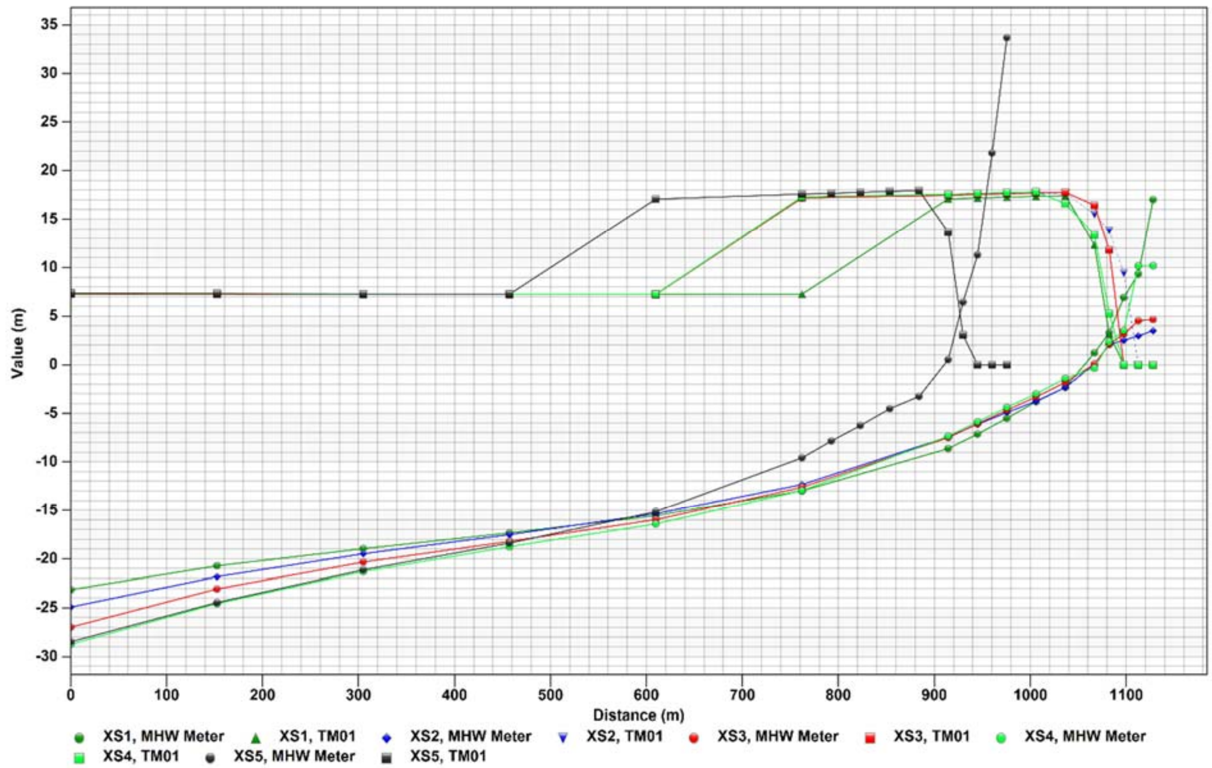


Figure 31: Plot of the peak wave period Tp associated with the wave height shown in Figure 30 and depth relative to MHW (i.e. SWAN model datum) for 100 year wave and 2100 high water level scenario.

3.4 TSUNAMI EFFECTS

3.4.1 HISTORIC EVENTS IN THE REGION

Historic tsunami events for the entire globe are available through NOAA (2018b). These data were queried for Point Conception to the US Mexico border and sorted for runup height. The top events with runup heights greater than 4.3 feet (1.3 m) are shown below in Figure 32. Note the largest runup of 39 feet (12 m) is not considered to be from a tsunami source. Thus, the next largest value is 14.5 feet (4.5 m) for Santa Barbara in 1913. There are several smaller events registering runup heights of 6.6 feet (2 m) or more.

NOAA NATIONAL CENTERS FOR ENVIRONMENTAL INFORMATION
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

NOAA > NESDIS > NCEI (formerly NGDC) > Natural Hazards

Tsunami Runups Full Search, sort by Maximum Vertical Runup, Date

Tsunami Runups where (Latitude <= 34.5 and Latitude >= 32.5) and Runup Country = USA and Runup State = CA

View parameter descriptions and access statistical information by clicking on column headings.

For additional information about the tsunamigenic earthquake, tsunami runup, or source event click on the links in the **Tsu Src**, **EQ Mag**, **Volcano**, or **Tsu Runup** columns.

Date						*Tsunami Source*					*Addl Info*		*Tsunami Runup Location*									*Tsunami Runup Measurements*			
																			Travel Time						
Year	Mo	Dy	Hr	Min	Sec	Val	Tsu Cau Code	Tsu Src	EQ Mag	Vol-cano	Tsu Runup	Doubt-ful Runup	Country	State/ Province/ Prefecture	Name	Latitude	Longitude	Distance from Source	Hrs	Min	Max Water Height	Max Inundation Distance	Type	Per	1st Mtn
1934	8	21				0	9	*			*	M	USA	CA	NEWPORT BEACH, CA	33.59000	-117.92000	29.0			12.00		7		
1913	12	11				2	0	*			*		USA	CA	SANTA BARBARA, CA	34.42000	-119.68000				4.50		1		
1812	12	21	19	0		4	3	*	7.5		*		USA	CA	EL REFUGIO (GAVIOTA), CA	34.47000	-120.20000	41.0			3.40		1		
1930	8	31	0	40	38	3	3	*	5.2		*		USA	CA	SANTA MONICA, CA	34.00800	-118.50000	13.0			3.05		1		
1930	8	31	0	40	38	3	3	*	5.2		*		USA	CA	VENICE, CA	33.98800	-118.47200	16.0			3.05		1		
1896	12	17				-1	9	*			*	M	USA	CA	SANTA BARBARA, CA	34.48030	-119.69000				2.50		2		
1877	5	10	0	59		4	1	*	8.3		*		USA	CA	SAN PEDRO, CA	33.70700	-118.27300	7956.0			2.07		1		
1812	12	21	19	0		4	3	*	7.5		*		USA	CA	SANTA BARBARA, CA	34.42000	-119.68000	32.0			2.00		1		F
1812	12	21	19	0		4	3	*	7.5		*		USA	CA	VENTURA, CA	34.27000	-119.28000	58.0			2.00		1		
1877	5	10	0	59		4	1	*	8.3		*		USA	CA	GAVIOTA, CA	34.47000	-120.20000	8144.0			1.83		1		
1877	4	16				1	9	*			*	M	USA	CA	ANAHEIM LANDING, CA	33.74100	-118.10400	223.0			1.80		1	10	
1923	4	13	15	31	2	4	1	*	7.2		*		USA	CA	LOS ANGELES, CA	33.71700	-118.26700	6309.0			1.80		1		
1946	4	1	12	29	1.3	4	3	*	8.6		*		USA	CA	AVALON, CATALINA IS, CA	33.34500	-118.32500	4140.0			1.80		1		
1877	5	10	0	59		4	1	*	8.3		*		USA	CA	WILMINGTON, CA	33.78000	-118.25000	7960.0			1.68		1		
1964	3	28	3	36	14	4	3	*	9.2		*		USA	CA	SANTA CATALINA IS, CA	33.38000	-118.42000	3720.0			1.54		1		
1877	5	10	0	59		4	1	*	8.3		*		USA	CA	ANAHEIM, CA	33.84000	-117.90000	7941.0			1.52		1		
1946	4	1	12	29	1.3	4	3	*	8.6		*		USA	CA	CATALINA HARBOR, CATALINA IS, CA	33.43200	-118.50500	4122.0			1.50		1		F
1960	5	22	19	11	17	4	1	*	9.5	Vol	*		USA	CA	SANTA MONICA, CA	34.00800	-118.50000	9277.0	14	11	1.40	91.00	2	46	R
1975	11	29	14	47	40.9	4	3	*	7.7	Vol	*		USA	CA	AVALON HARBOR, CATALINA IS, CA	33.34500	-118.32500	3944.0			1.40		1		
1975	11	29	14	47	40.9	4	3	*	7.7	Vol	*		USA	CA	ISTHMUS HARBOR, CATALINA IS, CA	33.44100	-118.49600	3931.0			1.40		1		
2011	3	11	5	46	24.1	4	1	*	9.1		*		USA	CA	PORT HUENEME, CA	34.15000	-119.18000	8384.0			1.40		1		
1960	5	22	19	11	17	4	1	*	9.5	Vol	*		USA	CA	SANTA BARBARA, CA	34.48030	-119.69000	9382.0	14	15	1.37		2		
1960	5	22	19	11	17	4	1	*	9.5	Vol	*		USA	CA	PORT HUENEME, CA	34.14000	-119.19000	9325.0	14	4	1.34		2	20	R
2011	3	11	5	46	24.1	4	1	*	9.1		*		USA	CA	VENTURA HARBOR, CA	34.27000	-119.28000	8368.0			1.30		1		

Figure 32: Results from NOAA (2018b) global tsunami database for Southern California. Maximum water height is in meters.

3.4.2 TSUNAMI INUNDATION ESTIMATES

Although some probabilistic tsunami runup work is starting at some locations along the US Pacific Coast, e.g. Seaside, Oregon, to date there does not appear to be any available that are specific to the project site. There are products, such as inundation maps, produced from a collection of historic and synthetic tsunami events but none of these products provide the probability of occurrence for a given runup height. Two sources of tsunami inundation mapping are illustrated below. The State of California (2017) provides access to tsunami inundation maps that are overlain on USGS quadrangle maps. An enlarged map is shown below in Figure 33. Note from the approximate shape of the inundation line onshore at the beach the level is likely in the range of +20 ft to +25 ft, NAVD88.

ASCE (2018) has a new hazard tool available online that provides key information including tsunami inundation levels. An example of the graphic is shown below in Figure 34. The red triangles indicate runup elevation points. The data around the landward extend of these points was queried and the inundation level ranged between about 26 feet NAVD88 at PM 4.2 and from 27 feet to 29 feet, NAVD88 at PM4.0 along the length of the proposed secant wall.

The wind wave runup at the five transects T-4, PM 4.2, and T-5, PM 4.0, discussed later in this report are about 8 feet lower than the corresponding tsunami runup levels reported by ASCE (2018). However, without any probability information on these inundation levels, they may likely represent a lower probability of occurrence than the design event used for this study, namely an event with a 1% annual chance of occurrence (i.e. a 100 year event). Because of this the wind wave effects will be used to assess rock stability and runup values for design of the various elements of the project. The top of the wall elevations at 58 feet and 42 feet, NAVD88 for PM 4.0 and PM 4.2, respectively are located well above the tsunami runup heights. Based on current conditions, consisting of the assumed sea level rise in 2020, the top of wall elevations at PM 4.0 and PM 4.2 exceed the tsunami runup height by 29 feet and 16 feet, respectively. An approximation to account for the effect of sea level rise on tsunami runup, California Coastal Commission (2015), consists of adding sea level rise to the tsunami runup. Using this additive method and assuming the Extreme (H++) sea level rise scenario in 2095 of 9.2 feet, the top of the secant walls still exceed the tsunami runup by over 19 feet and 6 feet at PM 4.0 and 4.2, respectively.

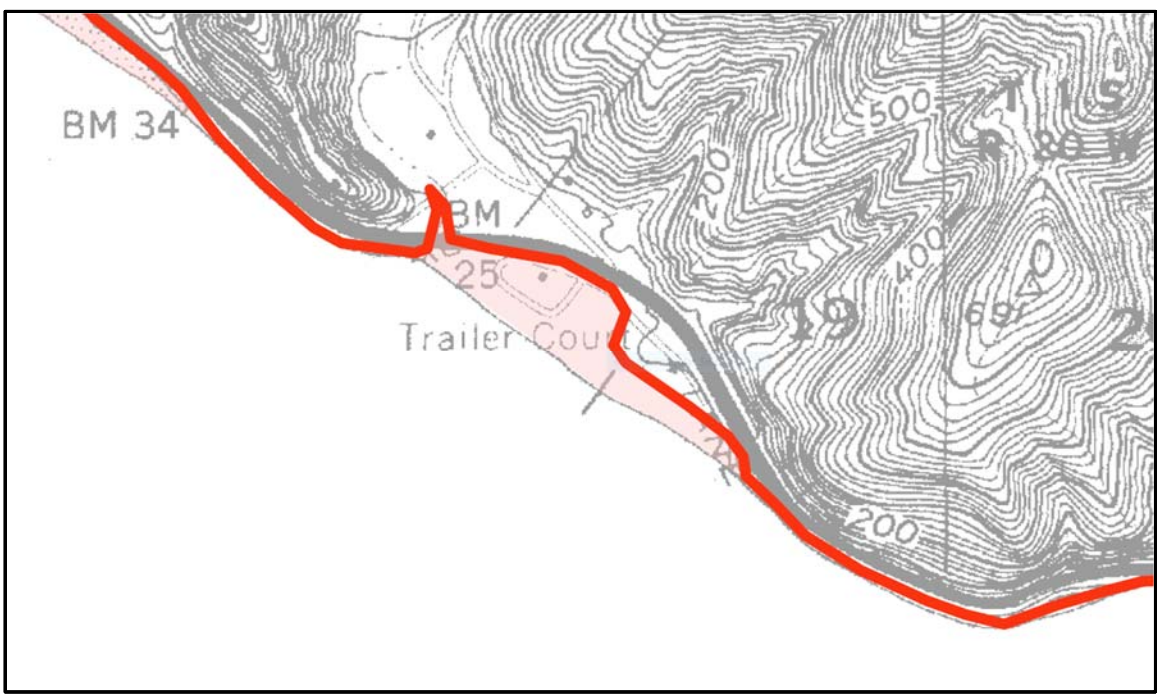


Figure 33: Inundation map available from State of California (2017).

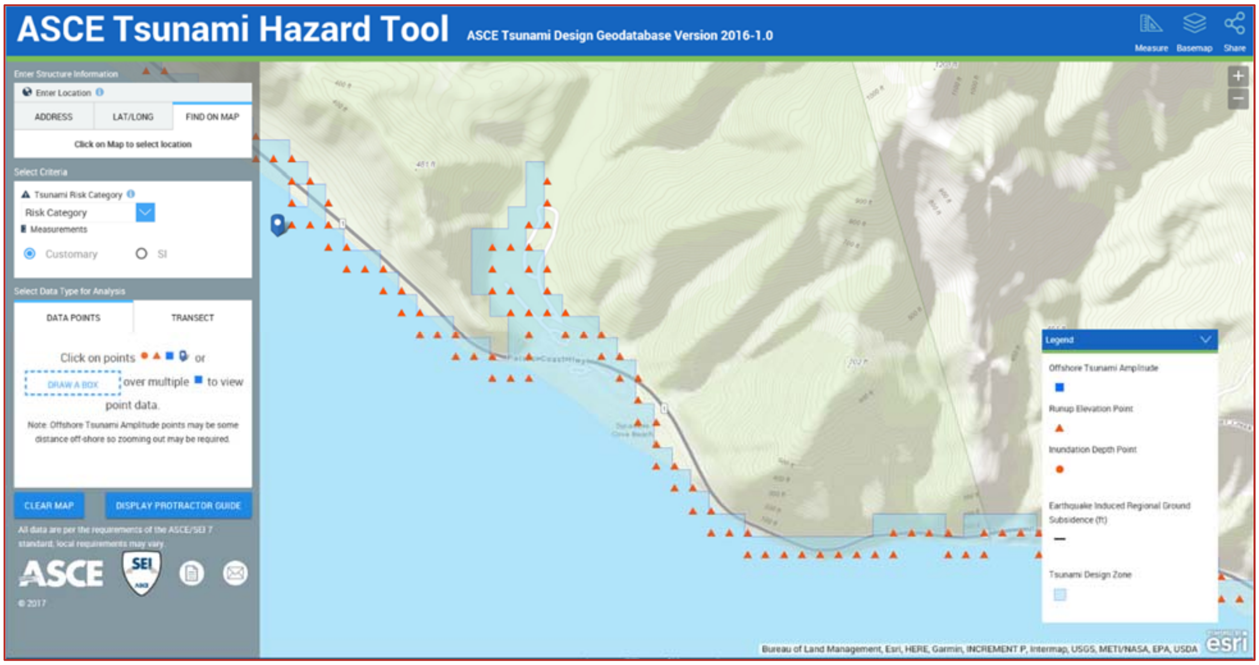


Figure 34: Inundation map from ASCE's new Tsunami Hazard Tool, ASCE (2018).

3.5 ANALYSIS OF BEACH IMPACTS

3.5.1 EFFECTS DUE TO SEA LEVEL RISE

There is both laboratory evidence and field studies documenting recession of sandy beaches for a given increase in water level Stive, et al. (2010). Historically the Bruun Rule has been used to estimate beach recession due to sea level rise. The Bruun Rule is discussed by the California Coastal Commission (2015), as a means to estimate beach recession due to sea level rise. There has been increasing criticism lately of the Bruun Rule as it only accounts for one key factor in what is potentially a complex interaction of numerous factors that affect beach recession and accretion, Stive, et al. (2010). For situations dominated by cross shore transport, where the sediment remains within the active profile, the Bruun Rule captures the main response of the beach for an increase in sea level. The beach recession estimates based on the Bruun Rule are provided below in Table 3.5. However, in light of the widely varying results various investigators have had in their attempts to validate the Bruun Rule with field data, the results should be considered indicative of the general trend with the caveat that the actual response of the beach may be significantly different than estimated below.

Table 3.5: Application of Bruun Rule to estimate future beach recession due to sea level rise.

Parameter	Transect 2 (abutment)	Transect 3	Transect 4
Berm elevation, B (ft, NAVD88)	15.1	19.3	11.2
Depth of active profile, d (assume deep water wave breaking depth) (ft, NAVD88)	-32.1	-32.1	-32.1
Width of active profile, l (ft)	984	955	808
Average slope over active profile, m	0.048	0.054	0.054
Sea level rise, S (ft)			
2050 high sea level rise (ft), S	1.9	1.9	1.9
2050 high recession (ft) R= S*(l/(B-d))	40	36	36
2070 high sea level rise (ft), S	3.4	3.4	3.4
2070 high recession (ft), R= S*(l/(B-d))	72	64	64
2095 high sea level rise (ft), S	6.2	6.2	6.2
2095 high recession (ft), R= S*(l/(B-d))	129	115	116

Under storm and winter conditions the beaches at transects T-2 and T-4 erode to expose significant deposits of cobble which acts to armor the beach in these locations. The approximate 40-foot to 130-foot recession indicated above in Table 3.5 will likely result in longer periods of time when the boulders are exposed. This will reduce the length of sandy beach from one or both ends, allowing longer periods of time where the steep slopes adjacent to the highway are exposed to more aggressive wave action. The results in Table 3.5 result in an annual erosion rate of 1.2 feet per year through 2070 and an erosion rate of 2.1 feet per year between 2070 and 2095. In contrast the CoSMoS modeling results yield erosion rates approximately twice as high as these values resulting in approximately 220 feet of erosion at transect T-4 in 2095. Using the CoSMoS results, Ericksen, et al. (2017), for sea level rise values of 1.6 feet (50 cm) assumed in 2050, 3.3 feet (100 cm) assumed in 2070, and 6.6 feet (200 cm) assumed in 2095 the resulting erosion distances are 2.7 feet per year through 2070 and 3.6 feet per year through 2095. Plots from Our Coast Our Future (OCOF) (2019) that show the CoSMoS modeling results are provided in the Appendix. These plots illustrate the shoreline location under the various sea level rise values noted above. The differences are most likely due to the more comprehensive analysis methods undertaken with the CoSMoS approach that includes assessment of existing erosion rates, sediment supply, etc. The erosion rates from the CoSMoS model indicate the existing beach area, adjacent to PM 4.0, will eventually convert to the steeper beach consisting of mostly stone. An example of this can be seen under storm conditions as illustrated in the bottom photo of Figure 16 between the rocky headland and the damaged lifeguard structure.

3.5.2 WAVE SETUP AND RUNUP

Wave setup and runup are directly related to the incident waves and the nearshore configuration. Wave setup is composed of a static value and a fluctuating component, often termed surf beat or dynamic wave setup, that has a period on the order of about 10 (+/-) times that of the wind wave period. FEMA (2015c) guidance provides methods targeted to the west coast of the U.S. where dynamic wave setup is a major component due to the long period waves that occur along this coast as evidenced by the large wave events from the WIS Stations with wave periods in the 18 (+/-) sec. range. Wave runup occurs in conjunction with static and dynamic wave setup and the FEMA guidance provided a coordinated methodology to account for the combination of these three phenomena.

Wave setup is calculated using the results of the Direct Integration Method (DIM) as outlined in FEMA (2015c). This includes the calculation of the static wave setup and the standard deviation of the dynamic wave setup. The wave runup for beaches is also calculated as a standard deviation, FEMA (2018b). Since the dynamic wave setup and wave runup are two waves with different wave periods both of the sigma values are combined and after adding the static wave setup and still water level this yields the 2% dynamic wave runup. This methodology is covered in the two FEMA guidance documents noted above. The calculations are provided in the Appendix. The results for runup on the three transects located on the beach are provided below in Table 3.6 through Table 3.8.

Table 3.6: Wave runup on the beach for transect T-2 near the abutment.

Wave setup and runup for Transect 2 (abutment)				
Year	2020	2050-high	2070-high	2095-high
Storm Surge (ft, NAVD88)	7.9	7.9	7.9	7.9
Sea level rise (ft)	0.1	1.9	3.4	6.2
Still water elev. (ft, NAVD88)	8.0	9.8	11.3	14.1
Foreshore slope (ft/ft)	0.057	0.057	0.057	0.057
Static wave setup (ft)	4.7	4.7	4.7	4.7
St. dev. of dynamic wave setup (ft)	3.8	3.8	3.8	3.8
St. dev. of wave runup (ft)	3.3	3.3	3.3	3.3
Combined standar deviations (ft)	10.0	10.0	10.0	10.0
Total wave runup, R2% (ft)	22.7	24.5	26.0	28.8
Berm crest elev., Zb (ft, NAVD88)	15.1	15.1	15.1	15.1
FEMA constraint where R2% <= Zb+3 (ft)	18.1	18.1	18.1	18.1
R2% incl. constraint (ft, NAVD88)	18.1	18.1	18.1	18.1

Table 3.7: Wave runup on the beach for transect T-3.

Wave setup and runup for Transect 3				
Year	2020	2050-high	2070-high	2095-high
Storm Surge (ft, NAVD88)	7.9	7.9	7.9	7.9
Sea level rise (ft)	0.1	1.9	3.4	6.2
Still water elev. (ft, NAVD88)	8.0	9.8	11.3	14.1
Foreshore slope (ft/ft)	0.062	0.062	0.062	0.062
Static wave setup (ft)	4.8	4.8	4.8	4.8
St. dev. of dynamic wave setup (ft)	3.9	3.9	3.9	3.9
St. dev. of wave runup (ft)	3.5	3.5	3.5	3.5
Combined standar deviations (ft)	10.5	10.5	10.5	10.5
Total wave runup, R2% (ft)	23.3	25.1	26.6	29.3
Berm crest elev., Zb (ft, NAVD88)	19.3	19.3	19.3	19.3
FEMA constraint where R2% <= Zb+3 (ft)	22.3	22.3	22.3	22.3
R2% incl. constraint (ft, NAVD88)	22.3	22.3	22.3	22.3

Table 3.8: Wave runup on the beach for transect T-4.

Wave setup and runup for Transect 4 (Beach)				
Year	2020	2050-high	2070-high	2095-high
Storm Surge (ft, NAVD88)	7.9	7.9	7.9	7.9
Sea level rise (ft)	0.1	1.9	3.4	6.2
Still water elev. (ft, NAVD88)	8.0	9.8	11.3	14.1
Foreshore slope (ft/ft)	0.061	0.061	0.061	0.061
Static wave setup (ft)	4.7	4.7	4.7	4.7
St. dev. of dynamic wave setup (ft)	3.9	3.9	3.9	3.9
St. dev. of wave runup (ft)	3.5	3.5	3.5	3.5
Combined standar deviations (ft)	10.4	10.4	10.4	10.4
Total wave runup, R2% (ft)	23.2	25.0	26.5	29.3
Berm crest elev., Zb (ft, NAVD88)	15.1	15.1	15.1	15.1
FEMA constraint where R2% <= Zb+3 (ft)	18.1	18.1	18.1	18.1
R2% incl. constraint (ft, NAVD88)	18.1	18.1	18.1	18.1

FEMA (2015a) provides the 2% wave runup along the project site for the 100-year event. The 2% wave runup is 13 feet, NAVD88 along the beach and 22 feet NAVD88 along the headland near the location of transects T-4 and T-5. These values from FEMA are for current conditions and thus are only applicable to the values shown above for 2020. Depending on the crest elevation of the beach, the 2% runup result calculated varies from 5 feet to 9 feet above FEMA's wave runup levels. At the time of FEMA's analysis the beach configuration may have been significantly different than what it is currently (as of July, 2018 when the beach survey was conducted).

For transects T-4 and T-5, the runup occurs on steeply sloping banklines. This includes the RSP at transect T-5. Thus, the equation for the runup is different and because the empirical runup model is based on laboratory studies that included wave setup, there is no need to include wave setup separately for the calculations at these locations. The wave runup empirical model for steeply sloping coastal structures is contained in the Eurotop (2016) wave runup and overtopping guidance manual. The calculations are contained in the appendix. The Eurotop guidance manual includes the model and detailed explanation. The results are provided below in Table 3.9 and Table 3.10. As with the beach runup results, the values shown for the year 2020 in the tables are comparable against the FEMA 2% runup elevation of 22 feet, NAVD88. The results for Transect 5 is within about a foot of the reported FEMA value. Note the wave runup for 2020 at transect T-4 is higher when based on the beach calculation in Table 3.8 than when calculated for the wall in Table 3.9. However, for years 2050, 2070 and 2095 the runup based on the steep slope calculations in Table 3.9 are higher than those in Table 3.8. Therefore, for the purposes of this study the largest of the two values will be used resulting in a wave runup of 18.1 feet, NAVD88 for transect T-2 in 2020 and for other years to results in Table 3.9 are used.

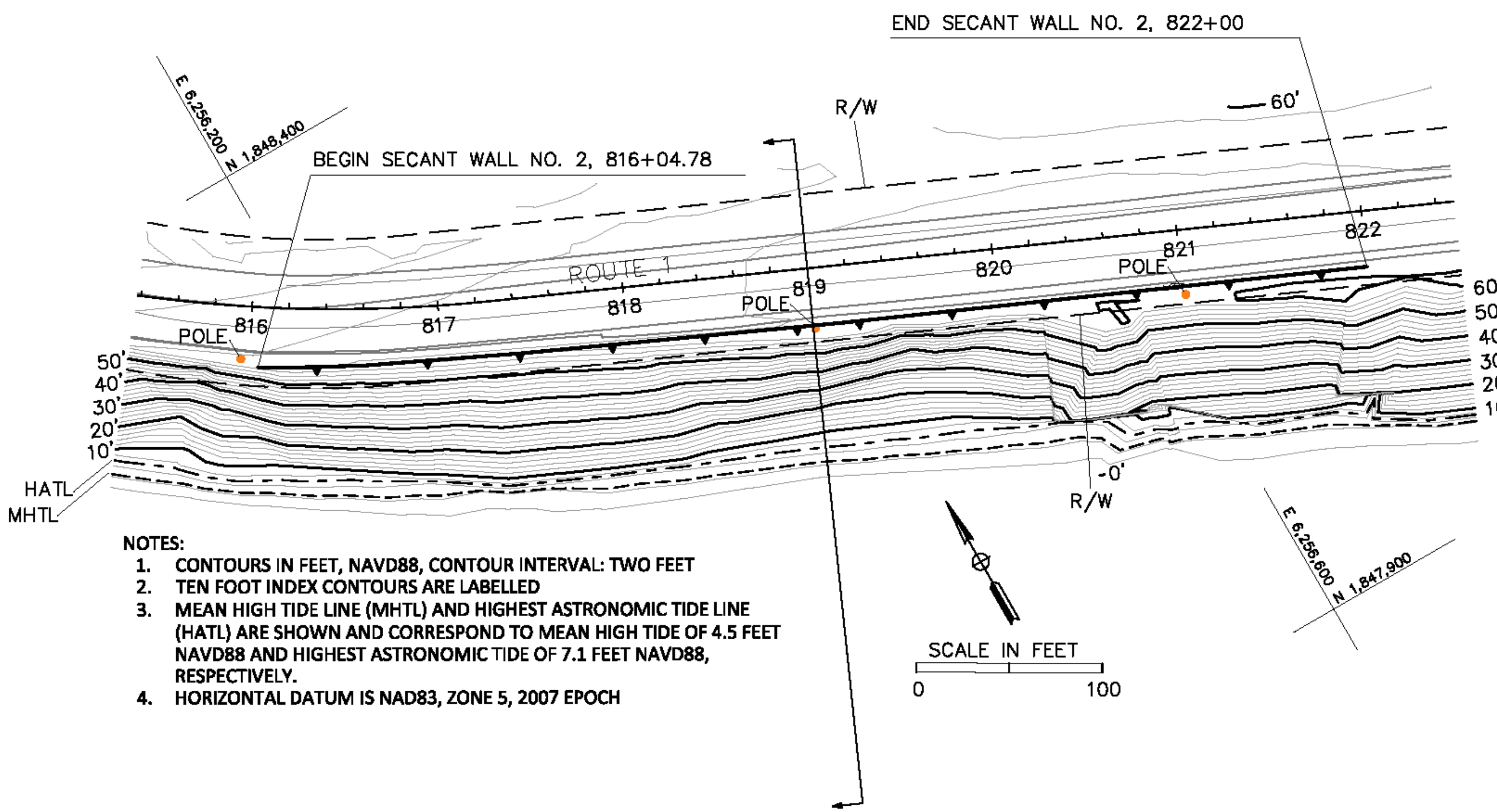
Table 3.9: Wave runup on the steep slope for transect T-4.

Wave setup and runup on steep slope for Transect 4				
Year	2020	2050-high	2070-high	2095-high
Structure toe elevation (ft, NAVD88)	6	6	6	6
Storm Surge (ft, NAVD88)	7.9	7.9	7.9	7.9
Sea level rise (ft)	0.1	1.9	3.4	6.2
Still water elev. (ft, NAVD88)	8.0	9.8	11.3	14.1
Still water depth (ft)	2.0	3.8	5.3	8.1
Cotangent of structure slope (ft/ft)	1.5	1.5	1.5	1.5
Wave height at toe, Hmo (ft)	1.6	3.0	4.1	6.3
Mean wave period Tmo (sec)	18.2	18.2	18.2	18.2
Relative runup Ru2%/Hmo	3.0	3.0	3.0	3.0
Runup, Ru2% (ft)	4.7	8.9	12.4	18.9
Runup elevation (ft, NAVD88)	12.7	18.8	23.8	33.0

Table 3.10: Wave runup on the rock slope protection for transect T-5.

Wave setup and runup for Transect 5				
Year	2020	2050-high	2070-high	2095-high
Structure toe elevation (ft, NAVD88)	2	2	2	2
Storm Surge (ft, NAVD88)	7.9	7.9	7.9	7.9
Sea level rise (ft)	0.1	1.9	3.4	6.2
Still water elev. (ft, NAVD88)	8.0	9.8	11.3	14.1
Still water depth (ft)	6.0	7.8	9.3	12.1
Cotangent of structure slope (ft/ft)	1.33	1.33	1.33	1.33
Wave height at toe, Hmo (ft)	4.7	6.1	7.3	9.4
Mean wave period Tmo (sec)	18.2	18.2	18.2	18.2
Relative runup Ru2%/Hmo	2.9	2.9	2.9	2.9
Runup, Ru2% (ft)	13.4	17.4	20.8	26.9
Runup elevation (ft, NAVD88)	21.4	27.2	32.1	41.0

Plan views and associated cross sections are shown in Figure 35 through Figure 38 at the two proposed secant wall locations. The Highest Astronomic Tide Line (HATL) and Mean High Tide Line (MHTL) are shown in the plan views. The cross sections include the beach profile, applicable tidal datums, still water levels including storm surge and sea level rise, wave runup elevations and the proposed elevation of the secant wall. As noted previously, the cross sections illustrate the large freeboard of the top of the proposes secant wall in relation to the wave runup at the end of the project life in 2095. The ongoing erosion is evident on the steep slope in Figure 38 between the beach and the road. The cross sections show the water levels associated with the 100-year storm surge (SS) and sea level rise (SLR) for four future dates. As noted earlier in this report the calculated storm surge includes the combined effects of tide, El Niño, and storm surge.



NOTES:
1. **CONTOURS IN FEET, NAVD88, CONTOUR INTERVAL: TWO FEET**
2. **TEN FOOT INDEX CONTOURS ARE LABELLED**
3. **MEAN HIGH TIDE LINE (MHTL) AND HIGHEST ASTRONOMIC TIDE LINE (HATL) ARE SHOWN AND CORRESPOND TO MEAN HIGH TIDE OF 4.5 FEET NAVD88 AND HIGHEST ASTRONOMIC TIDE OF 7.1 FEET NAVD88, RESPECTIVELY.**
4. **HORIZONTAL DATUM IS NAD83, ZONE 5, 2007 EPOCH**

Figure 35: Plan view of the proposed secant wall and surrounding topography at transect T-5 (PM 4.0).

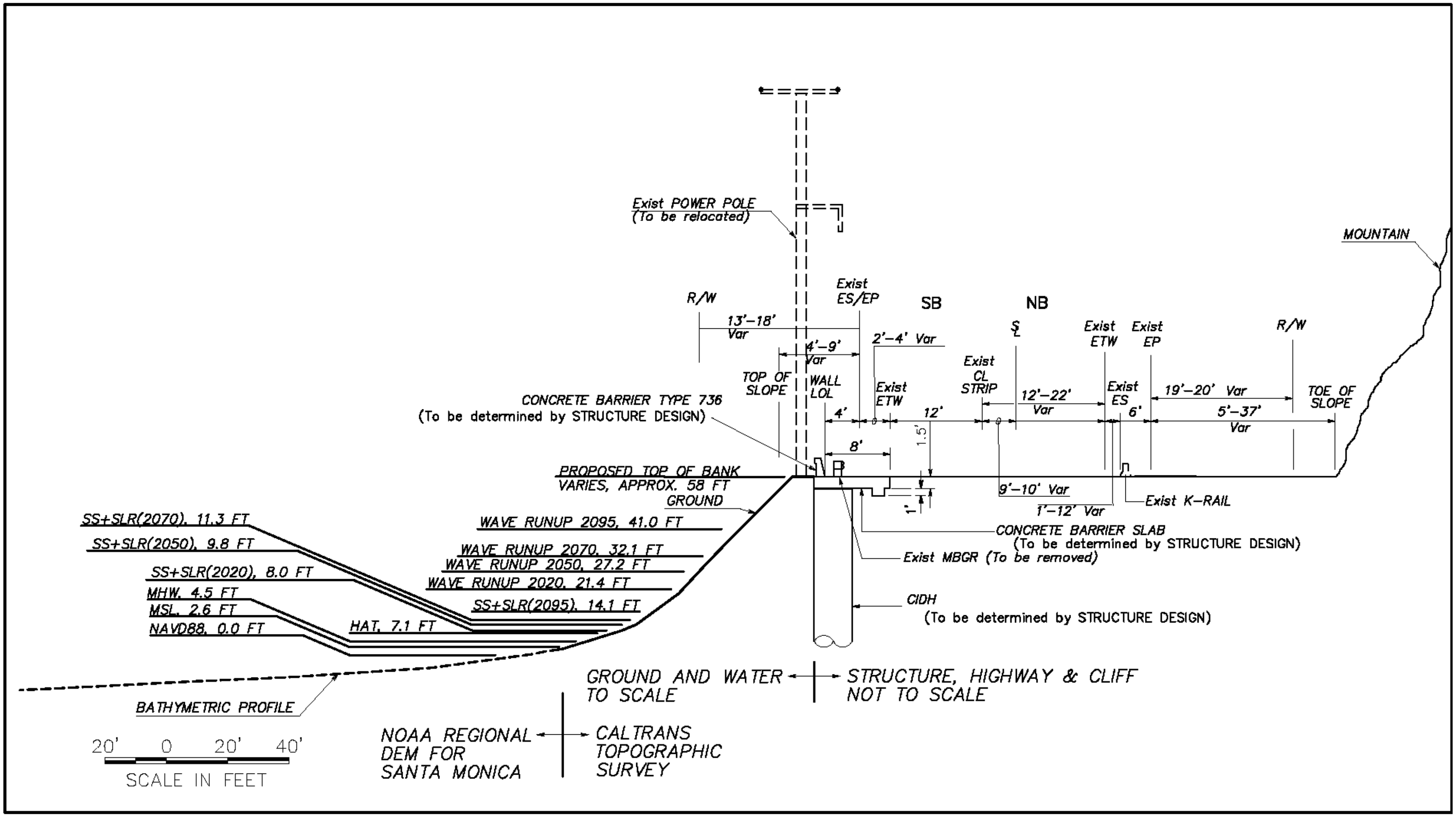


Figure 36: Cross section view of the proposed secant wall and applicable water levels at transect T-5 (PM 4.0).

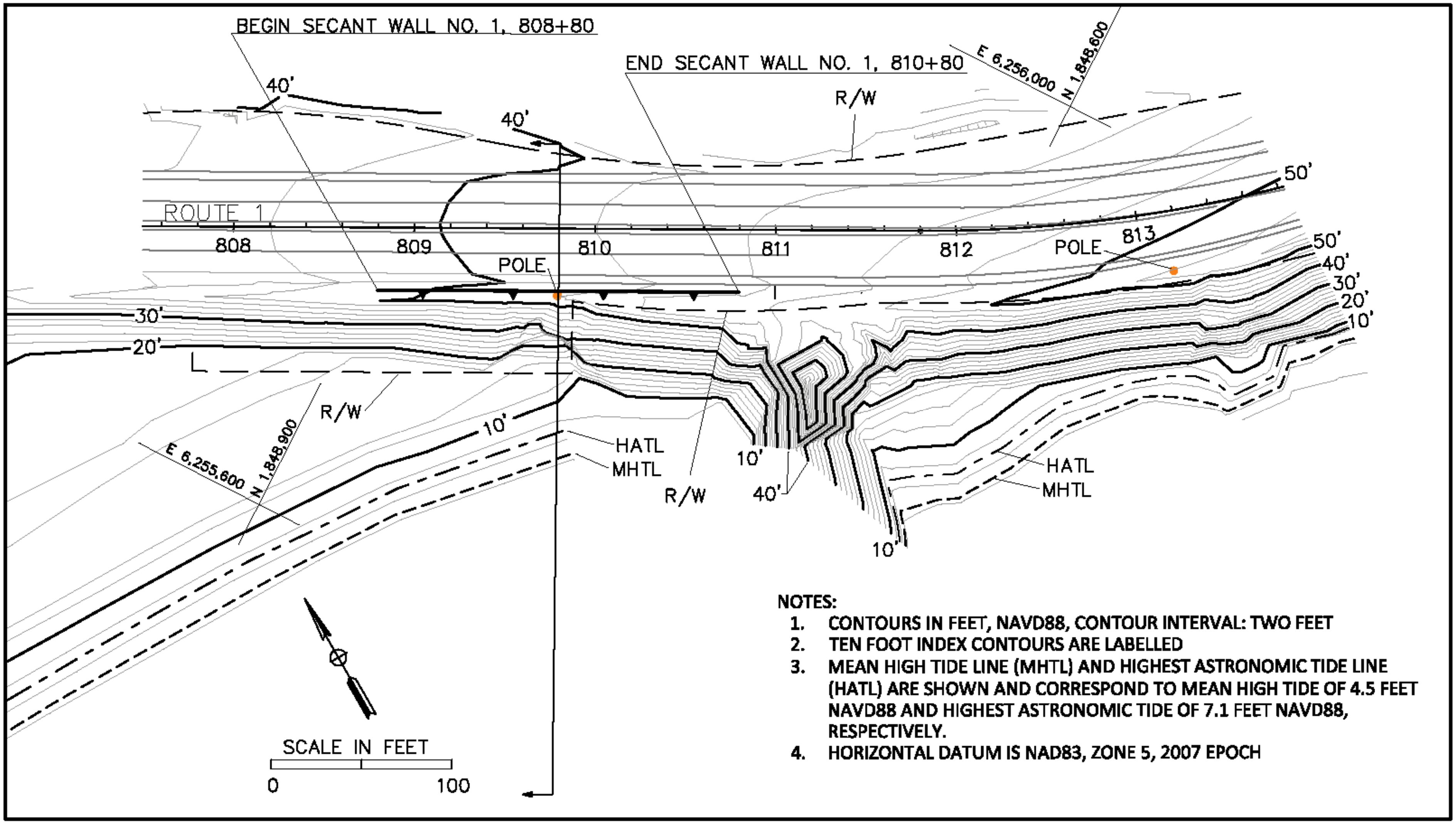


Figure 37: Plan view of the proposed secant wall and surrounding topography at transect T-4 (PM 4.2).

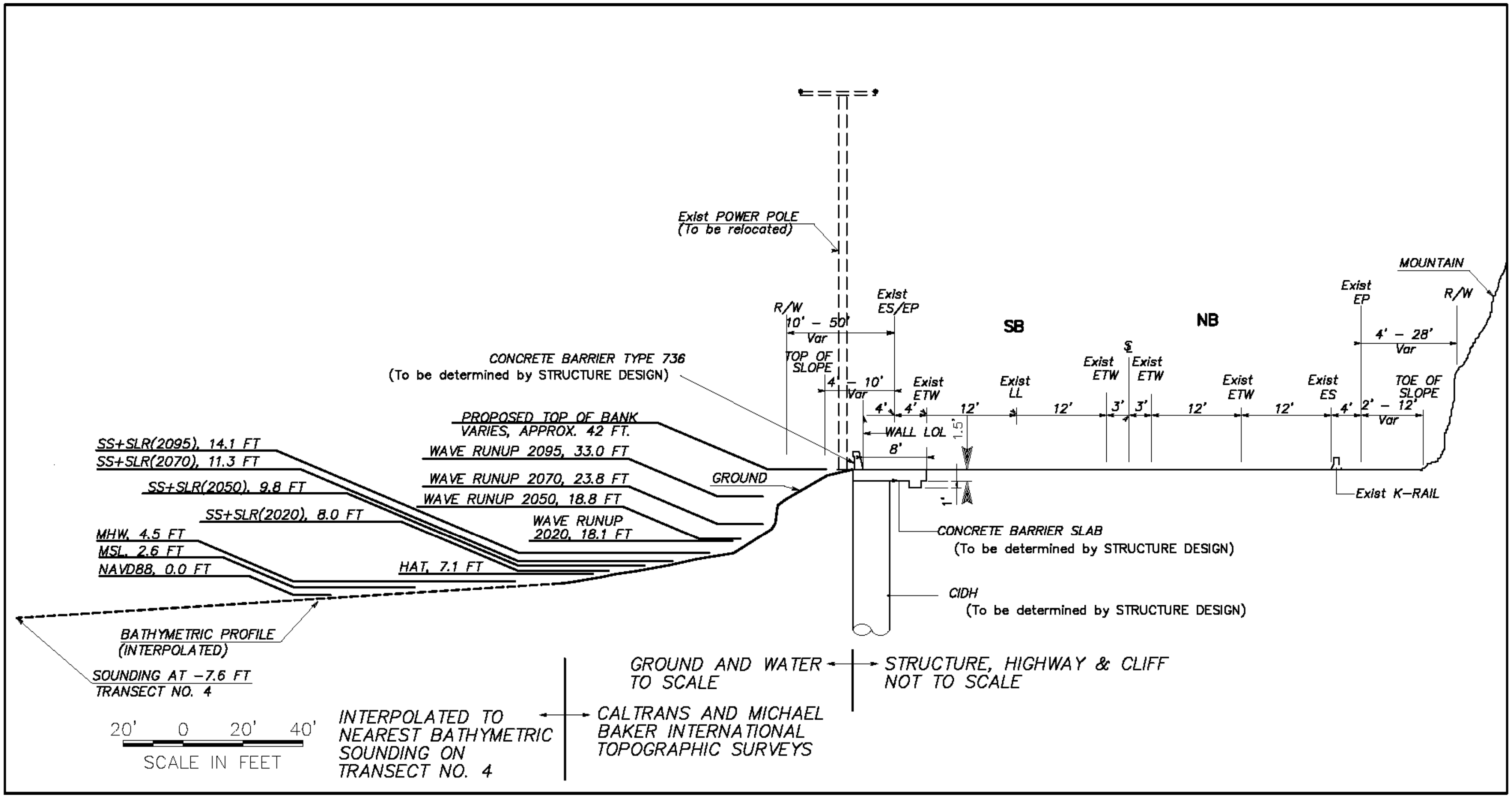


Figure 38: Cross section view of the proposed secant wall and applicable water levels at transect T-4 (PM 4.2).

3.5.3 STORM INDUCED BEACH EROSION

Storm induced beach erosion was analyzed using the Kriebel and Dean (K&D) (1993) model per FEMA (2018a) guidance. The model utilizes the sediment grain size, beach slope, berm height, water level increase, duration of storm and the wave conditions to calculate the lateral recession of the top of the berm due to the storm. There are two components to the calculation. The first is the calculation of the maximum recession if the storm had sufficient time to degrade the beach given the erosion response time of the beach. The other part is the calculation of the time response of the beach recession for the given storm duration. This normally results in only a fraction of the maximum recession distance once the time response is accounted for.

Results from the analysis are provided below in Table 3.11. The results for the maximum scour distance are relatively close to the 50 to 60 feet of erosion indicated by the transect T-2 profiles in Figure 17 associated with the 2015-2016 El Nino event. The approximate 90 feet of erosion for transect T-4 in Figure 18 associated with Hurricane Marie is within about 15% of the maximum scour distance of 102 feet shown for transect T-4. However, at both of these locations, there is a substantial amount of rock that becomes exposed during winter conditions (at transect T-2) and under storm conditions (such as Hurricane Marie) for Transect T-4. Because of this rock there may be less erosion experienced than if the shoreline was completely composed of sand as assumed in the Kreibel and Dean model.

Table 3.11: Storm induced beach erosion results for transects T-2 and T-4.

Parameter	Transect 2 (abutment)	Transect 4
Sediment size, D50 (mm)	0.42	0.49
Beach profile parameter, A (ft)^(1/3)	0.222	0.237
Beach face slope, m	0.133	0.209
Depth of breaking waves hb (ft)	34.7	34.7
Water level increase, S (ft)	7.3	7.3
Max. erosion potential, Rinf (ft)	283	297
Storm duration, TD (hr)	10.0	10.0
Breaking wave height, Hb (ft)	27.1	27.1
Max. scour distance, Rmax (ft)	63	102

Other impacts on the beach during storms can occur if new highly reflective structures are introduced along the coastline. These highly reflective structures, such as a secant pile wall exposed to significant wave runup or wave breaking can produce very high wave reflection. After propagating away from the structure, these reflected waves can turn due to edge wave related effects and can propagate back to shore at some distance from the highly reflective structure. This can have a cumulative wave related impact on adjacent shorelines up and down the coast from the point of reflection although the effect, in relation to incident waves and similar reflections from other nearby naturally reflecting shorelines, is anticipated to be minor. Another hazard of highly reflective structures is the propensity to generate large wave runup under specific wave conditions. This may create nuisance spray for motorists and pedestrians under certain combinations of wave conditions and water levels. These two impacts can be mitigated by providing a dissipative structure at the base of the secant pile walls such as rock slope protection that is sized large enough to protect the toe of the wall and provide some dissipation for wave action at the shoreline.

An effective way of avoiding the wave related impacts for a secant wall is to locate it near the edge of the current roadway. At PM 4.0 and PM 4.2 the existing sloped shoreline is intact although there is ongoing erosion at both locations. If the slopes are left to erode in their current state there is a possibility in the future that the secant wall may become exposed below the runup elevation. Once this occurs there is the possibility of wave reflection from the secant walls under extreme storm conditions with future sea level rise. This appears to be more imminent at PM 4.2

where the active erosion on the slope appears to be more pronounced at lower elevations than the erosion at PM 4.0 where RSP is protecting the lower portion of the slope. At both of the proposed secant walls one or more borings indicated the presence of beach sand at elevations of approximately Mean Sea Level (2.6 feet NAVD88).

Griggs (2005) and Basco (2006) summarize findings from long term field studies to document the impacts of seawalls on adjacent beaches. In the 1980's, Griggs (2005), there was a fair amount of discussion about deleterious impacts of seawalls on the coastline without studies to support such statements. This lead to a concerted effort in the 1980's and 1990's to study the issue through long term field studies. The U.S. Army Corps of Engineers commissioned exposed coastal studies at Monterey and in Virginia as summarized by Griggs (2005) and Basco (2006), respectively. Both studies document, based on long term field measurements, that the impacts to the beach are relatively minor as far as scour at the wall including post storm recovery and beach recovery from winter to summer conditions. Basco (2006) noted one case where the beach did not recover fully from a storm as did many of the other cases observed. Griggs (2005) indicated that there was no indication during their field observations (from Monterey Bay) of scour holes in front of seawalls. There are visual impacts associated with seawalls and there can be significant effects at the end of the seawall if corners are exposed. This can lead to scour near the ends of the seawall and this scour can extend tens of meters laterally. The preferred locations for seawalls, in the event they are needed, is as far shoreward as possible to avoid protrusion in to the existing beach and associated end wall effects. In addition, there did not appear to be significant difference in the behavior of the shoreline whether the seawall was a vertical wall or a revetment. Visual impacts may be improved by application visually aesthetic treatment to the wall. End effect may be reduced or mitigated by more gradually tapered wing walls and more gradual transition into the adjacent shoreline.

3.6 ROCK SLOPE PROTECTION

Rock size was calculated for the slope adjacent to each of the proposed secant walls. Although applications of RSP is not proposed, the rock sizes are calculated to provide some indication of size and weight of rock that would be needed to provide a more gradual and dissipative slope adjacent to the secant walls. Project locations and each of the sea level rise scenarios as shown below in Table 3.12 and Table 3.13. The Hudson Equation, USACE (2002), was used to calculate the rock size based on depth limited breaking waves and using stability coefficients of 2.0 for standard placement and 5.8 for special placement of the stone. Since the combination of storm surge, sea level rise and wave setup causes such large depths at the toe of the rock slope protection the weight of the stone becomes quite large especially for the large sea level rise assumption for the end of project life in 2095.

Scour at the base of the slopes in the sand was calculated using two methods. The first method is outlined in Sumer & Fredsoe (2002), applies to the case sand scour at the interface with RSP, and the results are shown below in Table 3.12 and Table 3.13. The scour depths ranged from 4 feet to 9 feet depending on the location and the assumed year and associated sea level rise. For the toe of slope offshore of the secant walls at PM 4.0 and PM 4.2 the calculated scour elevations are -4 feet and -3 feet, NAVD88, respectively. The second method is based on the approach outlined in Bradbury et al. (2012) and applies to sand scour at a vertical wall. The results are also included in Table 3.12 and Table 3.13. As seen in the results deeper water depths at the face of the structure tend to reduce the scour depth adjacent to a revetment. For the vertical wall the opposite is true for the range of conditions evaluated. Thus, scour depths for the extreme sea level rise scenario, H++, in 2095 are not expected to cause increased scour depth if the RSP protection remains. However, if the RSP and slopes are not maintained and erode then the calculated erosion increases for the extreme sea level rise scenario in 2095 will be larger than calculated for the medium high sea level rise scenario.

Table 3.12: Rock slope protection size and scour depth calculations for transect T-4.

RSP rock weight and scour depth for Transect 4				
Year	2020	2050-high	2070-high	2095-high
Bed Elev. (ft)	6.0	6.0	6.0	6.0
Storm Surge (ft, NAVD88)	7.9	7.9	7.9	7.9
Sea level rise (ft)	0.1	1.9	3.4	6.2
Still water elev. (ft, NAVD88)	8.0	9.8	11.3	14.1
Depth (ft)	2.0	3.8	5.3	8.1
Wave setup (ft)	8.4	8.0	7.6	6.9
Depth including wave setup (ft)	10.4	11.8	12.9	15.0
Breaking wave height Hb (ft) (0.78*Depth)	8.1	9.2	10.1	11.7
Armor stone weight (lb) (kD=2.0)	6900	10000	13100	20500
Armor stone size (ft) (kD=2.0)	3.5	3.9	4.3	5.0
Armor stone weight (lb) (kD=5.8)	2400	3400	4500	7100
Armor stone size (ft) (kD=5.8)	2.4	2.7	3.0	3.5
Scour at interface of RSP and sandy beach				
Wave induced scour (ft)	8.7	6.3	5.6	4.9
Scour depth (ft, NAVD88) calculated	-2.7	-0.3	0.5	1.2
Scour depth (ft, NAVD88) recommended	-3	-3	-3	-3
Scour at interface of secant wall and sandy beach				
Wave induced scour (ft)	0.7	3.7	6.0	9.6
Scour depth (ft, NAVD88) calculated	5.3	2.3	0.0	-3.6
Scour depth (ft, NAVD88) recommended	-4	-4	-4	-4

Table 3.13: Rock slope protection size and scour depth calculations for transect T-5.

RSP rock weight and scour depth for Transect 5				
Year	2020	2050-high	2070-high	2095-high
Bed Elev. (ft)	2.0	2.0	2.0	2.0
Storm Surge (ft, NAVD88)	7.9	7.9	7.9	7.9
Sea level rise (ft)	0.1	1.9	3.4	6.2
Still water elev. (ft, NAVD88)	8.0	9.8	11.3	14.1
Depth (ft)	6.0	7.8	9.3	12.1
Wave setup (ft)	7.4	7.0	6.6	6.0
Depth including wave setup (ft)	13.4	14.8	15.9	18.0
Breaking wave height Hb (ft) (0.78*Depth)	10.5	11.5	12.4	14.1
Armor stone weight (lb) (kD=2.0)	14800	19700	24600	35800
Armor stone size (ft) (kD=2.0)	4.5	4.9	5.3	6.0
Armor stone weight (lb) (kD=5.8)	5100	6800	8500	12300
Armor stone size (ft) (kD=5.8)	3.1	3.5	3.7	4.2
Scour at interface of RSP and sandy beach				
Wave induced scour (ft)	5.3	4.9	4.7	4.4
Scour depth (ft, NAVD88) calculated	-3.3	-2.9	-2.7	-2.4
Scour depth (ft, NAVD88) recommended	-4.0	-4.0	-4.0	-4.0
Scour at interface of secant wall and sandy beach				
Wave induced scour (ft)	5.7	7.7	9.3	11.8
Scour depth (ft, NAVD88) calculated	-3.7	-5.7	-7.3	-9.8
Scour depth (ft, NAVD88) recommended	-10.0	-10.0	-10.0	-10.0

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4 CONCLUSIONS

Significant erosion along two sections of SR-1 at PM 4.0 and 4.2 have lead Caltrans to the conclusion that repairs need to be made along the highway at Sycamore Cove Beach and vicinity. Some of the erosion has generated a nearly vertical escarpment within a few feet of the guardrail at PM 4.0 and there is an actively eroding slump in the slope adjacent to PM 4.2. In response, Caltrans proposes to install secant pile walls along 600 feet of highway at PM 4.0 and 200 feet of highway at PM 4.2.

This report presents the results of a wave runup study that is required by the California Coastal Commission as part of the documentation to support the permit determination for the proposed work. This study resulted in several key findings based on the data gathered, collected and generated during this study.

(1) NOAA analyzed extreme water levels based on the Santa Monica tide gauge. The results were used to determine the 100 year "Storm Surge". The tide gauge includes tides, storm surge and events such as El Niño when they occur. The results from the multi-decade period of records include the two largest El Niño events in the last 145 years. Thus, as noted in the FEMA guidance document, separate analysis of water levels due to El Niño are not needed. Query of the top 10 high water levels indicate that they are often associated with very high astronomic tides. The 100-year extreme water level is 5.3 feet, MSL or 7.9 feet, NAVD88.

(2) Sea level rise values were obtained from the most recent State of California guidance for Sea Level Rise, State of California (2018). The results used were based on the Santa Monica tide gauge and included the "Medium-High Risk Aversion" and "Extreme Risk Aversion" scenarios. The medium-high risk aversion case includes values for a low and high emission scenario associated with RCP 2.4 and RCP 8.5 values, respectively. The medium-high risk aversion values were used in the calculations and included 1.9 feet for 2050, 3.4 feet for 2070 and 6.2 feet in 2095 coinciding with the project life of 75 years. The extreme risk aversion (H++) case includes the possibility of accelerated loss of ice and was considered and discussed but was not included in the calculations for this study. For the years 2050 and 2070, the extreme risk aversion values are captured within the range of sea level rise results used in the calculations. In addition, lower emission scenarios and reduced risk levels also fall within the range of the values used for the calculations.

(3) Sycamore Cove Beach is a very dynamic location, with a pocket beach located between two headlands. However, there appears to be a longshore transport of sand along the coast in this area. The beach also has a sand source due to the material deposited by Big Sycamore Creek. Recent aerial photographs, news stories and El Niño events illustrate a beach exposed to significant seasonal migration of sand away from and back to the northwestern part of the beach near the bridge. In 2014, Hurricane Marie eroded the shoreline at the southeast end of the beach resulting in loss of a life guard station that had been located there for several decades. A lidar survey after the event showed a significant recession and accretion of sand at the south end and north end of the beach, respectively. Historic Lidar surveys over the past 20 years support these observations. This storm was unusual with large waves arriving from nearly due South.

(4) Historic aerial photographs were analyzed dating back to 1945 to see if any definitive trends in beach recession/ accretion could be identified. There does appear to be a tendency for the earlier water lines to be further offshore relative to the more recent photographs over the past few decades.

(5) Wave conditions were analyzed using the offshore USACE WIS hindcast stations as the boundary condition for a SWAN wave model. The wave model was used to run multiple cases for an array of wave periods and wave directions for the assumed design condition associated with the 100-year wave. The wave modeling results were post-processed to generate the maximum wave height at each point based on all the wave periods and wave directions analyzed. As the waves approach the shoreline, they have a wave height very close to the initial wave height applied as the boundary condition. Once the waves approach the shoreline they begin to break due to the depth limitations.

For all structures and beach impacts analysis, the wave conditions are controlled by depth limited wave breaking so the wave height is directly proportional to the available water depth at the location of interest.

(6) Historic tsunamis and tsunami inundation limits were investigated. The tsunami inundation was found to be about 8 feet higher than the wind wave induced runup. However, there is no probability information associated with the tsunami. Therefore, it is difficult to gauge whether use of this result would be consistent with the other probabilistic based parameters used such as wind waves and extreme water levels based on the water level and wave conditions based on a 100-year storm, i.e. a storm with an annual probability of occurrence of 1%. The historic record dates back about 200 years and the maximum runup reported along the entire Southern California coast was only 15 feet (4.5 m) or about half of the most current tsunami runup heights reported by ASCE. Because of the uncertainty associated with the probabilities of the tsunami inundation levels, the analysis is based on the wind wave conditions with a known probability of occurrence. For current conditions the top of the proposed secant walls at PM 4.0 and PM 4.2 are 29 feet and 16 feet above the ASCE tsunami runup elevations, respectively. For the extreme risk aversion H++) sea level rise scenario in 2095, the tsunami runup elevations are estimated to be 19 feet and 6 feet below the proposed top of the secant wall at PM 4.0 and 4.2, respectively.

(7) Beach impacts due to sea level rise were assessed using the Bruun Rule and found to range from about 40 feet for the year 2050 up to 130 feet for the 2095-year scenario with the medium-high risk aversion scenario. The more comprehensive CoSMoS modeling indicated erosion rates nearly twice as high culminating in 220 feet of erosion by 2095. The CoSMoS model includes additional aspect controlling the overall erosion of the beach and should be considered more representative of future erosion potential at the site. This will likely cause the beach to suffer from more prolonged periods of high wave action with reduced sand volumes over longer periods of time, especially near the two ends of the beach. The extreme risk aversion scenario, H++, will increase these erosion amounts considerably due to the additional 2.9 feet of sea level rise.

(8) Wave setup and runup were calculated using FEMA guidance documents and the results are consistent with the FEMA Flood Insurance Study at PM 4.0 and 4.2. Along the beach, the resulting runup is higher that that reported by FEMA, but this may be due to differing beach conditions at the time of this study vs. when FEMA conducted its analysis. Along the proposed secant walls, at PM 4.0 and 4.2, the FEMA runup values were within 4 feet and one foot of the calculations for this study, respectively. Given the trends in runup values between the 2070 and 2095 values, the runup levels for the extreme risk aversion scenario, H++, will be higher than those currently calculated for 2095 and could reach the top of the secant wall at PM 4.2 but should be about 10 feet below the top of the wall at PM 4.0.

(9) Storm induced beach erosion was analyzed following FEMA guidance documents and was found to be consistent with the storm and El Niño beach recession signatures in the historic lidar surveys. The analysis indicated storm recession of about 100 feet at PM 4.2. As noted above, with respect to beach recession due to sea level rise, the beach is backed by larger cobbles and small boulders that are exposed during winter and/or storm induced beach conditions. Thus, the calculated recession, based on sand, will likely be smaller if these larger materials are encountered over the storm event. The combination of sea level rise induced beach erosion coupled with storm induced erosion is expected to increase the exposure and associated erosion at the shoreline in the years ahead. This is evident at the site with the recent loss of the decades-old life guard facility and the erosion apparent at PM 4.0 and 4.2. As with all projects along this portion of the highway, periodic monitoring will be needed. The use of secant walls will provide a sound structural support for the highway that is not predicated on the continual maintenance of the adjacent slopes. However, under high storm conditions there is the potential for increased wave reflection from the secant wall in the future if the slope in front of the walls erodes below the wave runup elevation.

U. S. Army Corps of Engineers sponsored studies if seawall impacts to beaches on both the Atlantic and Pacific coasts indicate that the impact of seawalls to the beach immediately fronting the wall is relatively minor. This includes post storm recovery and transition from winter conditions to summer conditions. There are potential end wall effects that can cause erosion but these can be reduced by wing walls or, preferably, locating the seawall as far shorward as possible to avoid impacting the beach and associated upland slopes as proposed for this project. Visual impacts can be reduced by application of more visually appealing treatments in the event the walls become exposed.

(10) Although RSP is not proposed as part of this project rock size was calculated using the Hudson formula per the USACE Coastal Engineering Manual. The results indicate that for the year 2050, stone sizes up to about 10 tons may be needed unless special placement techniques can be employed during construction which significantly improves the stability of the resulting rock thereby reducing its required weight by about a factor of 3. For the year 2095, under the high emission scenario and for a medium-high risk aversion, the large depths at the base of the rock slope protection structures lead to very large rock weights on the order of 17 tons unless the special placement methods can be utilized. Scour calculations indicate that scour depths to elevations of -4 feet and -3 feet, NAVD88 are anticipated at PM 4.0 and 4.2, respectively, if the RSP and associated slopes remain in front of the secant wall. If the RSP and associated slopes erode the scour calculations were based on sand scour at the wall. The resulting scour elevation is -10 feet and -4 feet, NAVD88 at PM 4.0 and 4.2, respectively. If the RSP and associated slopes in front of the walls erode then for sea level rise greater than 6.2 feet the scour depth may be larger than those calculated for the extreme sea level rise (H++) scenario.

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— U.S. Department of Homeland Security, Federal Emergency Management Agency (FEMA), (2018b). Guidance for Flood Risk Analysis and Mapping – Coastal Wave Runup and Overtopping. Guidance Document No. 89, February, 2018.

APPENDIX

A ADDITIONAL INFORMATION

APPENDIX

APPENDIX

A-1 ADDITIONAL SITE VISIT PHOTOGRAPHS

APPENDIX

Figure A-1-1: Top and bottom photos show conditions at high and low tide, respectively at Big Sycamore Creek Bridge during October 2017 site visit.

Figure A-1-2: Top and bottom photos show conditions at high and low tide, respectively at the southeast end of Sycamore Cove Beach during the October 2017 site visit. Erosion area is located just above the beach in the bottom photo between the telephone pole and the rocky headland.

APPENDIX

Figure A-1-3: Photos at southeast end of beach from March 2018 showing: top left entire beach with erosion escarpment in left of photo, middle left (this photo from Oct. 2017) former location of life guard structure lost during Hurricane Marie, bottom left exposed geotextile and mesh in erosion escarpment. Top to bottom on right is a pan of the erosion escarpment, toe protection rock and headland.

APPENDIX

Figure A-1-4: Photos of structures along beach taken October 2018: top left structure to protect portable toilets, middle left and bottom right life guard lookouts at south and north end of beach, respectively, bottom left shows an escarpment of four to five feet with exposed pipes protruding, top right is the beach and picnic area and middle right is the California State Park Ranger Station.

Figure A-1-5: Site conditions at Big Sycamore Creek Bridge. The three photos on the left are from the beach and the three on the right are from the north side of the bridge. Photos taken October 2017. The loss of seawall height is evident in the top left photos where the wave runup back wash is spilling over the wall. The bottom left photo shows the rock revetment next to the bridge and eroding slope immediately beyond the protective rock.

APPENDIX

Figure A-1-6: Site conditions photos taken in October 2017 along the rock slope protection southeast of bridge PM 4.5. Top to bottom left and top right show successive photos progressing toward the bridge. The erosion escarpment transitions from a couple of feet high in the top right photo to about 6 feet high in the bottom left photo. The bottom right photo shows exposed geotextile and either fill or bedding material within the rock slope protection that is directly exposed to wave runup. Note the rock immediately to the right of the bottom of the bridge abutment and compare this with the abutment photo in Figure 5 showing an additional two rocks exposed below this one during winter conditions.

APPENDIX

Figure A-1-7: Site conditions at the seawall and bridge abutment in October 2017. Top left is abutment and seawall with utilities that cross the bridge. Middle left to bottom left then top right to bottom is a pan from offshore to the bridge of the seawall. The low part of the seawall is shown at the bottom left. The deterioration at the interface between the bridge abutment and seawall is evident in the bottom right photo.

APPENDIX

A-2 BEACH PROFILES

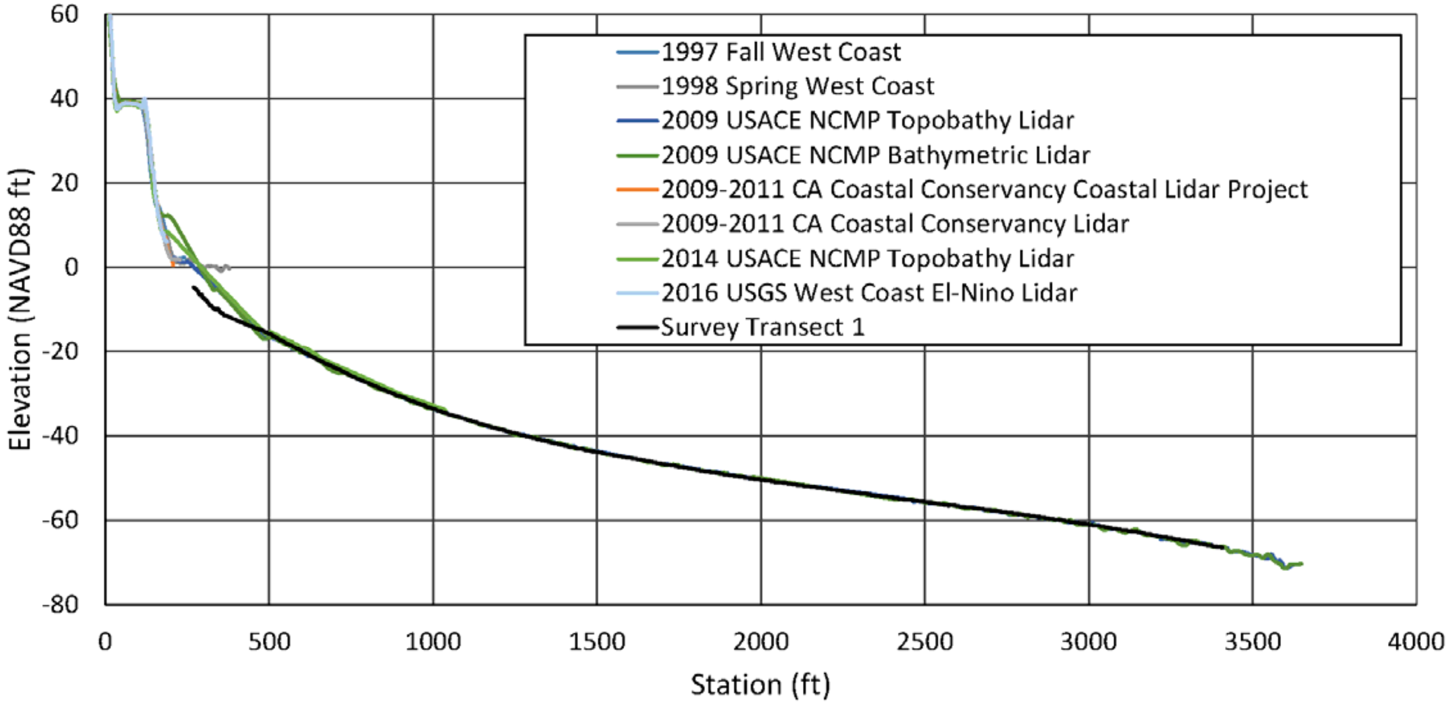

Figure A-2-1: Beach profile for transect T-1.

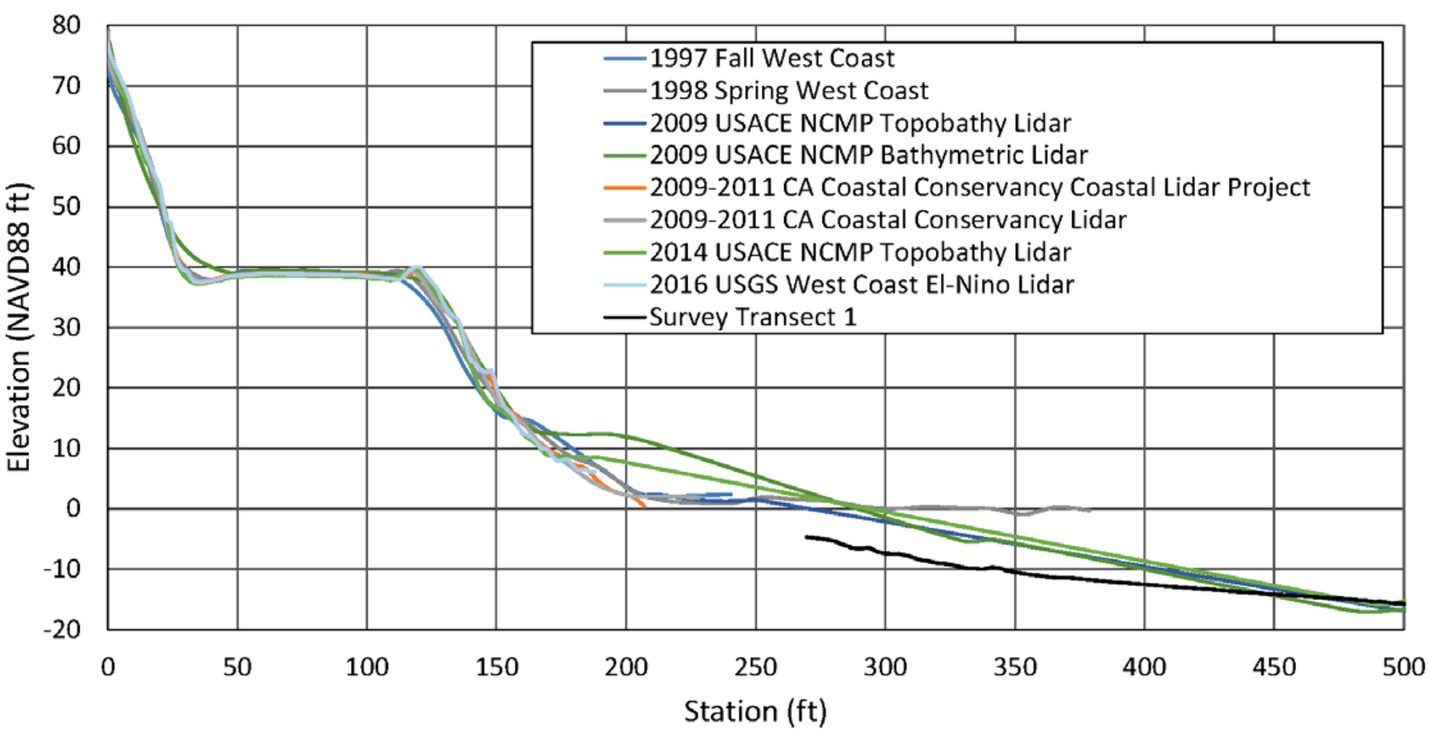

Figure A-2-2: Nearshore beach profile for transect T-1.

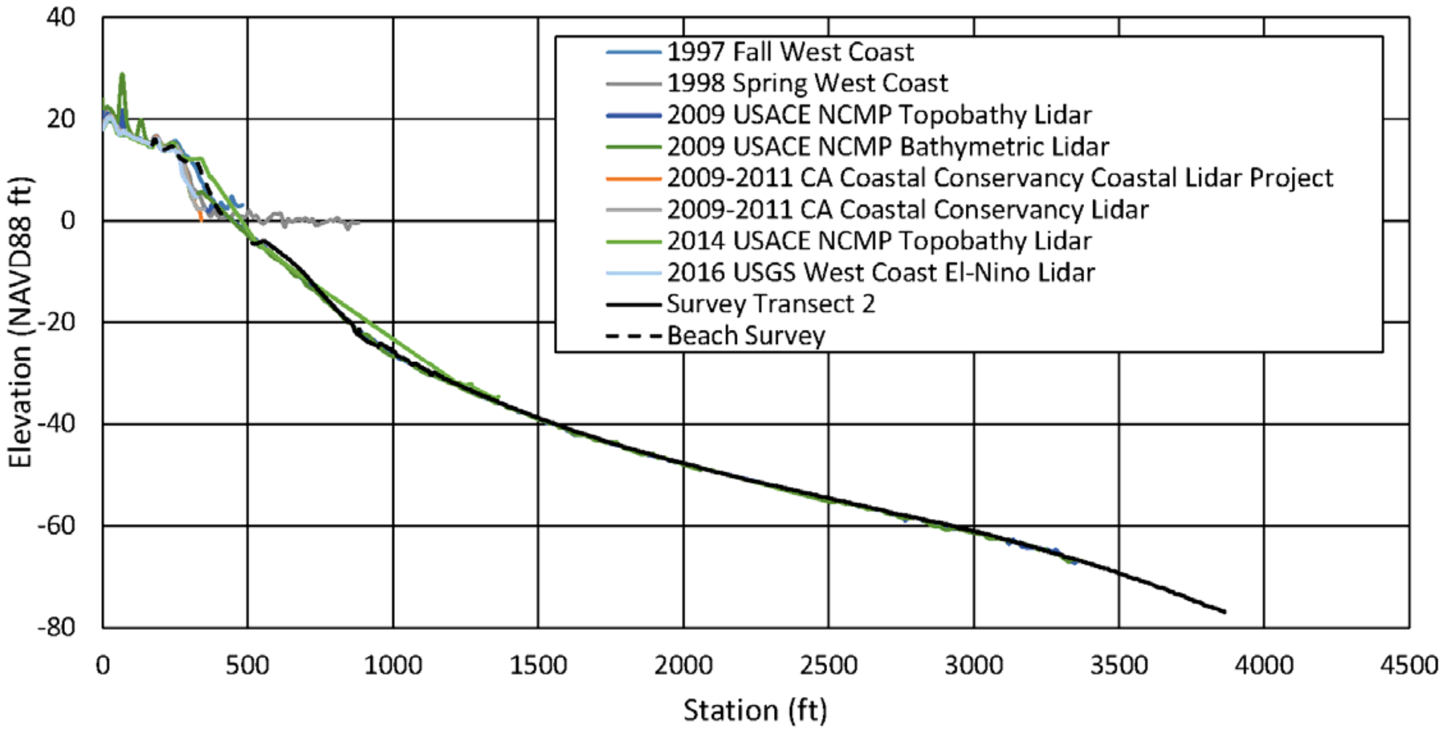

Figure A-2-2: Beach profile for transect T-2.

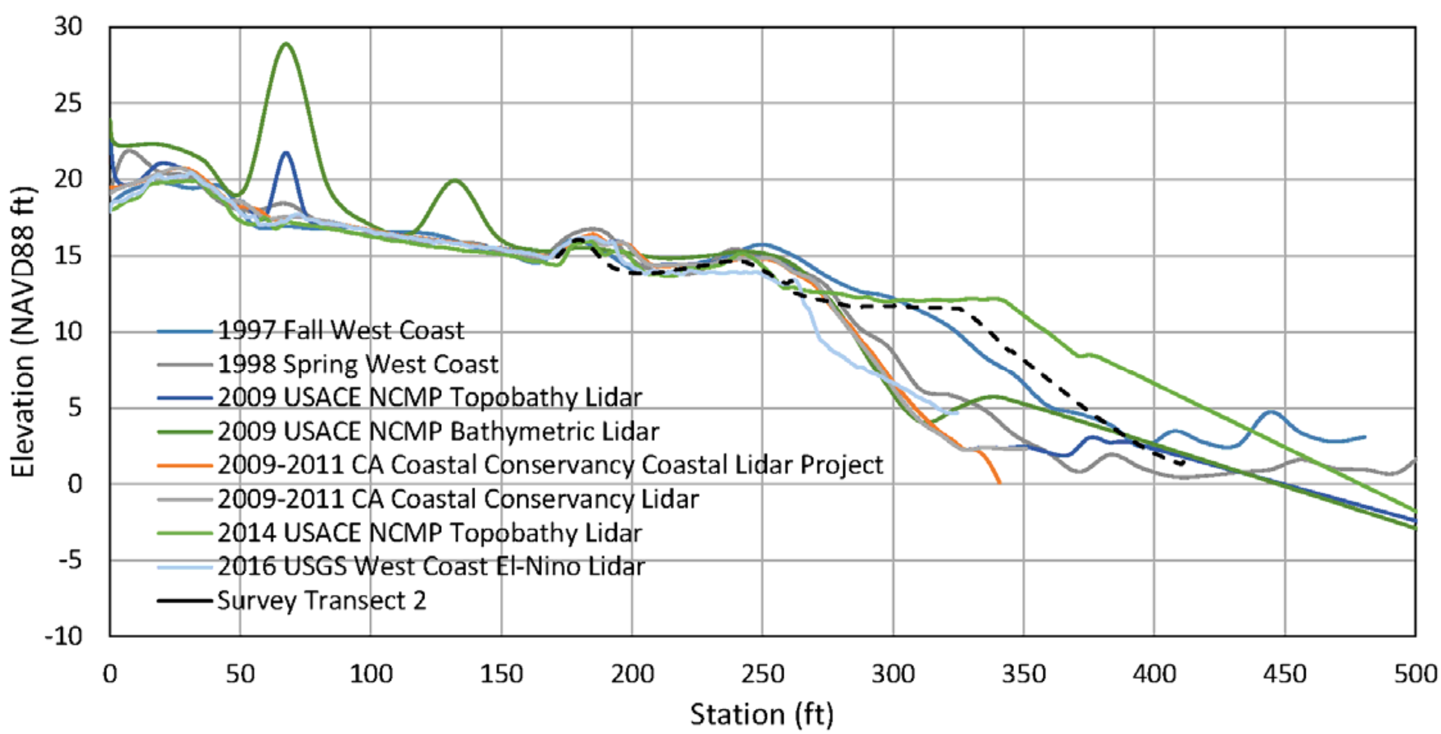

Figure A-2-3: Nearshore beach profile for transect T-2.

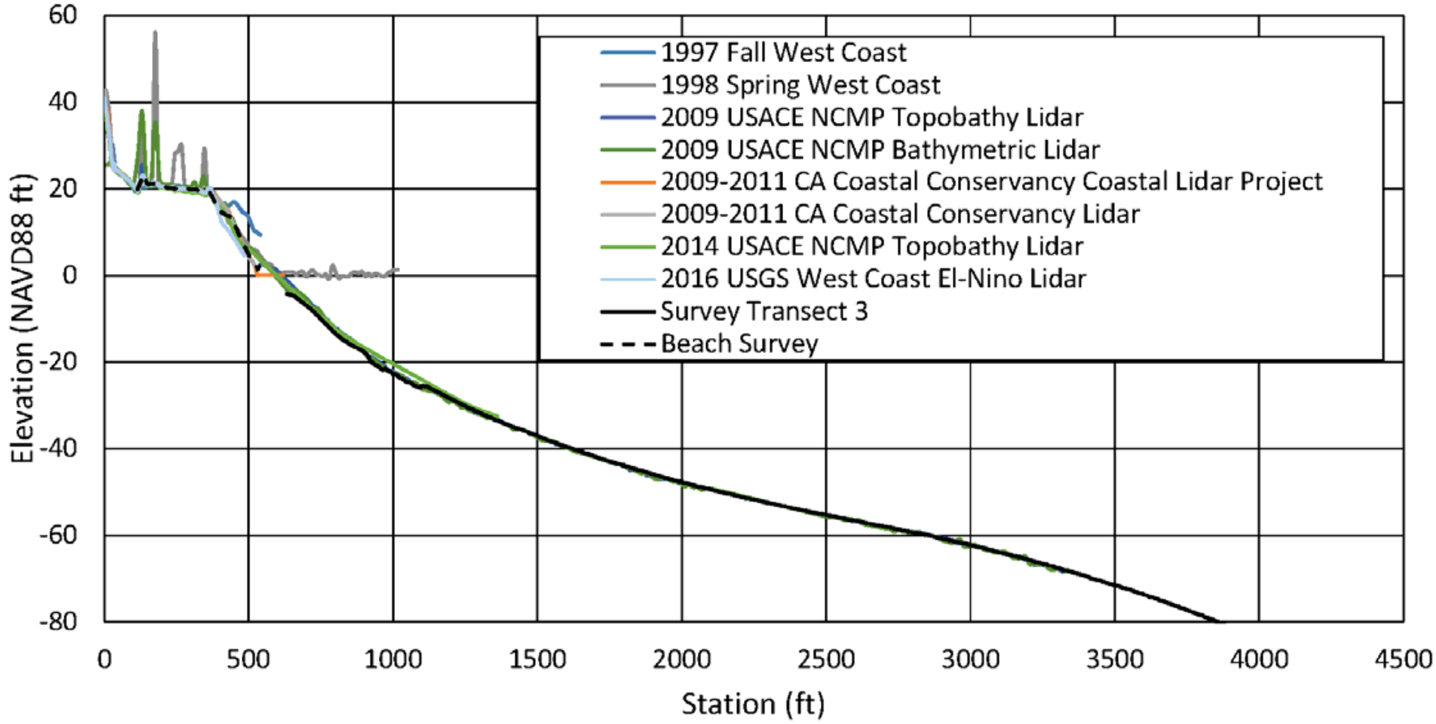

Figure A-2-4: Beach profile for transect T-3.

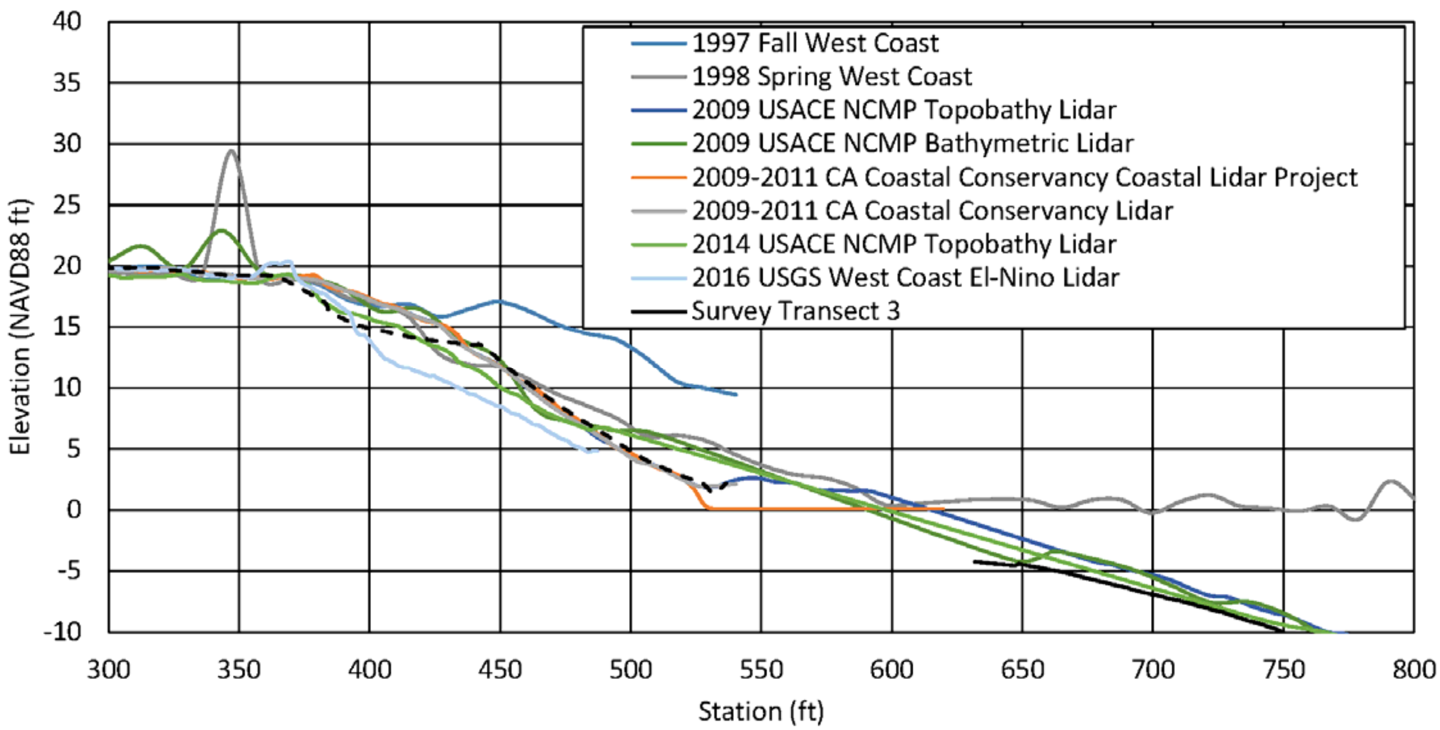

Figure A-2-5: Nearshore beach profile for transect T-3.

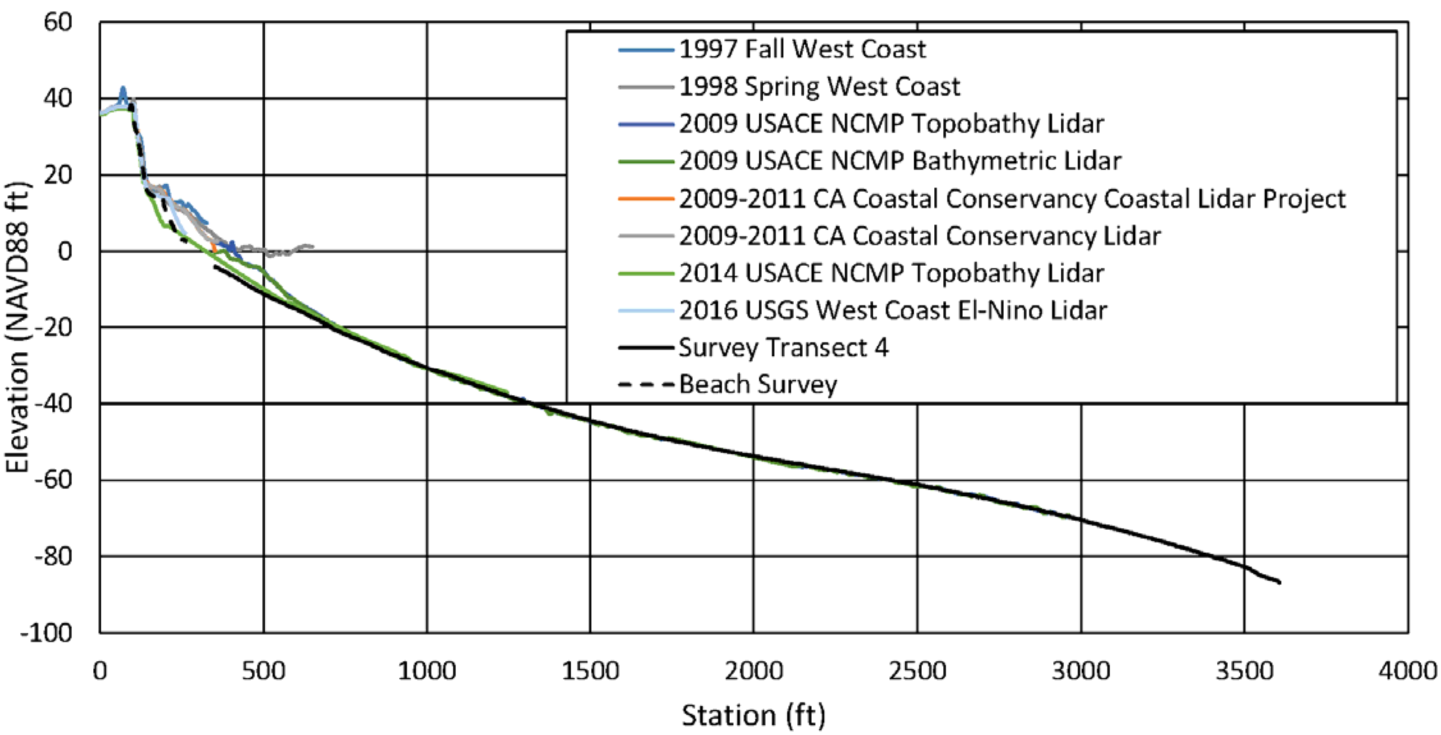

Figure A-2-7: Beach profile for transect T-4.

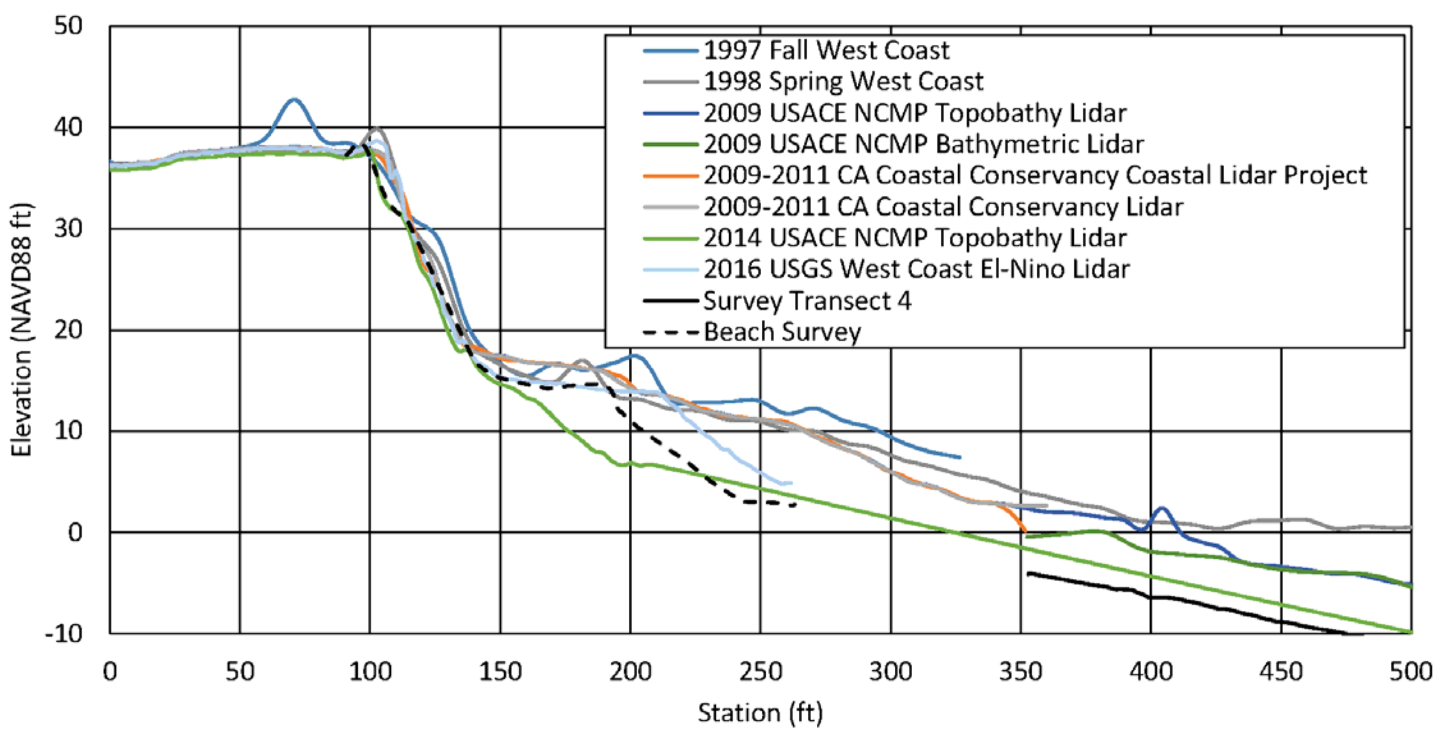

Figure A-2-8: Nearshore beach profile for transect T-4.

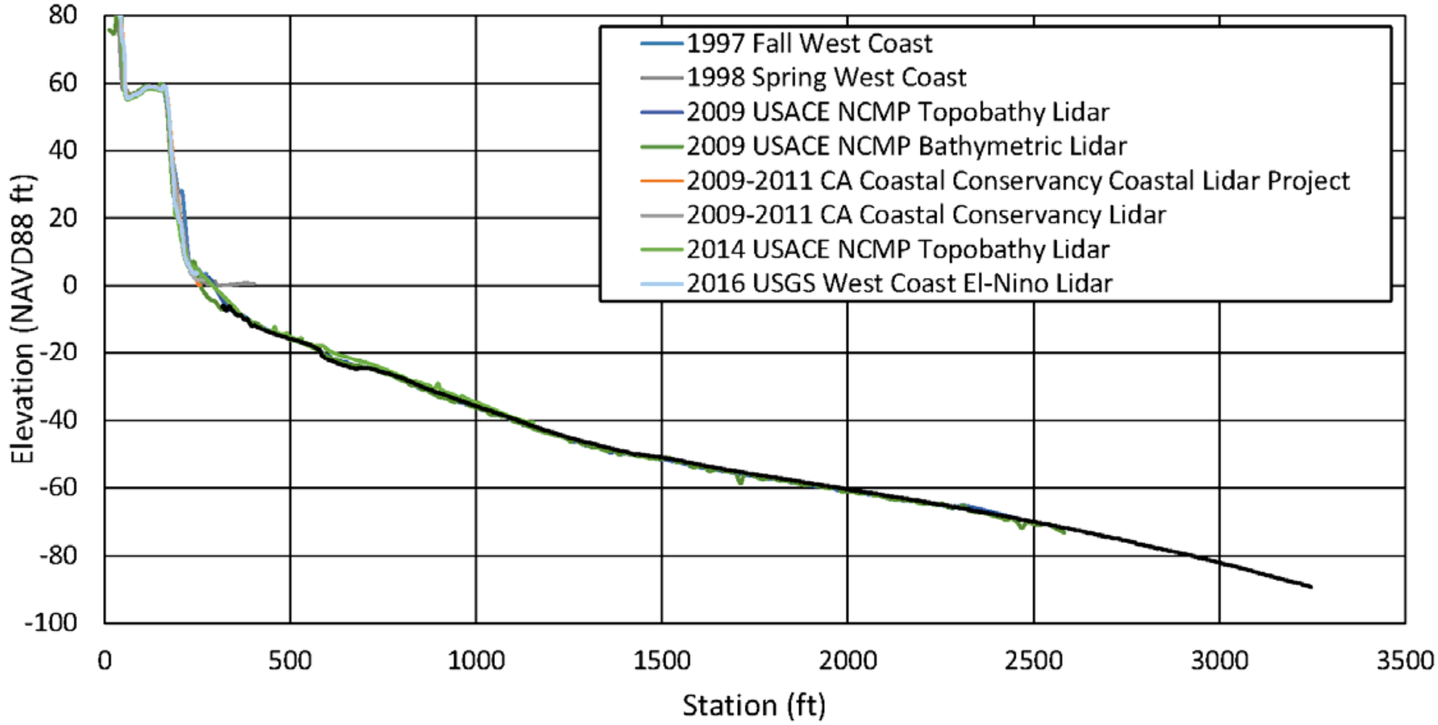

Figure A-2-9: Beach profile for transect T-5.

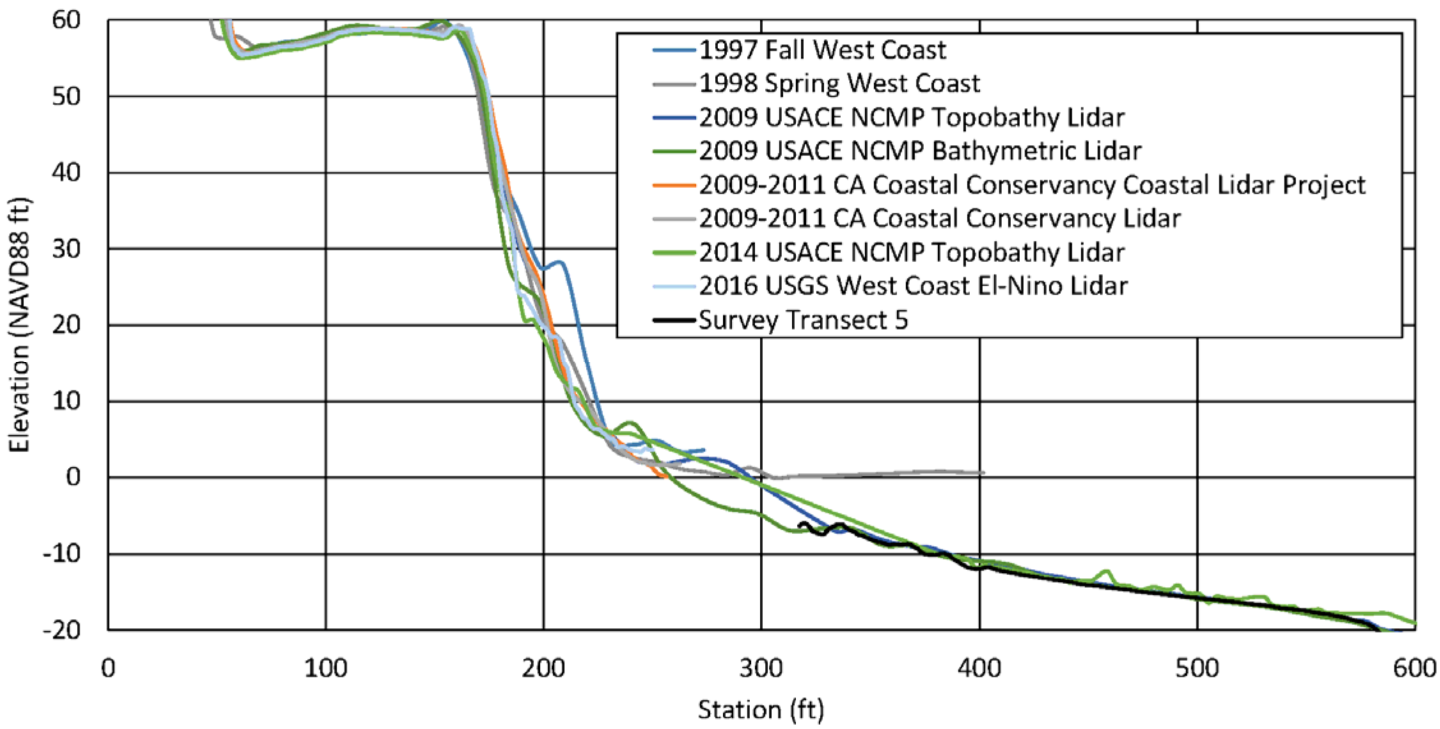

Figure A-2-10: Nearshore beach profile for transect T-5.

A-3 AERIAL PHOTOS

APPENDIX

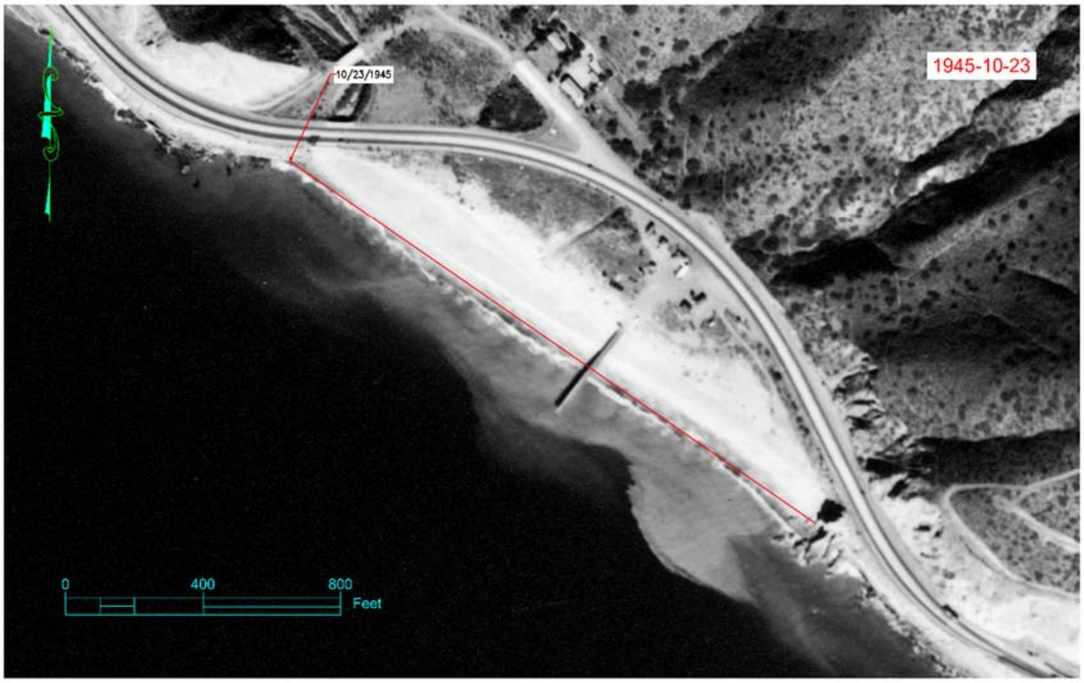

Figure A-3-1: Aerial photo taken on 10/23/1945, estimated time 12:00 pm.

Figure A-3-2: Aerial photo taken on 12/31/1946, estimated time 3:00 pm.

Figure A-3-3: Aerial photo taken on 8/2/1959, estimated time 12:00 pm.

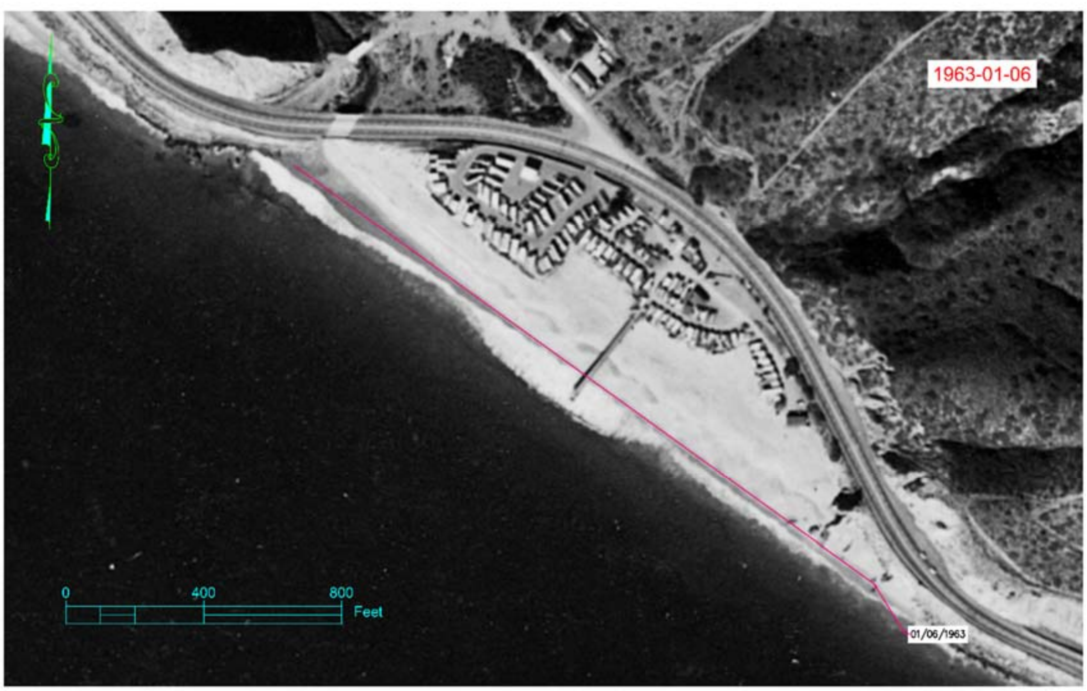

Figure A-3-4: Aerial photo taken on 1/6/1963, estimated time 12:00 pm.

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Figure A-3-5: Aerial photo taken on 1/31/1977, estimated time 2:00 pm, est. tide -2.9 feet, MSL

Figure A-3-6: Aerial photo taken on 2/28/1982 estimated time 1:00 pm, est. tide -1.7 feet, MSL

APPENDIX

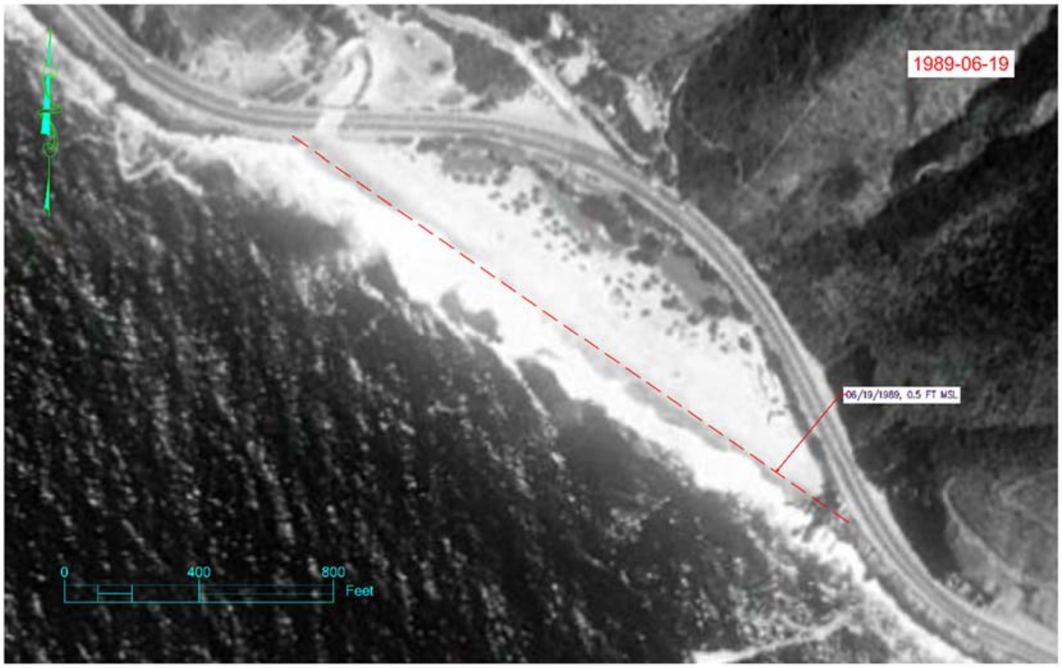

Figure A-3-7: Aerial photo taken on 6/19/1989, estimated time 10:00 am, est. tide 0.5 feet, MSL

Figure A-3-8: Aerial photo taken on 9/2/1994, estimated time 12:00 pm, est. tide -0.5 feet, MSL

Figure A-3-9: Aerial photo taken on 5/29/2001, estimated time 12:00 pm, est. tide -1.1 feet, MSL

Figure A-3-10: Aerial photo taken on 8/31/2007, estimated time 11:00 am, est. tide 3.1 feet, MSL

Figure A-3-11: Aerial photo taken on 8/26/2012, estimated time 12:30 pm, est. tide 0.5 feet, MSL

Figure A-3-12: Aerial photo taken on 12/31/2017, estimated time 12:00 pm, est. tide -1.9 feet, MSL

APPENDIX

Figure A-3-13: Composite of the water lines from the historic aerial photos shown on the most recent Google Aerial photo, 12/31/17.

APPENDIX

A-4 SWAN MODEL INPUT FILE EXAMPLES

APPENDIX

```
coarse_1.07_5.39_16_330.swn                                              8/29/2018

PROJ 'Run2' 'R2'
SET LEVEL 1.07
SET CARTESIAN
MODE STATIONARY TWODIMENSIONAL
COORD SPHERICAL QC
CGRID REGULAR -119.50 33.77 0.0 0.53 0.43 530 430 CIRCLE 36 0.03 1.0
INPGRID BOTTOM REGULAR -119.50 33.77 0. 530 430 0.001 0.001
READINP BOTTOM -1 'Bottom_001_West_Max.bot' 4 0 FREE
WIND 00.0 45.0
BOUND SHAPESPEC JONSWAP 3.3 PEAK DSPR DEGREES
BOUNDSPEC SEGMENT XY -119.50 33.77 -119.50 34.20 CONSTANT PAR 5.39 16.00 330
30.0
BOUNDSPEC SEGMENT XY -119.50 33.77 -118.97 33.77 CONSTANT PAR 5.39 16.00 330
30.0
BOUNDSPEC SEGMENT XY -119.50 34.20 -119.25 34.20 CONSTANT PAR 5.39 16.00 330
30.0
BREAKING CONSTANT 1.0 0.7
FRICTION MADSEN 0.05
NUMERIC STOPC 0.05 0.05 0.05 98. STAT 50
NGRID 'NEST R2' -119.08 34.009 0.0 0.1 0.1 100 100
NESTOUT 'NEST R2' 'NEST_OUTPUT W'
BLOCK 'COMPGRID' NOHEAD 'BOT_1.07_00.0_45.0_5.39_16.00_330C.mat' LAYOUT 3
BOTLev
BLOCK 'COMPGRID' NOHEAD 'HS 1.07 00.0 45.0 5.39 16.00 330C.mat' LAYOUT 3 HSIGN
BLOCK 'COMPGRID' NOHEAD 'DEPTH_1.07_00.0_45.0_5.39_16.00_330C.mat' LAYOUT 3
DEPTH
BLOCK 'COMPGRID' NOHEAD 'TM01_1.07_00.0_45.0_5.39_16.00_330C.mat' LAYOUT 3
TM01
BLOCK 'COMPGRID' NOHEAD 'DIR 1.07 00.0 45.0 5.39 16.00 330C.mat' LAYOUT 3 DIR
BLOCK 'COMPGRID' NOHEAD 'TPS 1.07 00.0 45.0 5.39 16.00 330C.mat' LAYOUT 3 TPS
BLOCK 'COMPGRID' NOHEAD 'WATLEV_1.07_00.0_45.0_5.39_16.00_330C.mat' LAYOUT 3
WATLEV
COMPUTE
STOP
```

Figure A-4-1: SWAN model input for the coarse grid, Hs=17.7 feet (5.4 m), Tp=16 sec., waves from 300 deg. (approx. WNW), and water level for current condition (i.e. year 2020)

```
fine_1.07_5.39_16_330.swn                                                8/29/2018

PROJ 'Run3' 'R3'
SET LEVEL 1.07
SET CARTESIAN
MODE STATIONARY TWODIMENSIONAL
COORD SPHERICAL QC
CGRID REGULAR -119.0800 34.0090 0.0 0.1 0.1 500 500 CIRCLE 36 0.03 1.0
INPGRID BOTTOM REGULAR -119.0800 34.0090 0. 500 500 0.0002 0.0002
READINP BOTTOM -1 'Bottom_0002_Fine_Max.bot' 4 0 FREE
WIND 00.0 45.0
BOUNDNEST1 NEST 'NEST_OUTPUT_W' CLOSED
BREAKING CONSTANT 1.0 0.7
FRICTION MADSEN 0.05
NUMERIC STOPC 0.05 0.05 0.05 98. STAT 50
BLOCK 'COMPGRID' NOHEAD 'BOT_1.07_00.0_45.0_5.39_16.00_330.mat' LAYOUT 3
BOTLev
BLOCK 'COMPGRID' NOHEAD 'HS 1.07 00.0 45.0 5.39 16.00 330.mat' LAYOUT 3 HSIGN
BLOCK 'COMPGRID' NOHEAD 'DEPTH_1.07_00.0_45.0_5.39_16.00_330.mat' LAYOUT 3
DEPTH
BLOCK 'COMPGRID' NOHEAD 'TM01 1.07 00.0 45.0 5.39 16.00 330.mat' LAYOUT 3 TM01
BLOCK 'COMPGRID' NOHEAD 'DIR 1.07 00.0 45.0 5.39 16.00 330.mat' LAYOUT 3 DIR
BLOCK 'COMPGRID' NOHEAD 'TPS 1.07 00.0 45.0 5.39 16.00 330.mat' LAYOUT 3 TPS
BLOCK 'COMPGRID' NOHEAD 'WATLEV_1.07_00.0_45.0_5.39_16.00_330.mat' LAYOUT 3
WATLEV
COMPUTE
STOP
```

Figure A-4-2: SWAN model input for the fine grid model run for same conditions as shown above for the coarse grid.

```
coarse_1.07_6.61_16_030.swn                                          8/29/2018

PROJ 'Run1' 'R1'
SET LEVEL 1.07
SET CARTESIAN
MODE STATIONARY TWODIMENSIONAL
COORD SPHERICAL QC
CGRID REGULAR -119.50 33.92 0.0 0.75 0.28 750 280 CIRCLE 36 0.03 1.0
INPGRID BOTTOM REGULAR -119.50 33.92 0. 750 280 0.001 0.001
READINP BOTTOM -1 'Bottom_001_South_Max.bot' 4 0 FREE
WIND 00.0 45.0
BOUND SHAPESPEC JONSWAP 3.3 PEAK DSPR DEGREES
BOUNDSPEC SEGMENT XY -119.50 33.92 -119.50 34.20 CONSTANT PAR 6.61 16.00 030
30.0
BOUNDSPEC SEGMENT XY -119.50 33.92 -118.75 33.92 CONSTANT PAR 6.61 16.00 030
30.0
BREAKING CONSTANT 1.0 0.7
FRICTION MADSEN 0.05
NUMERIC STOPC 0.05 0.05 0.05 98. STAT 50
NGRID 'NEST R1' -119.08 34.009 0.0 0.1 0.1 100 100
NESTOUT 'NEST R1' 'NEST_OUTPUT S'
BLOCK 'COMPGRID' NOHEAD 'BOT_1.07_00.0_45.0_6.61_16.00_030C.mat' LAYOUT 3
BOTLev
BLOCK 'COMPGRID' NOHEAD 'HS 1.07 00.0 45.0 6.61 16.00 030C.mat' LAYOUT 3 HSIGN
BLOCK 'COMPGRID' NOHEAD 'DEPTH_1.07_00.0_45.0_6.61_16.00_030C.mat' LAYOUT 3
DEPTH
BLOCK 'COMPGRID' NOHEAD 'TM01_1.07_00.0_45.0_6.61_16.00_030C.mat' LAYOUT 3
TM01
BLOCK 'COMPGRID' NOHEAD 'DIR 1.07 00.0 45.0 6.61 16.00 030C.mat' LAYOUT 3 DIR
BLOCK 'COMPGRID' NOHEAD 'TPS 1.07 00.0 45.0 6.61 16.00 030C.mat' LAYOUT 3 TPS
BLOCK 'COMPGRID' NOHEAD 'WATLEV_1.07_00.0_45.0_6.61_16.00_030C.mat' LAYOUT 3
WATLEV
COMPUTE
STOP
```

Figure A-4-3: SWAN model input for the coarse grid, Hs=21.7 feet (6.6 m), Tp=16 sec., waves from 240 deg. (approx. WSW), and water level for current condition (i.e. year 2020)

```
fine_1.07_6.61_16_030.swn                                            8/29/2018

PROJ 'Run3' 'R3'
SET LEVEL 1.07
SET CARTESIAN
MODE STATIONARY TWODIMENSIONAL
COORD SPHERICAL QC
CGRID REGULAR -119.0800 34.0090 0.0 0.1 0.1 500 500 CIRCLE 36 0.03 1.0
INPGRID BOTTOM REGULAR -119.0800 34.0090 0. 500 500 0.0002 0.0002
READINP BOTTOM -1 'Bottom_0002_Fine_Max.bot' 4 0 FREE
WIND 00.0 45.0
BOUNDNEST1 NEST 'NEST_OUTPUT_S' CLOSED
BREAKING CONSTANT 1.0 0.7
FRICTION MADSEN 0.05
NUMERIC STOPC 0.05 0.05 0.05 98. STAT 50
BLOCK 'COMPGRID' NOHEAD 'BOT_1.07_00.0_45.0_6.61_16.00_030.mat' LAYOUT 3
BOTLev
BLOCK 'COMPGRID' NOHEAD 'HS 1.07 00.0 45.0 6.61 16.00 030.mat' LAYOUT 3 HSIGN
BLOCK 'COMPGRID' NOHEAD 'DEPTH_1.07_00.0_45.0_6.61_16.00_030.mat' LAYOUT 3
DEPTH
BLOCK 'COMPGRID' NOHEAD 'TM01 1.07 00.0 45.0 6.61 16.00 030.mat' LAYOUT 3 TM01
BLOCK 'COMPGRID' NOHEAD 'DIR 1.07 00.0 45.0 6.61 16.00 030.mat' LAYOUT 3 DIR
BLOCK 'COMPGRID' NOHEAD 'TPS 1.07 00.0 45.0 6.61 16.00 030.mat' LAYOUT 3 TPS
BLOCK 'COMPGRID' NOHEAD 'WATLEV_1.07_00.0_45.0_6.61_16.00_030.mat' LAYOUT 3
WATLEV
COMPUTE
STOP
```

Figure A-4-4: SWAN model input for the fine grid model run for same conditions as shown above for the coarse grid.

APPENDIX

A-5 *COSMOS SHORE EROSION SCHEMATICS DUE TO SEA LEVEL RISE*

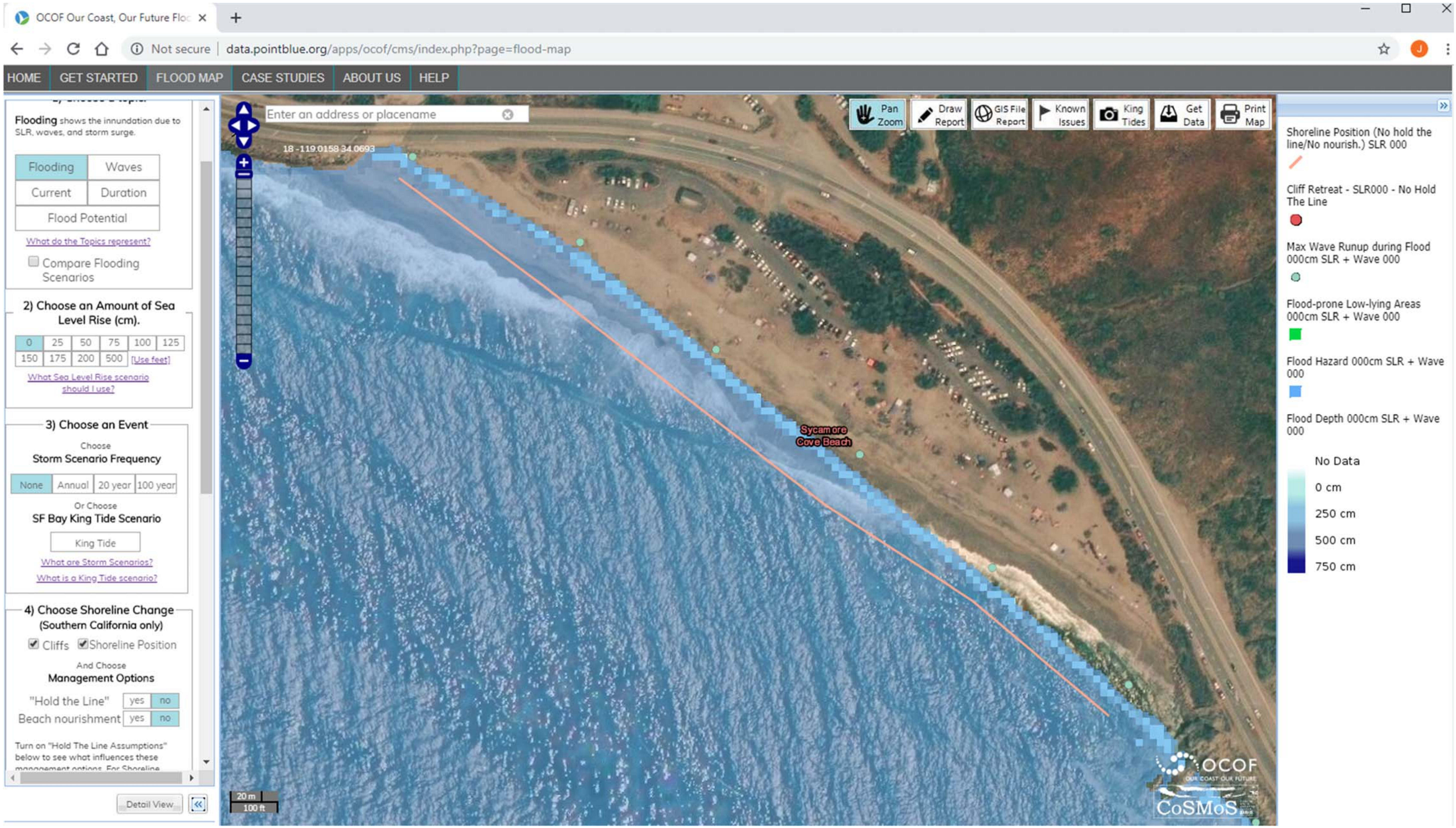

Figure A-5-1: CoSMoS schematic showing shoreline for existing condition without sea level rise, approximating year 2020 for this study.

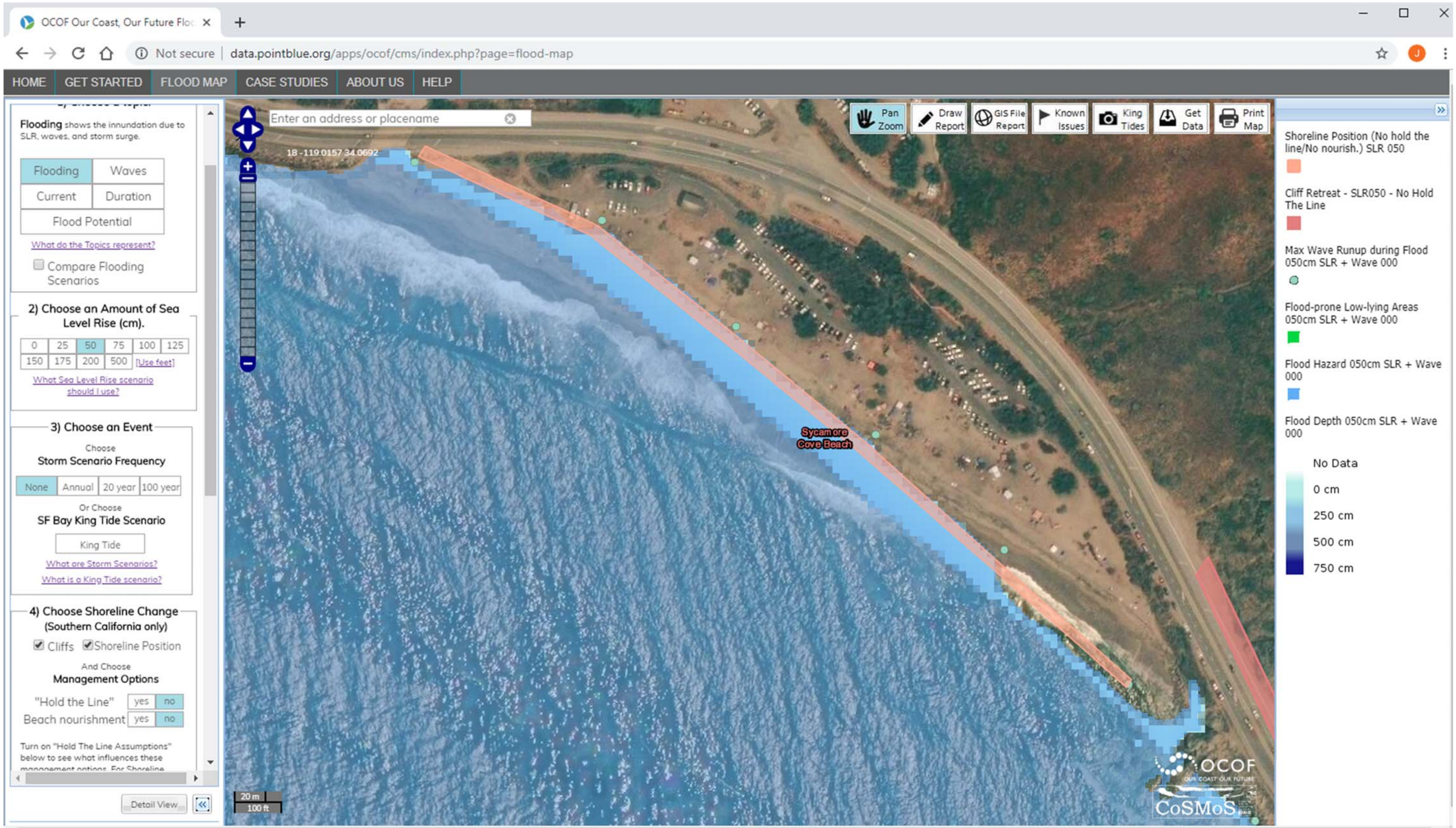

Figure A-5-2: CoSMoS schematic showing shoreline for sea level rise of 1.6 feet (50 cm), approximating year 2050 for this study.

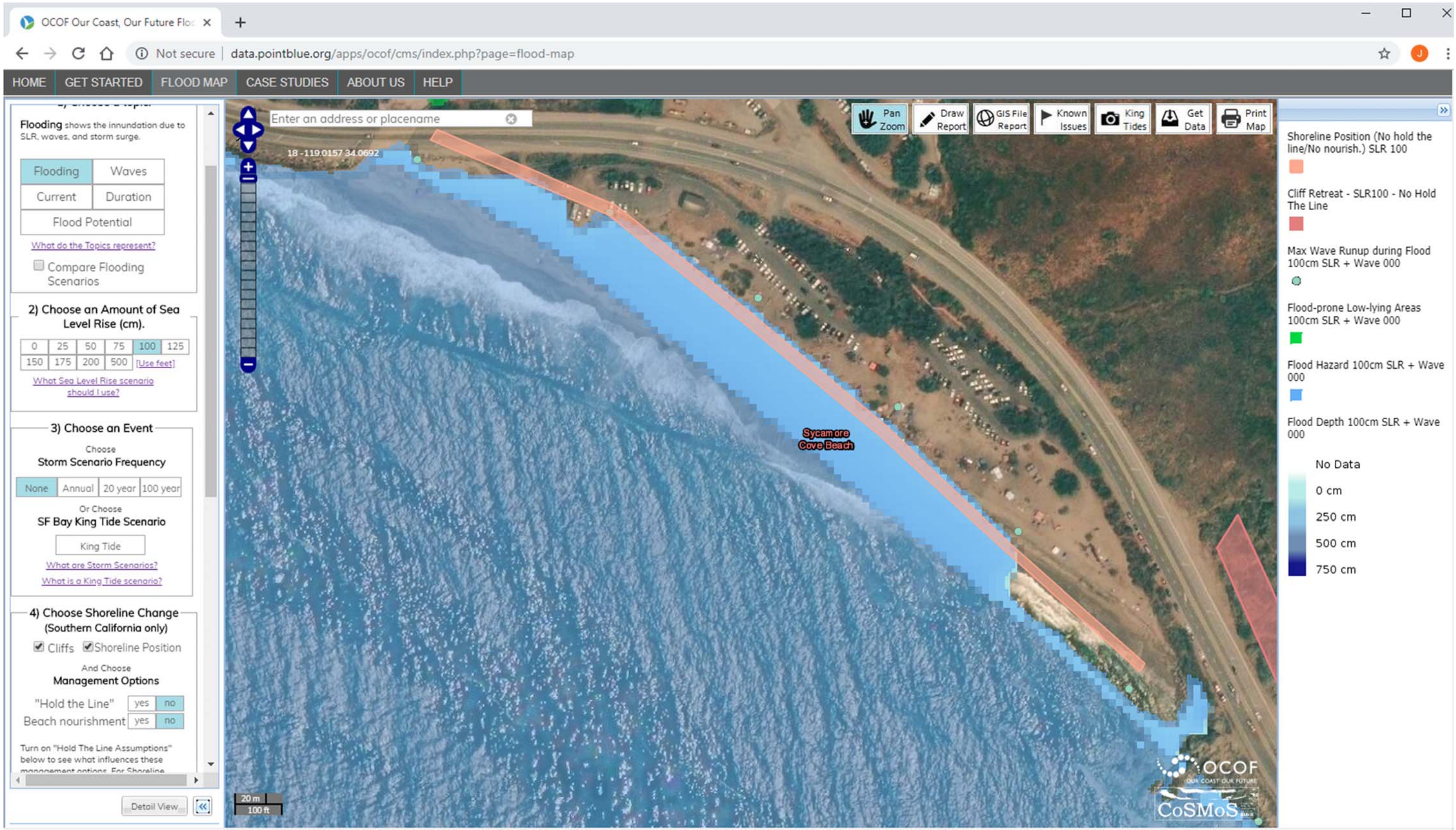

Figure A-5-3: CoSMoS schematic showing shoreline for sea level rise of 3.3 feet (100 cm), approximating year 2070 for this study.

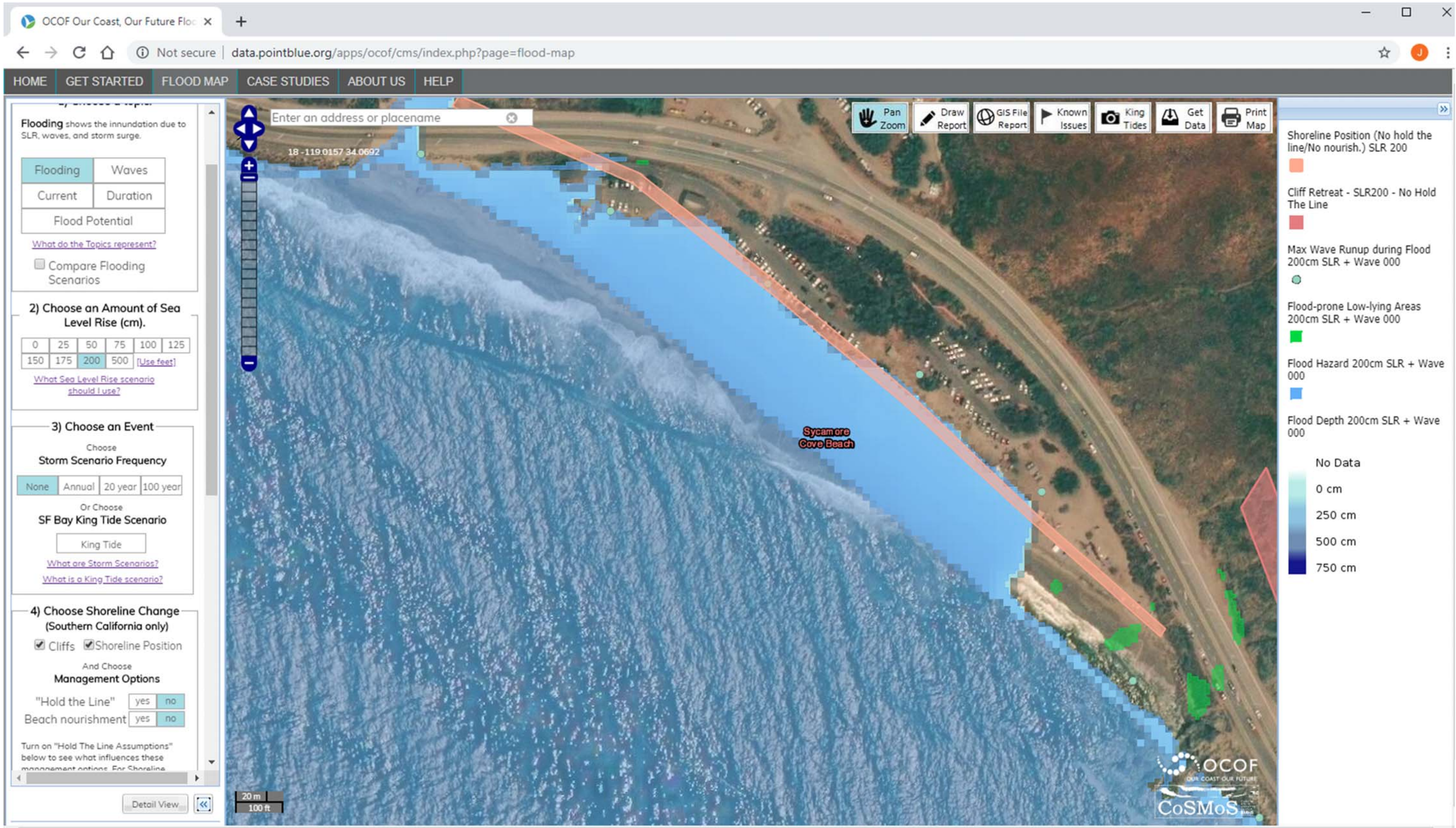

Figure A-5-4: CoSMoS schematic showing shoreline for sea level rise of 6.6 feet (200 cm), approximating year 2095 for this study.

APPENDIX

A-6 *WAVE SETUP AND RUNUP CALCULATIONS*

APPENDIX

Caltrans Sycamore Cove Wave Runup Study

Wave setup and runup on the beach transects

By: J. Ramsden	8/31/2018	Revised: J. Ramsden	4/19/2019
Checked: Y. Li	9/7/2018	Checked: R. Bottcher	4/19/2019

Reference: (1) U.S. Department of Homeland Security, Federal Emergency Management Agency (FEMA), (2015). Guidance for Flood Risk Analysis and Mapping – Coastal Wave Setup. Guidance Document No. 44, November, 2015.

Deep water significant wave height	Ho=	21.7	ft	From SWAN model results
Deep water mean wave period	Tm01=	18.2	sec.	From SWAN model results
Deep water wave length	Lo=	1693	ft	=(g/(2*pi))*(Tm01^2)
Deep water wave steepness	Ho/Lo=	0.0128	(-)	
Breaking wave steepness	Hb/Lo=	0.016	(-)	FEMA (2015), Fig. 2-5
Breaking wave height	Hb=	27.1	ft	
Ratio of breaking wave height to depth	kappa=	0.78	(-)	FEMA (2015), last paragraph pp. 20
Depth at wave breaking	hb=	34.7	ft	hb=Hb/kappa FEMA (2015) , last paragraph pp. 15

Direct Integration Method (DIM), FEMA (2015c)

Transect	Year (yr)	Storm ARI (yr)	Storm surge (SS) (ft, NAVD88)	Sea level rise (SLR) (ft)	slope from berm crest to hb m (ft/ft)	eta_bar (ft)	eta_rms (ft)	zeta_0 (-)	sig2 (ft)	eta_hat_T (ft)	R2 (ft)	R2 Elev. SLR+SS+R2 (ft, NAVD88)	berm crest elevation (ft, NAVD88)	R2 Elev. FEMA constraint <= 3' above berm (ft, NAVD88)
T-2	2020	100	7.9	0.1	0.057	4.7	3.8	0.50	3.3	10.0	14.7	22.7	15.1	18.1
T-3	2020	100	7.9	0.1	0.062	4.8	3.9	0.54	3.5	10.5	15.3	23.3	19.3	22.3
T-4	2020	100	7.9	0.1	0.061	4.7	3.9	0.54	3.5	10.4	15.2	23.2	15.1	18.1
					Perform calculation with m based on runup height from above (i.e. R2)									
					0.068	4.9	4.0	0.60	3.9	11.1	16.0	24.0	15.1	18.1
					0.067	4.8	4.0	0.59	3.8	11.0	15.9	23.9	19.3	22.3
					0.081	5.0	4.1	0.72	4.7	12.4	17.4	25.5	15.1	18.1

Direct Integration Method (DIM), FEMA (2015)

Transect	Sea level rise scenario (yr)	Storm ARI (yr)	Storm surge (SS) (ft, NAVD88)	Sea level rise (SLR) (ft)	slope from berm crest to hb m (ft/ft)	eta_bar (ft)	eta_rms (ft)	zeta_0 (-)	sig2 (ft)	eta_hat_T (ft)	R2 (ft)	R2 Elev. SLR+SS_R2 (ft, NAVD88)	berm elevation (ft, NAVD88)	R2 Elev. FEMA constraint <= 3' above berm (ft, NAVD88)
T-2	2050	100	7.9	1.9	0.057	4.7	3.8	0.50	3.3	10.0	14.7	24.5	15.1	18.1
T-3	2050	100	7.9	1.9	0.062	4.8	3.9	0.54	3.5	10.5	15.3	25.1	19.3	22.3
T-4	2050	100	7.9	1.9	0.061	4.7	3.9	0.54	3.5	10.4	15.2	25.0	15.1	18.1
					Perform calculation with m based on runup height from above (i.e. R2)									
					0.068	4.9	4.0	0.60	3.9	11.1	16.0	25.8	15.1	18.1
					0.067	4.8	4.0	0.59	3.8	11.0	15.9	25.7	19.3	22.3
					0.081	5.0	4.1	0.72	4.7	12.4	17.4	27.3	15.1	18.1

Direct Integration Method (DIM), FEMA (2015)

Transect	Sea level rise scenario (yr)	Storm ARI (yr)	Storm surge (SS) (ft, NAVD88)	Sea level rise (SLR) (ft)	slope from berm crest to hb m (ft/ft)	FEMA (2015) Eq. 3-14 eta_bar (ft)	FEMA (2015) Eq. 3-14 eta_rms (ft)	FEMA (2015) Eq. 3-14 zeta_0 (-)	FEMA (2015) Eq. 3-14 sig2 (ft)	FEMA (2015) Eq. 3-14 eta_hat_T (ft)	R2 (ft)	R2 Elev. SLR+SS_R2 (ft, NAVD88)	berm elevation (ft, NAVD88)	R2 Elev. FEMA constraint <= 3' above berm (ft, NAVD88)
T-2	2070	100	7.9	3.4	0.057	4.7	3.8	0.50	3.3	10.0	14.7	26.0	15.1	18.1
T-3	2070	100	7.9	3.4	0.062	4.8	3.9	0.54	3.5	10.5	15.3	26.6	19.3	22.3
T-4	2070	100	7.9	3.4	0.061	4.7	3.9	0.54	3.5	10.4	15.2	26.5	15.1	18.1
					Perform calculation with m based on runup height from above (i.e. R2)									
					0.068	4.9	4.0	0.60	3.9	11.1	16.0	27.3	15.1	18.1
					0.067	4.8	4.0	0.59	3.8	11.0	15.9	27.2	19.3	22.3
					0.081	5.0	4.1	0.72	4.7	12.4	17.4	28.8	15.1	18.1

Direct Integration Method (DIM), FEMA (2015)

Transect	Sea level rise scenario (yr)	Storm ARI (yr)	Storm surge (SS) (ft, NAVD88)	Sea level rise (SLR) (ft)	slope from berm crest to hb m (ft/ft)	eta_bar (ft)	eta_rms (ft)	zeta_0 (-)	sig2 (ft)	eta_hat_T (ft)	R2 (ft)	R2 Elev. SLR+SS_R2 (ft, NAVD88)	berm elevation (ft, NAVD88)	R2 Elev. FEMA constraint <= 3' above berm (ft, NAVD88)
T-2	2095	100	7.9	6.2	0.057	4.7	3.8	0.50	3.3	10.0	14.7	28.8	15.1	18.1
T-3	2095	100	7.9	6.2	0.062	4.8	3.9	0.54	3.5	10.5	15.3	29.3	19.3	22.3
T-4	2095	100	7.9	6.2	0.061	4.7	3.9	0.54	3.5	10.4	15.2	29.3	15.1	18.1
					Perform calculation with m based on runup height from above (i.e. R2)									
					0.068	4.9	4.0	0.60	3.9	11.1	16.0	30.1	15.1	18.1
					0.067	4.8	4.0	0.59	3.8	11.0	15.9	29.9	19.3	22.3
					0.081	5.0	4.1	0.72	4.7	12.4	17.4	31.5	15.1	18.1

Figure A-6-1: Wave setup and runup calculations for beach transects T-2, T-3 and T-4.

Caltrans Sycamore Cove Wave Runup Study

Calculate wave setup and runup on the steep structures

by	J. Ramsden	8/31/2018	Revised by J. Ramsden	4/19/2019
checked	Y. Li	9/7/2018	Checked R. Bottcher	4/19/2019

References: (1) U.S. Department of Homeland Security, Federal Emergency Management Agency (FEMA), (2015). Guidance for Flood Risk Analysis and Mapping – Coastal Wave Setup. Guidance Document No. 44, November, 2015.

(2) EurOtop, (2016). Manual on wave overtopping of sea defences and related structures. An overtopping manual largely based on European research, but for worldwide application. Van der Meer, J.W., Allsop, N.W.H., Bruce, T., De Rouck, J., Kortenhaus, A., Pullen, T., Schüttrumpf, H., Troch, P. and Zanuttigh, B., www.overtopping-manual.com, accessed June, 2018.

Deep water significant wave height	Ho=	21.7	ft	From SWAN model results
Deep water mean wave period	Tm01=	18.2	sec.	From SWAN model results
Deep water wave length	Lo=	1693	ft	=(g/(2*pi))*(Tm01^2)
Deep water wave steepness	Ho/Lo=	0.0128	(-)	
Breaking wave steepness	Hb/Lo=	0.016	(-)	FEMA (2015), Fig. 2-5
Breaking wave height	Hb=	27.1	ft	
Ratio of breaking wave height to depth	kappa=	0.78	(-)	FEMA (2015), last paragraph pp. 20
Depth at wave breaking	hb=	34.7	ft	hb=Hb/kappa FEMA (2015) , last paragraph pp. 15

No need to include wave setup to the water level at the toe of the structure for runup or overtopping calculated using Eurotop (2016) guidance methods. See Eurotop (2016) third paragraph in section 2.2.3, pp. 20. Also see FEMA (2018) (Coastal Wave Runup and Overtopping Guidance), section 3.4.1.2 (pp. 14) Wave Setup paragraph.

Transect Bathymetry	Site description	Existing toe of structure or beach z(toe) (ft, NAVD88)	Sea level rise scenario (year)	Sea level rise (SLR) (ft)	Storm surge (100-yr) (SS) (ft, NAVD88)	Still water level SS+SLR (ft, NAVD88)	Slope of structure or beach m (ft/ft)	1/slope 1/m (ft/ft)	d=SS+SLR-z Depth at toe of slope d (ft)	Hmo=0.78*d Wave height at toe Hmo (ft)	Eurotop (2016) Eq. 5.7 Relative Runup Ru2%/Hmo (-)	Eurotop (2016) Eq. 5.7 max (3.21) min (1.93) Ru2%/Hmo (-)	Ru2% (ft)	Ru2% runup elevation (ft, NAVD88)
T-4	Secant wall post mile 4.2	6	2020	0.1	7.9	8.0	0.67	1.50	2.0	1.6	3.00	3.00	4.7	12.7
T-5	Secant wall post mile 4.0	2	2020	0.1	7.9	8.0	0.75	1.33	6.0	4.7	2.86	2.86	13.4	21.4
T-4	Secant wall post mile 4.2	6	2050	1.9	7.9	9.8	0.67	1.50	3.8	3.0	3.00	3.00	8.9	18.8
T-5	Secant wall post mile 4.0	2	2050	1.9	7.9	9.8	0.75	1.33	7.8	6.1	2.86	2.86	17.4	27.2
T-4	Secant wall post mile 4.2	6	2070	3.4	7.9	11.3	0.67	1.50	5.3	4.1	3.00	3.00	12.4	23.8
T-5	Secant wall post mile 4.0	2	2070	3.4	7.9	11.3	0.75	1.33	9.3	7.3	2.86	2.86	20.8	32.1
T-4	Secant wall post mile 4.2	6	2095	6.2	7.9	14.1	0.67	1.50	8.1	6.3	3.00	3.00	18.9	33.0
T-5	Secant wall post mile 4.0	2	2095	6.2	7.9	14.1	0.75	1.33	12.1	9.4	2.86	2.86	26.9	41.0

Figure A-6-2: Wave setup and runup calculations for the rock slope protection at PM 4.0 and the steep slope at PM 4.2.

APPENDIX

A-7 STORM INDUCED BEACH EROSION CALCULATIONS

APPENDIX

Caltrans Sycamore Cove Wave Runup Study

Calculate the beach slope on the steep portion of the equilibrium beach profile starting above MSL and terminating before the top of bank

These slopes are used for the beach erosion calculations based on the Kriebel and Dean (1993) model

by J. Ramsden 8/22/2018
checked Y. Li 9/7/2018

Transect Beach	Transect Bathymetry	Category	low point (ft, NAVD88)	high point (ft, NAVD88)	horizontal distance (ft)	slope m (ft/ft)	1/slope 1/m (ft/ft)	Average slope m (ft/ft)	Average 1/slope 1/m (ft/ft)	Notes
B-1		Creek	3.20	7.53	52.8	0.082	12.2			
B-2		Creek	2.57	8.64	63.3	0.096	10.4			
B-3		Creek	3.10	9.66	70.7	0.093	10.8	0.090	11.1	
B-4		South Abutment	3.39	9.91	67.3	0.097	10.3	0.097	10.3	
B-5		H-2	2.58	10.68	61.3	0.132	7.6			
B-6	T-2	H-2	3.01	11.57	63.0	0.136	7.4			
B-7		H-2	2.62	11.49	67.2	0.132	7.6			
B-8		H-2	3.02	11.70	65.6	0.132	7.6	0.133	7.5	Slope south of bridge abutment
B-9		H-3	3.77	12.02	65.5	0.126	7.9			
B-10		H-3	3.45	12.59	74.5	0.123	8.2			
B-11		H-3	3.68	12.68	68.9	0.131	7.7			
B-12		H-3	2.71	12.96	76.8	0.133	7.5			
B-13		H-3	2.81	13.30	75.1	0.140	7.2			
B-14	T-3	H-3	2.96	13.61	75.2	0.142	7.1			
B-15		H-3	2.78	13.51	75.6	0.142	7.0			
B-16		H-3	2.57	14.40	71.0	0.167	6.0			
B-17		H-3	3.32	14.54	66.1	0.170	5.9			
B-18		H-3	3.11	14.96	64.8	0.183	5.5	0.146	7.0	Slope along main part of beach
B-19		H-4	4.30	15.19	52.6	0.207	4.8			
B-20		H-4	4.85	14.53	45.5	0.213	4.7			
B-21	T-4	H-4	3.08	14.56	52.4	0.219	4.6			
B-22		H-4	2.89	13.17	52.2	0.197	5.1	0.209	4.8	Slope along secant wall, PM 4.2

Figure A-7-1: Calculation of beach slopes from topographic beach transects B-1 through B-22.

Caltrans Sycamore Cove Wave Runup Study

Beach erosion calculation using the Kriebel and Dean (1993) model for storm induced beach erosion per FEMA (2018) Coastal Erosion Guidance Document No. 40.

by	J. Ramsden	9/4/2018
checked	Y. Li	9/7/2018

References:

(1) U.S. Department of Homeland Security, Federal Emergency Management Agency (FEMA), (2018a). Guidance for Flood Risk Analysis and Mapping - Coastal Erosion. Guidance Document No. 40, February, 2018.

(2) Kriebel, D.L. and R.G. Dean (1993). Convolution Method for Time-Dependent Beach-Profile Response. Journal of Waterway, Port, Coastal, and Ocean Engineering, American Society of Civil Engineers, Vol. 119, No. 2, March/April, 1993.

Calculate the maximum horizontal erosion potential, Rinf, for a beach backed by a low sand berm:
Calculate the results for the transect cooincident with offshore profile T-2.

Rinf = [S(Wb-hb/m)]/[B+hb-(S/2)]			FEMA (2018), Eq. 2-1
S=increase in water level due to storm surge and static wave setup			FEMA (2018), Eq. 2-2
Wb (surf zone width) = Wo + (hb/A)^(3/2)			K&D (1993), Eq. 23, Note K&D use xb for Wb
Wo (distance from the still-water shoreline to the virtual origin of the concace equilibrium profile form)			K&D (1993), Eq. 16b, Note K&D use xo for Wo
Wo = ht/(3*m)			
ht (depth at which the linear slope is tangent to the concave profile)			K&D (1993), Notes below Eq. 16b
ht=(4*A^3)/(9*m^2)			
A (beach profile parameter)			FEMA (2018) Eq. 2-8
A=0.09973*ln(D50)+0.309 (ft^(1/3))			
D50=	0.416	mm	From worksheet Grab Sample Data
A=	0.222	ft^(1/3)	FEMA (2018) Eq. 2-8
m (beach face slope)=	0.133	(-)	From worksheet Beach slopes
ht=	0.273	ft	
Wo=	0.683	ft	
hb (depth of breaking waves)	34.7	ft	From Beach wave runup worksheet
Wb=	1964	ft	
S=	7.25	ft	Storm surge above MHHW + (eta_bar). Note that most high water events are associated with extremely high tides and thus the storm surge residual is not very large. Thus, taking the 100 year SS (including El Nino effects) of 7.88 ft, NAVD and subtracting the MHHW level of 5.31 ft yields 2.57 feet. Note that for the highest recorded water level the residual was only 1.8 ft. Thus, use of 2.6 feet for the storm surge elevation above normal tides appears reasonable.
B (berm height above MSL)	12.47	ft	From Spreadsheet Profile Data 072418-v3_with foreshore slopes.xlsx, worksheet Slopes, cell I69 and converted to MSL
Rinf=	283	ft	

Figure A-7-2: Storm induced beach erosion calculations for transect T-2.

Now determine the time response of the storm using K&D Eq. 13.		
Rmax = Rinf *(1/2)*(1-cos(2*sigma*tm))		K&D (1993) Eq. 13
sigma = pi/TD		K&D (1993) text below Eq. 8
TD (storm duration) during which water levels are elevated above normal tides	10 hr	Of the top 10 water levels from the Santa Monica gauge only one showed a significant and prolonged residual (i.e. the highest water event on 11/29/1982 (i.e. the 82/83 El Nino) with a max. residual of 1.8 ft. The next highest residual for a high water event was 0.7 ft but these residuals were not of any significant duration. Take total duration of event at 20 hours but divide by 2 in reconition that the tide swing over each 12 hour period will reduce the water level significantly below the storm induced water level.
sigma=	0.314 1/hr	
beta (ratio of the erosion time scale to the storm duration)		
beta=2*pi*(TS/TD)		K&D (1993) Eq. 11
TS (erosion time scale)		
TS=C1*(Hb^(3/2))/(g^(1/2)*A^3)*(1+(hb/B)+((m*xb)/hb))^(-1)		K&D (1993) Eq. 31
C1 (from linear fit between equation and numerical model data)		
C1=	320	
Hb (breaking wave height)=	27.1 ft	From Beach wave runup worksheet
TS=	64687 s	
TS=	18.0 hr	
beta=	11.3 (-)	

Iterate to determine tm, where Diff = 0 solution occurs — K&D (1993) Eq. 12

sigma*tm	exp(-(2*sigma*tm)/beta)	cos(2*sigma*tm)-(1/beta)*sin(2*sigma*tm)	Diff
1.571	0.7571	-1.0000	1.7571
1.649	0.7466	-0.9738	1.7205
1.728	0.7363	-0.9237	1.6600
1.806	0.7261	-0.8508	1.5769
1.885	0.7161	-0.7570	1.4731
1.963	0.7062	-0.6445	1.3507
2.042	0.6965	-0.5161	1.2126
2.121	0.6868	-0.3751	1.0619
2.199	0.6774	-0.2248	0.9021
2.278	0.6680	-0.0690	0.7369
2.356	0.6588	0.0886	0.5702
2.435	0.6497	0.2439	0.4057
2.513	0.6407	0.3933	0.2474
2.592	0.6318	0.5329	0.0989
2.670	0.6231	0.6594	-0.0363
2.749	0.6145	0.7697	-0.1552
2.827	0.6060	0.8611	-0.2551
2.906	0.5976	0.9312	-0.3336
2.985	0.5894	0.9784	-0.3891
3.063	0.5812	1.0015	-0.4203
3.142	0.5732	1.0000	-0.4268

sigma*tm=	2.650 (-)
tm=	8.4 hr

Rmax (maximum resulting scour accounting for the duration of the storm in relation to the beach response time)		K&D (1993) Eq. 13
Rmax/Rinf = (1/2)*(1-cos(2*sigma*tm))		
Rmax/Rinf =	0.223 (-)	
Rmax=	63 ft	

Figure A-7-3: Storm induced beach erosion calculations for transect T-2 continued.

APPENDIX

Caltrans Sycamore Cove Wave Runup Study

Beach erosion calculation using the Kriebel and Dean (1993) model for storm induced beach erosion per FEMA (2018) Coastal Erosion Guidance Document No. 40.

by	J. Ramsden	9/4/2018
checked	Y. Li	9/7/2018

References:

(1) U.S. Department of Homeland Security, Federal Emergency Management Agency (FEMA), (2018a). Guidance for Flood Risk Analysis and Mapping - Coastal Erosion. Guidance Document No. 40, February, 2018.

(2) Kriebel, D.L. and R.G. Dean (1993). Convolution Method for Time-Dependent Beach-Profile Response. Journal of Waterway, Port, Coastal, and Ocean Engineering, American Society of Civil Engineers, Vol. 119, No. 2, March/April, 1993.

Calculate the maximum horizontal erosion potential, Rinf, for a beach backed by a low sand berm:
Calculate the results for the transect cooincident with offshore profile T-4.

Rinf = [S(Wb-hb/m)]/[B+hb-(S/2)]		FEMA (2018), Eq. 2-1
S=increase in water level due to storm surge and static wave setup		FEMA (2018), Eq. 2-2
Wb (surf zone width) = Wo + (hb/A)^(3/2)		K&D (1993), Eq. 23, Note K&D use xb for Wb
Wo (distance from the still-water shoreline to the virtual origin of the concace equilibrium profile form)		K&D (1993), Eq. 16b, Note K&D use xo for Wo
Wo = ht/(3*m)		
ht (depth at which the linear slope is tangent to the concave profile)		K&D (1993), Notes below Eq. 16b
ht=(4*A^3)/(9*m^2)		
A (beach profile parameter)		FEMA (2018) Eq. 2-8
A=0.09973*ln(D50)+0.309 (ft^(1/3))		
D50=	0.486 mm	From worksheet Grab Sample Data
A=	0.237 ft^(1/3)	FEMA (2018) Eq. 2-8
m (beach face slope)=	0.209 (-)	From worksheet Beach slopes
ht=	0.136 ft	
Wo=	0.2 ft	
hb (depth of breaking waves)	35 ft	From Beach wave runup worksheet
Wb=	1774 ft	
S=	7.32 ft	Storm surge above MHHW + (eta_bar). Note that most high water events are associated with extremely high tides and thus the storm surge residual is not very large. Thus, taking the 100 year SS (including El Nino effects) of 7.88 ft, NAVD and subtracting the MHHW level of 5.31 ft yields 2.57 feet. Note that for the highest recorded water level the residual was only 1.8 ft. Thus, use of 2.6 feet for the storm surge elevation above normal tides appears reasonable.
B (berm height above MSL)	9 ft	From Spreadsheet Profile Data 072418-v3_with foreshore slopes.xlsx, worksheet Slopes, cell I69 and converted to MSL
Rinf=	297 ft	

Figure A-7-4: Storm induced beach erosion calculations for transect T-4.

Now determine the time response of the storm using K&D Eq. 13.			
Rmax = Rinf *(1/2)*(1-cos(2*sigma*tm))			K&D (1993) Eq. 13
sigma = pi/TD			K&D (1993) text below Eq. 8
TD (storm duration) during which water levels are elevated above normal	10	hr	Of the top 10 water levels from the Santa Monica gauge only one showed a significant and prolonged residual (i.e. the highest water event on 11/29/1982 (i.e. the 82/83 El Nino) with a max. residual of 1.8 ft. The next highest residual for a high water event was 0.7 ft but these residuals were not of any significant duration. Take total duration of event at 20 hours but divide by 2 in reconition that the tide swing over each 12 hour period will reduce the water level significantly below the storm induced water level.
sigma=	0.314159	1/hr	
beta (ratio of the erosion time scale to the storm duration)			
beta=2*pi*(TS/TD)			K&D (1993) Eq. 11
TS (erosion time scale)			
TS=C1*(Hb^(3/2))/(g^(1/2)*A^3)*(1+(hb/B)+((m*xb)/hb))^(-1)			K&D (1993) Eq. 31
C1 (from linear fit between equation and numerical model data)			
C1=	320		
Hb (breaking wave height)=	27.1	ft	From Beach wave runup worksheet
TS=	38001	s	
TS=	10.6	hr	
beta=	6.63	(-)	

Iterate to determine tm — K&D (1993) Eq. 12

sigma*tm	exp(-(2*sigma*tm)/beta)	cos(2*sigma*tm)-(1/beta)*sin(2*sigma*tm)	Diff
1.571	0.6227	-1.0000	1.6227
1.649	0.6081	-0.9641	1.5722
1.728	0.5939	-0.9045	1.4984
1.806	0.5800	-0.8226	1.4026
1.885	0.5664	-0.7204	1.2868
1.963	0.5532	-0.6005	1.1537
2.042	0.5402	-0.4658	1.0060
2.121	0.5276	-0.3197	0.8472
2.199	0.5152	-0.1656	0.6809
2.278	0.5032	-0.0075	0.5107
2.356	0.4914	0.1508	0.3406
2.435	0.4799	0.3053	0.1745
2.513	0.4687	0.4524	0.0163
2.592	0.4577	0.5883	-0.1306
2.670	0.4470	0.7098	-0.2628
2.749	0.4365	0.8137	-0.3772
2.827	0.4263	0.8976	-0.4713
2.906	0.4163	0.9595	-0.5431
2.985	0.4066	0.9976	-0.5911
3.063	0.3971	1.0113	-0.6142
3.142	0.3878	1.0000	-0.6122

sigma*tm=	2.513	(-)
tm=	8.0	hr

Rmax (maximum resulting scour accounting for the duration of the storm in relation to the beach r			K&D (1993) Eq. 13
Rmax/Rinf = (1/2)*(1-cos(2*sigma*tm))			
Rmax/Rinf =	0.345	(-)	
Rmax=	102	ft	

Figure A-7-5: Storm induced beach erosion calculations for transect T-4 continued.

APPENDIX

A-8 ROCK SLOPE PROTECTION SIZE AND SCOUR CALCULATIONS

Caltrans Sycamore Cove - Wave Runup Study

Toe scour calculations and armor sizing.

by J. Ramsden	9/5/2018	Modified by J. Ramsden	4/23/2019
checked Y. Li	9/7/2018	Checked: R. Bottcher	4/23/2019

Purpose: Calculate Rock Size using the Hudson formula and toe scour.

References:

1) U.S. Army Corps of Engineers, 2006. "Coastal Engineering Manual" (CEM)
2) Sumer & Fredsoe (S&F), 2002. "The Mechanics of Scour in the Marine Environment." World Scientific Publishing Co., Pte. Ltd., New Jersey.
3)FEMA, (2015). "Coastal Wave Setup," Guidance Doc. No. 44, November, 2015.
4) FEMA, (2005). "Wave Setup - FEMA Coastal Flood Hazard Analysis and Mapping Guidelines Focused Study Report", February, 2015.
5) CIRIA (2007). "The Rock Manual - The Use of Rock in Hydraulic Engineering," 2nd Ed. CUR, CIRIA, C683.
6) Bradbury, A., J. Rogers, and D. Thomas, (2012). Toe Structures Management Manual. Project: SC070056/R, prepared by Halcrow Group Ltd. for Environment Agency, Bristol, UK.

	value	units	symbol	
Acceleration due to gravity	32.18	ft/s^2	g	
Water unit weight	64.0	lb/cf	γ_w	Typical for seawater
Fresh water unit weight	62.4	lb/cf	γ_w	
Rock specific weight	2.65	(-)	γ_r/γ_w	Typical value assumed
Rock unit weight	165.36	lb/cf	γ_r	
delta	1.62	(-)	Δ	CEM Table VI-5-22
1/Revetment slope (i.e. cotangent of slope)	1.50	(-)	$\cot(\alpha)$	Assumed revetment slope
Revetment slope	0.67	(-)	$\tan(\alpha)$	
Revetment slope	33.7	deg.	α	

Deep water significant wave height	Hm0 (100-yr)	21.7	ft	From SWAN model results
Deep water peak wave period	Tp	20.0	sec	From SWAN model results
Deep water mean wave period	Tm01	18.2	sec	=Tp/1.1, CIRIA (2007), Eq. 4.62
Deep water wave length	Lo	1693	ft	=(g/(2*pi))*(Tm01^2)
Deep water wave steepness	Hm0/Lo	0.0128	(-)	
Breaking wave steepness	Hb/Lo	0.016	(-)	FEMA (2015), Fig. 2-5
Ratio of breaking wave height to depth	kappa=Hb/d	0.78	(-)	hb=Hb/kappa FEMA (2015) , last paragraph pp. 15
Breaking wave height	Hb	27.1	ft	FEMA (2015), last paragraph pp. 20

Figure A-8-1: Rock slope protection size calculations.

Site specific and Storm Related Information																	
Project Location	Average Return Interval	Bed elev. based on bottom envelope of historic lidar and beach survey for this study	Still Water Surface, no wave setup	Caltrans plans elevation of road	Road elevation above seabed	Freeboard CEM Table VI-5-24 pp. VI-5-75	Depth d=WS-zb	Static wave setup FEMA (2015) Guid. No. 44 Eq. 3-2	Root mean square dynamic wave setup FEMA(2005) Dean et al. Eq. 7	Dynamic wave setup FEMA(2015) Guid. No. 44 Eq. 3-17	Wave setup FEMA(2015) Guid. No. 44 Eq. 3-1	Depth including wave setup d+eta	Offshore (incident) wave height	depth limited wave height Hs=0.6*d CEM Eq. II-4-10 pp. II-4-4	Minimum of prev. two columns	Hrms For depth limited breaking waves CIRIA (2007) Eq. 4.59	Local wavelength CEM Eq. II-1-11 pp. II-1-7
Post Mile &	ARI	z_b	WS	z_c	h_c	R_c	d	eta_bar	eta_rms	eta_hat	eta	d'	Hmo	Hs	Hs	Hrms	L_p
(Sea Level Rise Scenario)	(yr)	(ft, NAVD88)	(ft, NAVD88)	(ft, NAVD88)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)'	(ft)	(ft)	(ft)	(ft)	(ft)
PM 4.2 (2095 high)	100	6	14.1	40	34	25.9	8.1	3.6	1.6	3.3	6.9	15.0	21.7	9.0	9.0	7.1	322
PM 4.2 (2070 high)	100	6	11.3	40	34	28.7	5.3	4.1	1.7	3.4	7.6	12.9	21.7	7.7	7.7	6.1	262
PM 4.2 (2050 high)	100	6	9.8	40	34	30.2	3.8	4.4	1.8	3.5	8.0	11.8	21.7	7.1	7.1	5.6	222
PM 4.2 (2020)	100	6	8.0	40	34	32.0	2.0	4.8	1.8	3.7	8.4	10.4	21.7	6.3	6.3	5.0	161
PM 4.0 (2095 high)	100	2	14.07	60	58	45.9	12.1	2.9	1.5	3.1	6.0	18.0	21.7	10.8	10.8	8.6	394
PM 4.0 (2070 high)	100	2	11.32	60	58	48.7	9.3	3.4	1.6	3.2	6.6	15.9	21.7	9.6	9.6	7.6	346
PM 4.0 (2050 high)	100	2	9.82	60	58	50.2	7.8	3.7	1.6	3.3	7.0	14.8	21.7	8.9	8.9	7.0	317
PM 4.0 (2020)	100	2	8.02	60	58	52.0	6.0	4.0	1.7	3.4	7.4	13.4	21.7	8.1	8.1	6.4	278

Figure A-8-2: Rock slope protection size calculations continued.

Site specific and Storm Related Information				Calculate Revetment Armor Size and Weight				Calculate Wave Induced Scour Depth for Sand Adjacent to RSP						Recommended Scour for RSP	
Project Location	Average Return Interval	Bed elev. based on bottom envelope of historic lidar and beach survey for this study	Still Water Surface, no wave setup	Hudson equation median rock weight kD=2.0 CEM Eq. VI-5-67 pp. VI-5-73	Convert to D50 based on the volume of a cube	Hudson equation median rock weight kD=5.8 CEM Eq. VI-5-67 pp. VI-5-73	Convert to D50 based on the volume of a cube	ratio of depth to wave length	factor for use in calculating scour depth S & F (2002) Eq. 7.19 pp. 353	relative scour depth for revetment S & F (2002) Eq. 7.18 pp. 353	S=(S/H)*H for revetment S & F (2002) Eq. 7.18 pp. 353	Reduction by half for irregular waves S&F (2002) pp. 355	Width of scour hole at toe of revetment S & F (2002) pp. 362	Scour depth below grade for use	Elevation bottom of scour
Post Mile &	ARI	z_b	WS	W_{50}	D50	W_{50}	D50	h/Lp	f(α)	S/Hrms	S	S	W	S	bed
(Sea Level Rise Scenario)	(yr)	(ft, NAVD88)	(ft, NAVD88)	(lb)	(ft)	(lb)	(ft)	(-)	(-)	(-)	(ft)	(ft)	(ft)	(ft)	(ft, NAVD88)
PM 4.2 (2095 high)	100	6	14.1	20500	5.0	7100	3.5	0.025	0.113	1.36	9.7	4.85	36.3	9.0	-3.0
PM 4.2 (2070 high)	100	6	11.3	13100	4.3	4500	3.0	0.020	0.113	1.81	11.1	5.55	29.4	9.0	-3.0
PM 4.2 (2050 high)	100	6	9.8	10000	3.9	3400	2.7	0.017	0.113	2.26	12.7	6.34	24.9	9.0	-3.0
PM 4.2 (2020)	100	6	8.0	6900	3.5	2400	2.4	0.013	0.113	3.48	17.3	8.66	18.1	9.0	-3.0
PM 4.0 (2095 high)	100	2	14.07	35800	6.0	12300	4.2	0.031	0.113	1.03	8.9	4.44	44.3	6.0	-4.0
PM 4.0 (2070 high)	100	2	11.32	24600	5.3	8500	3.7	0.027	0.113	1.23	9.4	4.68	39.0	6.0	-4.0
PM 4.0 (2050 high)	100	2	9.82	19700	4.9	6800	3.5	0.025	0.113	1.39	9.8	4.90	35.7	6.0	-4.0
PM 4.0 (2020)	100	2	8.02	14800	4.5	5100	3.1	0.022	0.113	1.66	10.6	5.31	31.3	6.0	-4.0

Figure A-8-2: Rock slope protection size calculations continued.

Site specific and Storm Related Information				Calculate Wave Induced Scour Depth for Sand Adjacent to Secant Wall								Recommended Scour for Secant Wall	
Project Location Post Mile & (Sea Level Rise Scenario)	Average Return Interval ARI (yr)	Bed elev. based on bottom envelope of historic lidar and beach survey for this study z_b (ft, NAVD88)	Still Water Surface, no wave setup WS (ft, NAVD88)	1/(beach slope) cotan(α) (ft/ft)	Beach slope α (rad)	Offshore significant wave height H_s (ft)	Deep water mean wave length L_m (ft)	Water depth above beach level h_t (ft)	Relative depth h_t/L_m (-)	Bradbury et al. (2012) Eq. B.2 S_t/H_s (-)	Scour depth S_t (ft)	Scour depth S_t (ft)	Scour elevation z_b-S_t (ft, NAVD88)
PM 4.2 (2095 high)	100	6	14.1	4.8	0.21	21.7	1693	8.1	0.005	0.44	9.6	10	-4
PM 4.2 (2070 high)	100	6	11.3	4.8	0.21	21.7	1693	5.3	0.003	0.27	6.0	10	-4
PM 4.2 (2050 high)	100	6	9.8	4.8	0.21	21.7	1693	3.8	0.002	0.17	3.7	10	-4
PM 4.2 (2020)	100	6	8.0	4.8	0.21	21.7	1693	2.0	0.001	0.03	0.7	10	-4
PM 4.0 (2095 high)	100	2	14.07	10.0	0.10	21.7	1693	12.1	0.007	0.54	11.8	12	-10
PM 4.0 (2070 high)	100	2	11.32	10.0	0.10	21.7	1693	9.3	0.006	0.43	9.3	12	-10
PM 4.0 (2050 high)	100	2	9.82	10.0	0.10	21.7	1693	7.8	0.005	0.36	7.7	12	-10
PM 4.0 (2020)	100	2	8.02	10.0	0.10	21.7	1693	6.0	0.004	0.26	5.7	12	-10

Figure A-8-2: Rock slope protection size calculations continued.