CALIFORNIA COASTAL COMMISSION
NORTH CENTRAL COAST DISTRICT
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SAN FRANCISCO, CA 94105
PHONE: (415) 904-5260
FAX: (415) 904-5400
WEB: WWW.COASTAL.CA.GOV

F10a

2-20-0282 (Caltrans' Gleason Beach Highway 1 Realignment)

November 6, 2020

EXHIBITS

Exhibit 01 – Gleason Beach Blufftop Erosion and Highway 1(2019)
Exhibit 02 – General Project Location
Exhibit 03 – Gleason Beach Project Overview
Exhibit 04 – Project Area Visual Overview(2019)
Exhibit 05 – Gleason Beach at Scotty Creek (2020)
Exhibit 06 – Gleason Beach at Scotty Creek Parking (2019)
Exhibit 07 – Gleason Beach Blufftop Erosion (1972-2009)
Exhibit 08 – Gleason Beach and Shoreline Armoring (1988)
Exhibit 09 – Gleason Beach Erosion and Shoreline Debris (2020)
Exhibit 10 – Caltrans Gleason Beach Emergency Repairs
Exhibit 11 – Gleason Beach 2019 Closures
Exhibit 12 – Scotty Creek Bridge Impact Mapping and Flood Zone
Exhibit 13 – Proposed Highway 1 Scotty Creek Bridge
Exhibit 14 – Proposed Public Access Improvements
Exhibit 15 – Proposed Scotty Creek Beach Access
Exhibit 16 – Impacts to Scotty Creek Habitat
Exhibit 17 – Sonoma County Board of Supervisors Authorization 2018
Exhibit 18 – WRECO Geotech and SLR Analysis
Exhibit 19 – Conceptual Public Access Plan
Exhibit 20 – ESHA and Wetlands Impacts Overview
Exhibit 21 – Impacts to Coastal Terrace Prairie ESHA Habitat
Exhibit 22 – Impacts to Myrtle's Silverspot butterfly ESHA Habitat
Exhibit 23 – Impacts to CRLF ESHA Habitat
Exhibit 24 – Commission Staff Ecologist's Memo (2020)
Exhibit 25 – Caltrans Conceptual Mitigation Plan (2020)
Exhibit 26 – Caltrans Mitigation Funding Assurance Letter
Exhibit 27 – Impacts to Wetlands
Exhibit 28 – Coastal Hazards Clean-up In Lieu Fee Program

Source: Caltrans (2018)

Exhibit 1
CDP 2-20-0282
Page 1 of 1

Legend

Project Location

Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community

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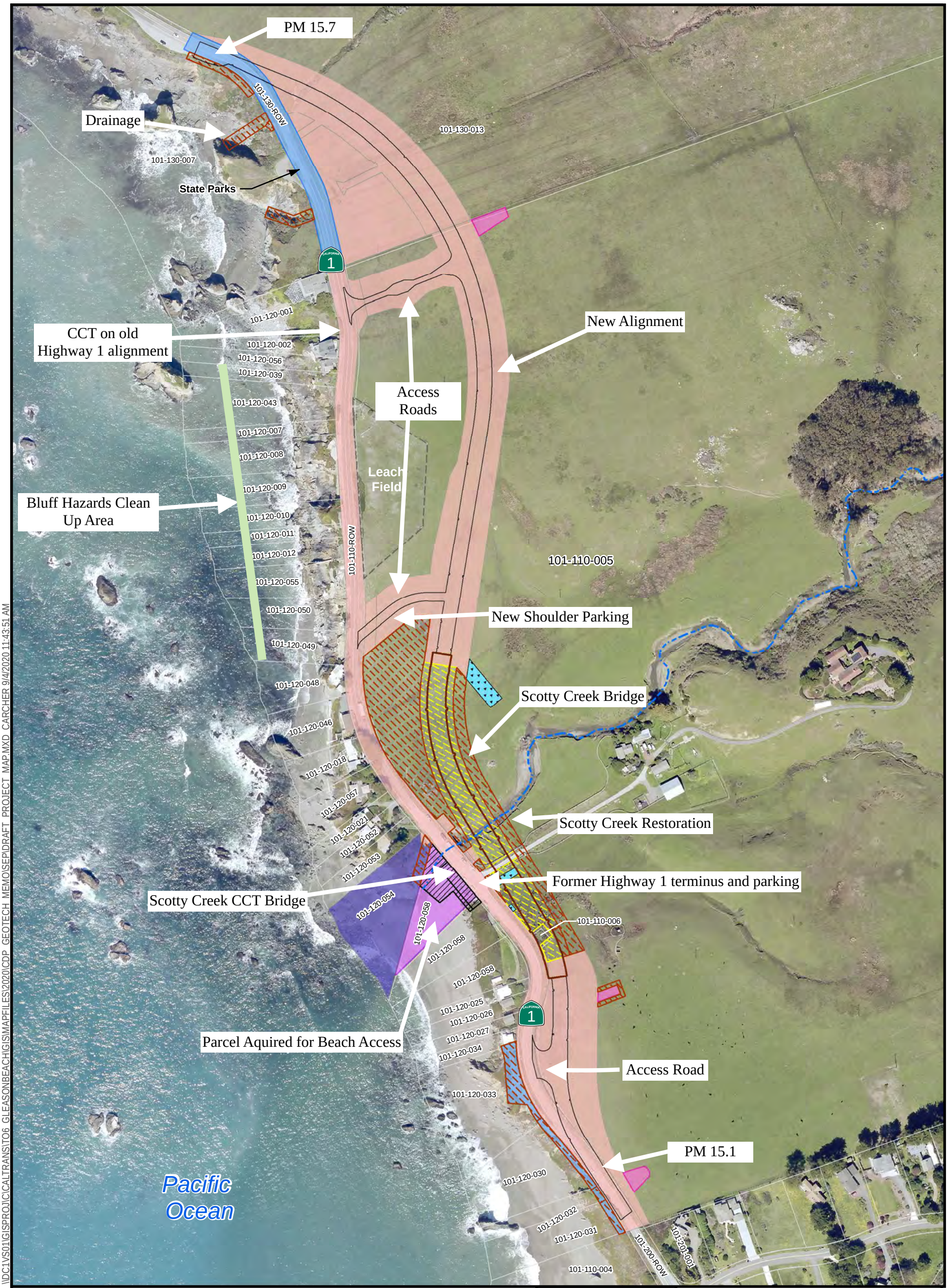
FIGURE 1
REGIONAL LOCATION
Gleason Beach Roadway Realignment Project
Coastal Development Permit Application
State Route1
PM 15.1-15.7, EA 0A0200
Sonoma County, California

\\BROOKSIDE\GIS_SHARE\ENBG\00_PROJ\C\CALTRANS\TO6_GLEASONBEACH\GIS\MAPFILES\2017\CDP\NOVEMBER\FIG1_REGIONAL_LOCATION_MAP.MXD 11/28/2017 10:40:39 AM

Source: Caltrans (2020)

Exhibit 2
CDP 2-20-0282
Page 1 of 1



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LEGEND

- Parcels
- Roadway Realignment
- Bridge
- Scotty Creek

Right of Way

- Caltrans
- Caltrans Permanent Easement
- Caltrans Drainage Easement
- Caltrans Aerial Easement
- Caltrans Temporary Construction Easement/Rights
- Permanent Utility Easement/Permit to Enter/Construct
- California Coastal Conservancy
- Sonoma County
- State Parks

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Imagery Source:
Sonoma County 10-11-2013

Caltrans

DRAFT PROJECT MAP
GLEASON BEACH ROADWAY REALIGNMENT PROJECT
Gleason Beach Roadway Realignment Project
Post Mile 15.1-15.7, EA 0A0200
Sonoma County, California

Source: Caltrans (2020)

Exhibit 3
CDP 2-20-0282
Page 1 of 1

Source: Coastal Records Project (2019)

Gleason Beach at Scotty Creek

Source: Caltrans (2020)

Gleason Beach Parking at Scotty Creek

Source: Coastal Records Project (2019)

Gleason Beach Bluff 1972 and 2009

1972

2009

Source: www.californiacoastline.org

Source: Coastal Records Project (2019)/WRECO

Gleason Beach 1988

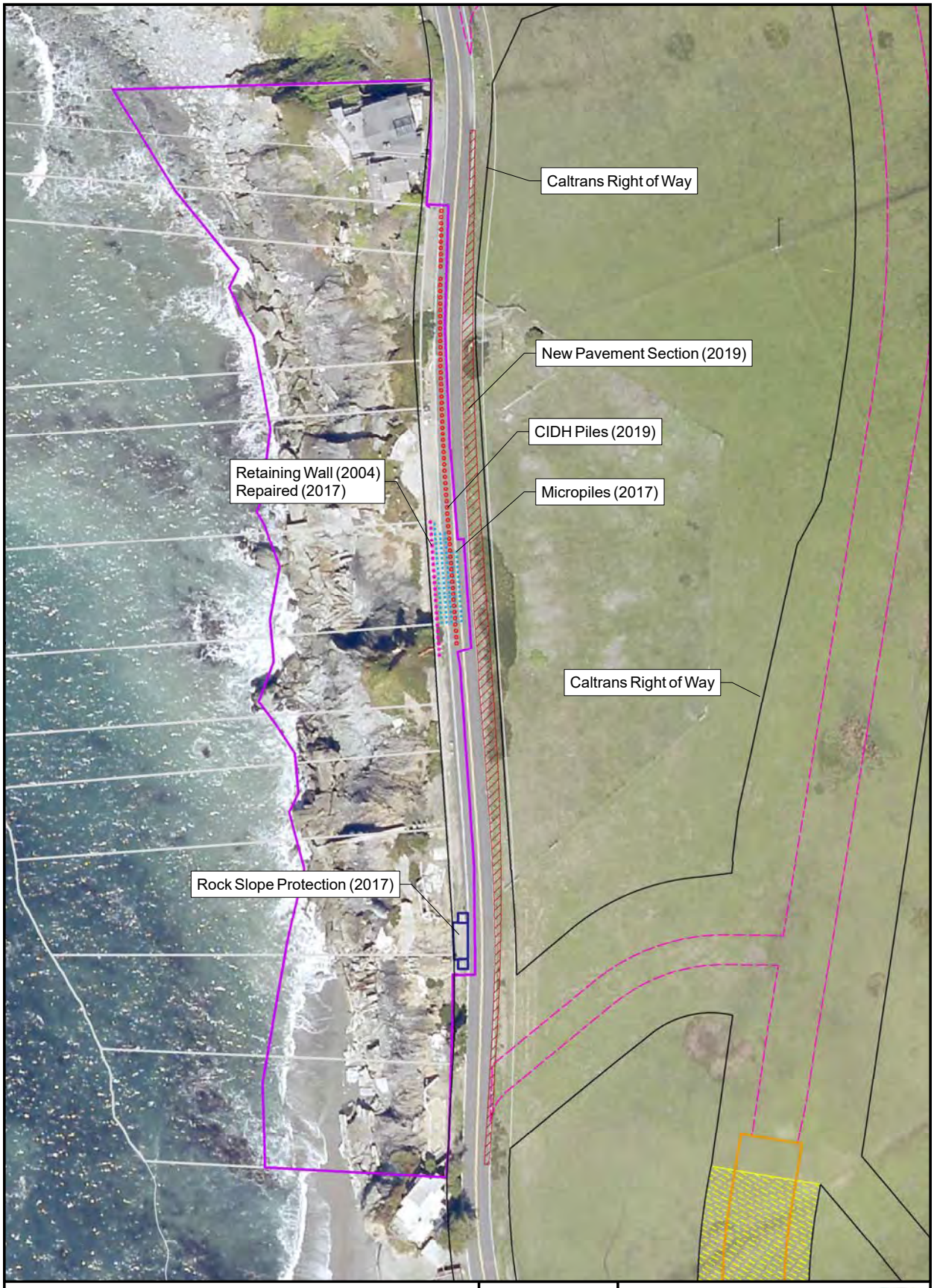
Source: Sonoma County/Helfrich

Gleason Beach Bluff Shoreline 2020

Source: Caltrans (2020)

Source: Caltrans (2020)

Source: Caltrans (2020)



LEGEND

- Coastal Hazards Clean-up
- Caltrans Right of Way
- Caltrans Aerial Easement
- County Parcels
- Roadway
- Proposed Bridge
- Rock Slope Protection (2017)
- Retaining Wall (2004)
- Micropiles (2017)
- New Pavement Section (2019)
- CIDH Piles (2019)

Imagery Source:
Sonoma County Spring 2018

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Caltrans

CALTRANS HIGHWAY REPAIRS

State Route 1
Post Mile 15.1-15.7, EA 0A0200
Sonoma County, California

Exhibit 10
CDP 2-20-0282

Source: Caltrans (2020)

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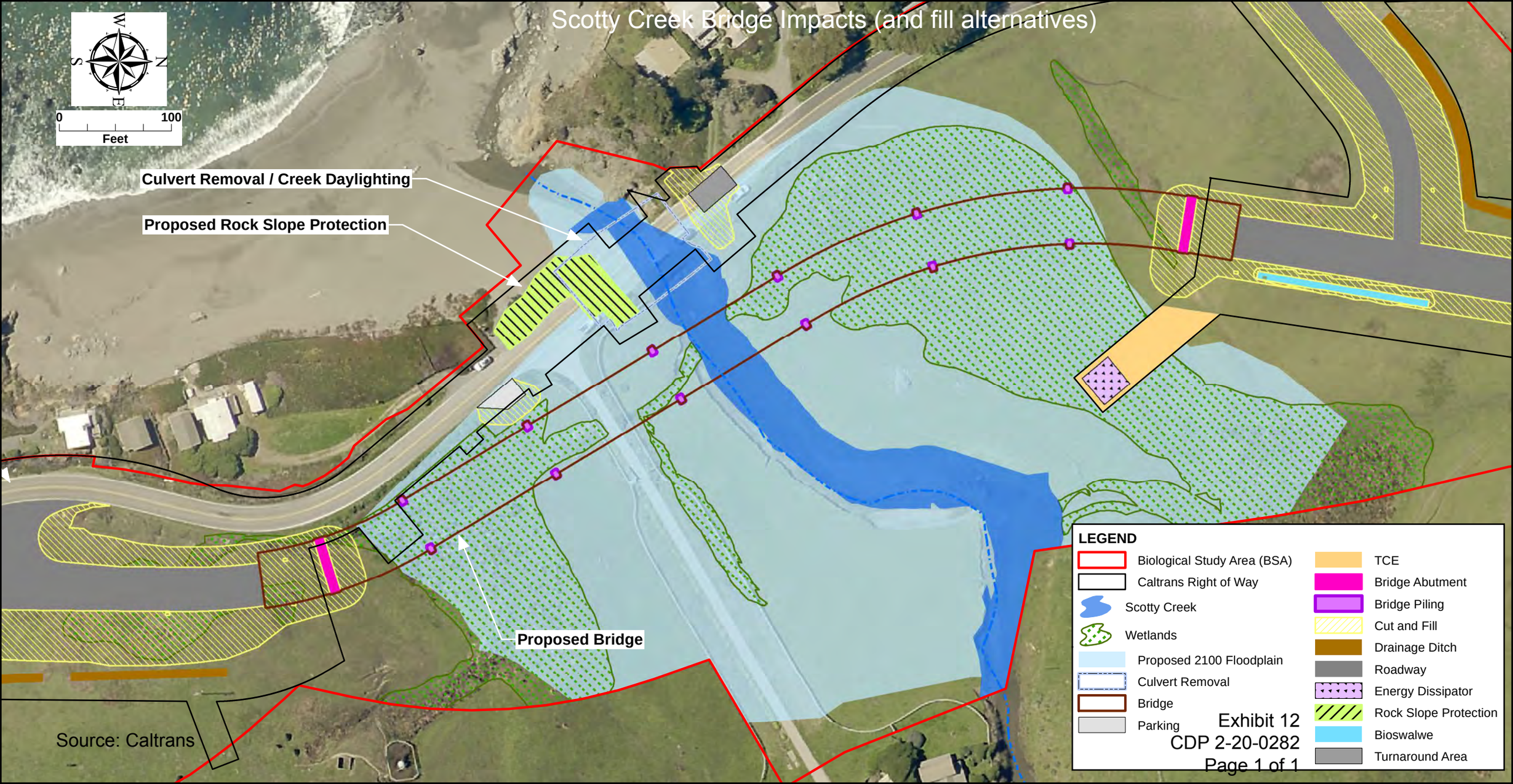
2019 Highway 1 Road Closures

Source: The Press Democrat (2019)

Exhibit 11
CDP 2-20-0282
Page 1 of 1


Scotty Creek Bridge Impacts (and fill alternatives)
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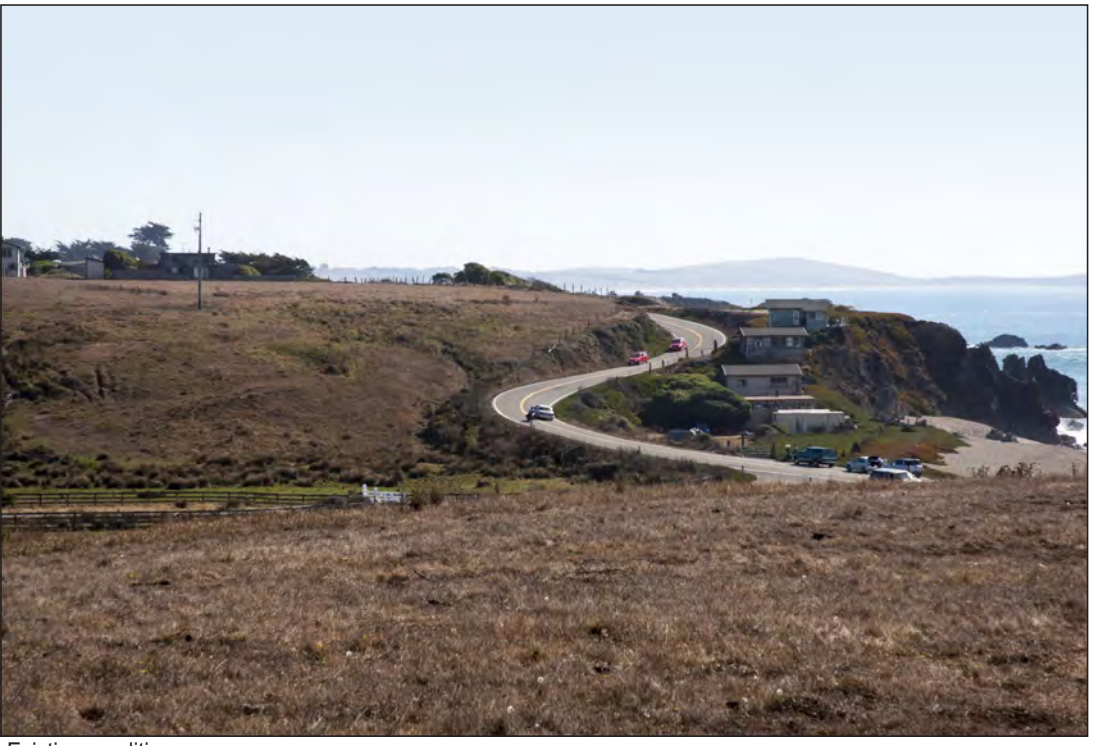
Culvert Removal / Creek Daylighting
Proposed Rock Slope Protection
Proposed Bridge
Source: Caltrans
LEGEND
Biological Study Area (BSA)
Caltrans Right of Way
Scotty Creek
Wetlands
Proposed 2100 Floodplain
Culvert Removal
Bridge
Parking
TCE
Bridge Abutment
Bridge Piling
Cut and Fill
Drainage Ditch
Roadway
Energy Dissipator
Rock Slope Protection
Bioswalwe
Turnaround Area
Exhibit 12
CDP 2-20-0282
Page 1 of 1

Source: Caltrans

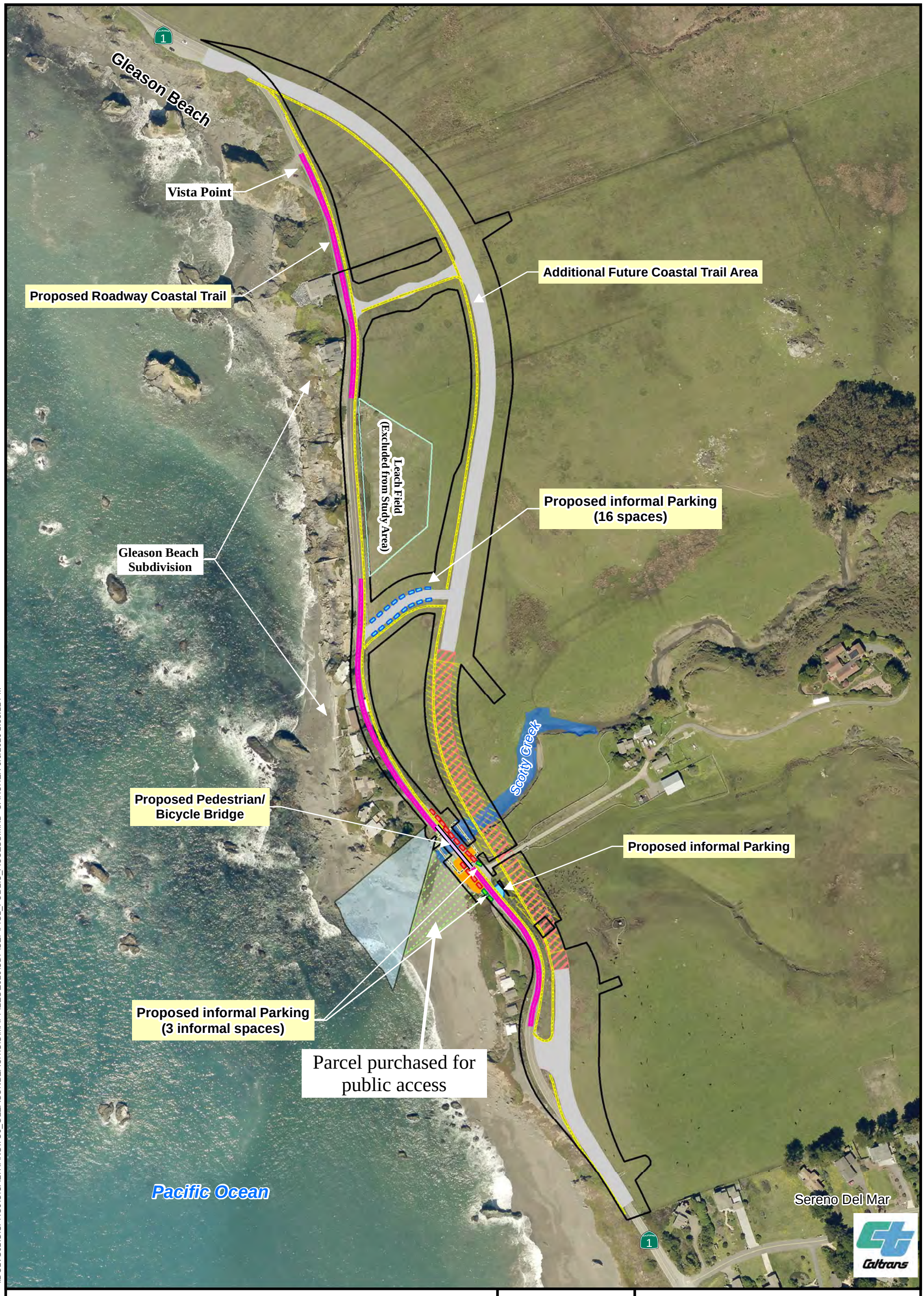
View from Gleason Beach 2020 Design
(Note: CCT Bridge not shown.)



Existing condition

Proposed condition

Source: Caltrans
(2015 Design Before Updates)



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LEGEND

- Caltrans Right of Way
- Clatrans Aerial Easement
- Scotty Creek

PROPOSED PROJECT

- Roadway
- Proposed Bridge
- Culvert Removal
- Rock Slope Protection
- Vehicle Access

Note: Habitat restoration will occur along sections of relinquished SR 1 as roadway sections are removed

PUBLIC ACCESS ELEMENTS

Parking

- Existing Informal Parking to Remain
- Existing Informal Parking to be Removed
- New informal Parking
- Proposed Pedestrian/Bicycle Bridge

Beach Access

- County Parcel Acquired for Beach Access
- Public Land (owned by CA Coastal Conservancy)

Coastal Trail

- Coastal Trail

Imagery Source:
Sonoma County Spring 2018

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FIGURE 1
PROPOSED GLEASON BEACH ROADWAY REALIGNMENT PUBLIC ACCESS COMPONENTS
Gleason Beach Roadway Realignment Project
Coastal Development Permit Application
State Route 1
Post Mile 15.1-15.7, EA 0A0200
Sonoma County, California

Source: Caltrans

Proposed Highway 1 alignment: bridge, looking east from Gleason Beach

Note: CCT Bridge design depicted is illustrative and not final.

Proposed Highway 1 alignment: bridge detail, looking north east from Gleason Beach and existing Highway 1 alignment

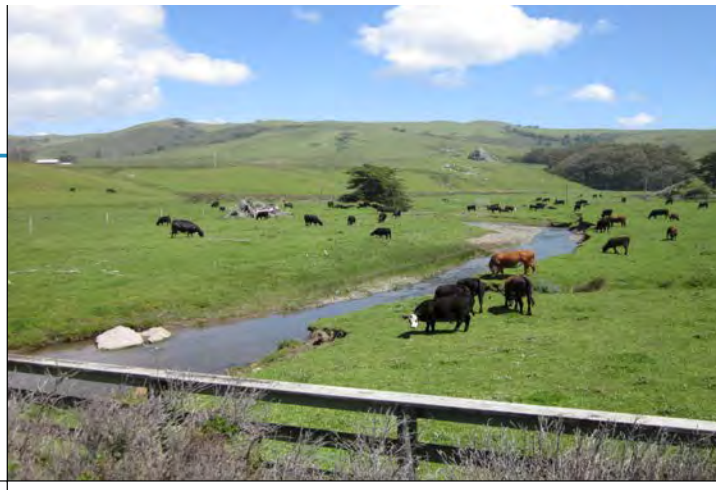
Source: Caltrans

Proposed Highway 1 alignment: bridge detail, looking north

Source: Caltrans

Scotty Creek: Existing

- Limited tidal flow
- Incised banks, no riparian vegetation
- Grazing along the creek



Source: Caltrans

County of Sonoma Agenda Item Summary Report Clerk of the Board 575 Administration Drive Santa Rosa, CA 95403	**Agenda Item Number:** (This Section for use by Clerk of the Board Only.)
To: Board of Supervisors	
Board Agenda Date: April 17, 2018	**Vote Requirement:** Majority
Department or Agency Name(s): Permit and Resource Management (Permit Sonoma)	
Staff Name and Phone Number: Gary Helfrich	**Supervisorial District(s):** 5
Title: Realignment of Highway 1 between Postmile 15.1 to 15.7 at Gleason Beach.	
Recommended Actions:	
Approve resolution authorizing the California Coastal Commission to consolidate approvals required for this project into a single Coastal Permit to be processed by the Commission.	
Executive Summary:	
Despite three decades of efforts on the part of both private property owners and Caltrans to stabilize this section of the coast, landslides have destroyed most of the homes west of Highway 1. The bluff is now at the edge of the roadway and Highway 1 is frequently closed to repair landslide damage and reinforce the bluff. To provide reliable connectivity along the Sonoma Coast, Caltrans is proposing a realignment/planned retreat project that moves Highway 1 away from the ocean. The project falls within the jurisdiction of both the Coastal Commission and Sonoma County and the Coastal Act and the Sonoma County Local Coastal Program are the standard of review for the project. While carefully designed to balance impacts to coastal resources, the scope of this project cannot avoid creating significant impacts to the natural environment and visual resources. Under Local Coastal Program policies, most projects that create significant impacts to coastal resources are prohibited. For example, a public road is not an allowed use in the environmentally sensitive habitat areas, wetlands, or agriculturally-designated lands found along the new road alignment, but avoidance of impacts often creates new impacts to other resources. For example, to avoid impacts to Scotty Creek, Tribal resources, and wetlands, Caltrans will construct an 850-foot long bridge that will be the largest structure on the Sonoma Coast, creating new visual impacts that are not allowed under Local Coastal Program policies protecting scenic resources. Because a project of this scope and complexity cannot be redesigned to conform to Local Coastal Program policies, the County would need to amend the Coastal Program to explicitly allow for the project before processing the Coastal Permit application. Amending the Local Coastal Program,	

Source: Sonoma County

approval of the amendment by the Coastal Commission, local processing of a Coastal Permit for realignment, and final approval by the Coastal Commission are separate actions that will create significant project delay.

Per Section 30601.3 of the Coastal Act, the Coastal Commission can process the project under a single consolidated Coastal Permit at the request of Caltrans and Sonoma County. A consolidated Coastal Permit can be approved without a Coastal Program amendment because the Commission has the authority to balance conflicting Coastal Act requirements in a way that can allow development that might not otherwise be approved due to inconsistencies with the Local Coastal Program.

Coastal Commission and Caltrans estimate that consolidation will expedite delivery of this urgently needed project by 24 month and allow Caltrans to secure available funds.

Discussion:

Coastal Commission and Caltrans staff have been working in partnership with Sonoma County, under the leadership of Supervisor Hopkins, to create a realignment project for Highway 1 at Gleason Beach that will be a statewide model for planned retreat and protection of coastal resources. Detailed information, photos, and a project map can be found in the attached Coastal Commission project mitigation memo to Caltrans.

If the County chooses to directly maintain local control, the project approval requires the County to amend the Local Coastal Program to accommodate the project, submit the amendment to the Coastal Commission for certification, and then process the local Coastal Permit. After the County process is complete, a separate Coastal Permit would be processed by the Coastal Commission for the portion of the project that is within their jurisdiction. This consecutive approach would likely add at least 24 months to the approval process.

While the County cannot approve this project without amending the Local Coastal Program, the Coastal Act recognizes that projects may raise unavoidable conflicts policies of the Act and Section 30007.5 grants the Coastal Commission authority to, at the request of the local agency, consolidate permitting actions to resolve these conflicts “in a manner which on balance is the most protective of significant coastal resources.”

The County was concerned that a consolidated Coastal Permit process may not adequately consider needs of the local community and the County’s vision for this important section of the Sonoma Coast, maintaining local control over the project design, scope, and mitigation measures was very important. In addition, the County was concerned that relocation of Highway 1 would leave the County responsible for maintaining a failing road in the old right-of-way. To address these concerns, Caltrans, Coastal Commission, and Sonoma County worked in partnership to draft a $10 million Coastal Permit mitigation package. These measures will be included in Coastal Commission staff’s recommended conditions of approval for the consolidated Coastal Permit and include:

(1) Acquisition and cleanup of vacant parcels along the Gleason Beach Bluff;

(2) A managed retreat fund to purchase any developed parcels on Gleason Beach from willing sellers;

Source: Sonoma County

(3) Development of a new ADA-compliant beach access point south of the Scotty Creek outfall;

(4) Fund construction of the California Coastal Trail within the project limits and provide alternative trail alignments to accommodate sea level rise and bluff erosion.

(5) Construct a new bike/pedestrian bridge across the mouth of Scotty Creek.

(6) Restoration of the lower reach of Scotty Creek for fish passage and on-site wetland mitigation plan during project construction

(7) Purchase the approximately 45 acres of the Ballard Ranch (6000 Highway 1 APN 101-110-005) westward of the new Highway 1 alignment for use as a public park, California Coastal Trail, and habitat restoration.

(8) Fund an endowment for restoration management.

Caltrans proposes allocating mitigation funds as follows:

Item (1): $3.2 million for purchase and cleanup of the vacant parcels west of the current Highway 1 alignment. This will restore approximately 850 feet of bluff.

Item (2): $1 million for future purchase of properties from willing sellers. The money may also be used to leverage other funding sources that require matching funds.

Items (3) and (4): $150,000 to develop the California Coastal Trail west of the new Highway 1 alignment and convert the existing Highway 1 roadway south of Scotty Creek into beach access parking. Land necessary for the Coastal Trail will be purchased as part of Item (7) below.

Item (5): $1 million to install and maintain a pedestrian bridge over Scotty Creek in the same location as the existing roadway.

Items (6), (7), and (8): $4.65 million for purchase of land westward of new Highway 1, restoration of Scotty Creek and funding for future property management.

Coastal Commission staff is recommending that all 8 mitigation measures be included in conditions of approval for this project.

Funding for the project, including these mitigation measures, must be approved by the California Transportation Commission. Any project requesting funding from the California Transportation Commission must be reviewed and recommended for presentation to the Commission by the Committee on Streets and Highways. Caltrans District 4 staff has had two meetings with the Committee and the project, including all mitigation measures, has been placed on the California Transportation Commission's May 16-17 agenda.

Senator Mike McGuire has sent a letter to the California Transportation Commission supporting the project and urging the Commission to fully fund the recommended mitigation.

If Caltrans is unsuccessful in obtaining funding, they are obligated to find alternative funding or submit a revised project to the Coastal Commission that avoided or significantly reduces the project's impact to coastal resources. It is highly unlikely that impacts from this project could be further reduced, given that after years of study, analysis, and consideration of dozens of alternatives the project EIR required adoption of a Statement of Overriding Considerations due to significant unavoidable impacts.

Source: Sonoma County

California State Parks, Sonoma County Regional Parks and Transportation and Public Works participated in meetings for this project. Despite the project being adjacent to Portuguese State Beach, California State Parks was unwilling to add the new handicapped accessible beach access point to the state beach. Transportation and Public Works, in February 16, 2017 letter to Caltrans (attached), expressed their strong opposition to accepting the old Highway 1 alignment into the County maintained system, since the existing road would primarily serve private property interests and the properties and the roadway itself will be lost to the ocean within the next several decades. In response, Caltrans agreed to maintain the existing road during construction of the realignment, remove the roadway along the vacant parcels once the new roadway is open, converting a short section at the north end of the project into a driveway serving the 2 remaining homes and an existing vista point, and build a new driveway from the realigned roadway to a small section of the existing roadway to serve 7 remaining homes at the southern end of the project and provide a second public access point to the beach. Maintenance costs will be shared between Regional Parks and the private property owners.

Sonoma County Regional Parks supported the concept of a new public park with beach access, parking, and construction of this portion of the California Coastal Trail. Regional Parks provided requirements for the Coastal Trail to Caltrans, including dedication of addition right-of-way necessary to accommodate erosion and sea level rise, and was clear that financial support is necessary to maintain the trail, beach access, and park. Caltrans agreed that Sonoma County will administer the mitigation funding, and may transfer any surpluses to operation and maintenance of public facilities. The County may also use the funding to leverage any additional funding that becomes available to implement project mitigation and/or maintain facilities that were developed as project mitigation.

The Coastal Commission will require cleanup and restoration of the vacant parcels and removal of unused sections of Highway 1 to mitigate visual impacts created by the new Highway 1 bridge. As mentioned above, Caltrans will be responsible for removal of old roadway along vacant parcels. In addition to restoration necessary to mitigate visual impact, Caltrans is also responsible for restoring approximately 450 feet of the upper bluff area to mitigate damage done by earlier efforts to stabilize the roadway. Gold Ridge Resource Conservation District has already partnered with Caltrans for habitat restoration on Ballard Ranch, it is likely Gold Ridge will work with the Caltrans and the County on bluff cleanup and restoration. Acquiring vacant parcels will be the responsibility of either Caltrans or the County. It is not known at this time if all of the owners of the vacant parcels are willing sellers. If Caltrans acquires the vacant parcels, the land would eventually be transferred to the County once the cleanup is complete, as Caltrans cannot hold land long-term that is not directly related to operation of transportation facilities.

While details regarding execution of the various actions and mitigation measures are not completely settled, the obligation to mitigate project impacts and meet the conditions of approval falls on Caltrans, not Sonoma County.

While consolidation relinquishes direct local control of the project, it allows Caltrans to avoid the rising costs of attempting to maintain the existing roadway, avoid repeated closures and eventual failure of Highway 1, and provide a safe, reliable transportation facility that will serve the Sonoma Coast for decades. The final project will serve as an exemplary model of how to effectively meet various State

Source: Sonoma County

mandates to address climate change, particularly sea level rise, in infrastructure planning, design, construction and operation.

Several well-attended public workshops have already been held for this project, and the Coastal Commission believes that it is important when considering a project of this scale and importance to provide the community and local leaders with an opportunity to provide input directly to the Commission. To provide this local forum, the Coastal Commission will hold their May 9-11 meeting in Sonoma County (location to be determined).

Prior Board Actions:

Strategic Plan Alignment Goal 2: Economic and Environmental Stewardship

The Highway 1 realignment project will create multimodal transportation facilities that are resilient to sea level rise and climate change while improving coastal access and restoring the lower reach of Scotty Creek. Consolidation of the Coastal Development Permit will expedite project delivery and allow Caltrans to secure project funding before the end of the fiscal year.

Fiscal Summary

Expenditures	**FY 17-18 Adopted**	**FY 18-19 Projected**	**FY 19-20 Projected**
Budgeted Expenses			
Additional Appropriation Requested			
Total Expenditures			
Funding Sources			
General Fund/WA GF			
State/Federal			
Fees/Other			
Use of Fund Balance			
Contingencies			
Total Sources			

Narrative Explanation of Fiscal Impacts:

Source: Sonoma County

Staffing Impacts			
Position Title (Payroll Classification)	**Monthly Salary Range** (A – I Step)	**Additions** (Number)	**Deletions** (Number)

Narrative Explanation of Staffing Impacts (If Required):
Attachments:
Draft Board of Supervisors Resolution Attachment A: California Coastal Commission Mitigation Memo To Caltrans Attachment B: California Coastal Commission Permit Consolidation Letter Attachment C: Sonoma County Transportation and Public Works Comment Letter Attachment D: Letter from Senator Mike McGuire
Related Items "On File" with the Clerk of the Board:
Caltrans Final EIR/FONSI SCH No. 2011022002

Source: Sonoma County

	Item Number: 18-
Date: April 17, 2018	Resolution Number:
	CPH17-0003 Gary Helfrich
	☐ 4/5 Vote Required

Resolution Of The Board Of Supervisors Of The County Of Sonoma, State Of California, Authorizing Consolidation By The California Coastal Commission Of A Coastal Permit To Realign Highway 1 From Postmile 15.1 to 15.7 At Gleason Beach

Whereas, in February of 2017, California Department of Transportation (Caltrans) has submitted an application to the County of Sonoma and the California Coastal Commission for realignment of Highway 1.

Whereas, Highway 1 is a critical transportation facility serving the Sonoma Coast.

Whereas, coastal erosion and landslides have caused resulted in severe damage to Highway 1 in the vicinity of Gleason Beach, requiring increasingly frequent road closures protect public safety and repair damage. Attempts to stabilize the bluffs have been unsuccessful and the roadway is now at the edge of an unstable 70-foot bluff.

Whereas, the project location falls within the jurisdiction of both the Coastal Commission and Sonoma County.

Whereas, the realignment project will create an 850-foot long bridge and approximately 0.6 miles of new roadway, creating visual and natural resource impacts that cannot be mitigated under Local Coastal Program policies

Whereas, Sonoma County cannot approve this project without a project-specific amendment to the Local Coastal Program.

Whereas, the Coastal Act recognizes that projects may raise unavoidable conflicts policies of the Act and Section 30007.5 grants the Coastal Commission authority to, at the request of the local agency, consolidate permitting actions to resolve these conflicts "in a manner which on balance is the most protective of significant coastal resources."

Whereas, Caltrans, the Coastal Commission, and Sonoma County worked in partnership to draft a Coastal Permit mitigation agreement that includes the following mitigation measures:

(1) Acquisition and cleanup of vacant parcels along the Gleason Beach Bluff.

(2) A managed retreat fund to purchase any developed parcels on Gleason Beach from willing sellers.

(3) Development of a beach access point south of the Scotty Creek outfall.

(4) Restoration of the lower reach of Scotty Creek for fish passage and on-site wetland mitigation plan during project construction

(5) Construct a new bike/pedestrian bridge across the mouth of Scotty Creek.

(6) Fund construction of the California Coastal Trail within the project limits and provide alternative trail alignments to accommodate sea level rise and bluff erosion.

(7) Purchase the approximately 50 acres between the realignment and ocean for use as a public park and habitat restoration.

(8) Fund an endowment for restoration management.

Whereas, consolidation of the Coastal Permit allows Caltrans to avoid the rising costs of attempting to maintain the existing alignment and avoid repeated closures of Highway 1 as the bluff continues to erode, and will expedite project delivery by 24 months.

Whereas, on January 25, 2018, Caltrans submitted a request for a consolidated Coastal Permit to the Coastal Commission.

Whereas, the Coastal Commission will hold their May 9-11 meeting in Sonoma County to hear this application and give the local community an opportunity to provide input, and avoid reduced public participation that may result from consolidation.

Now, Therefore, Be It Resolved that this project is an exemplary model of interagency coordination and cooperation working under various State mandates to create a major transportation infrastructure project that effectively addresses climate change, sea level rise, and protection of coastal resources.

Be It Further Resolved that the Sonoma County Board of Supervisors finds that project modifications and mitigation measures address concerns regarding maintaining local control and authorize the Coastal Commission process the project under a consolidated Coastal Permit pursuant to Section 30601.3 of the Coastal Act.

Supervisors:

Gorin: Rabbitt: Zane: Hopkins: Gore:

Ayes: Noes: Absent: Abstain:

So Ordered.

CALIFORNIA COASTAL COMMISSION
NORTH CENTRAL COAST DISTRICT OFFICE
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Revised March 20, 2018

TO: Bijan Sartipi, Caltrans District 4 Director

FROM: Tami Grove, Coastal Commission Development and Transportation Program Manager
Stephanie Rexing, Coastal Commission North Central Coast Acting District Manager

SUBJECT: **Mitigation for Gleason Beach Highway 1 Realignment Coastal Development Permit**

Project Background

The Sonoma Coast is a highly scenic, valuable resource for local residents, California citizens and visitors from afar. It offers unique, bucolic landscapes, rich cultural history, dramatic rocky Pacific vistas and abundant crop and livestock production. The special character of this area thus supports a strong tourism and agricultural economy. The proposed Gleason Beach Highway 1 Realignment project implicates many of the underlying coastal resources foundational to these economic drivers. Of particular note, within this stretch of coast, the mouth of Scotty Creek also opens onto one of only a handful of places in all of Sonoma County where a sandy beach area may be easily accessed; accordingly, it is explicitly called out for protection and improvement in the County's Local Coastal Program (LCP).

Coastal Panorama – Northern Gleason Beach
Source: https://www.youtube.com/watch?v=7lxVzi37w04&feature=youtu.be

Scotty Creek Sandy Beach with Access – Gleason Beach
Source: Sonoma County PRMD

Development in the Coastal Zone

Within the State's coastal zone, development (as broadly defined by the California Coastal Act of 1976) requires a coastal permit. The standard of review for these permits are the resource protection policies of Chapter 3 of the Act, which may also be locally applied through LCPs if the Coastal Commission has certified that an individual county or city's LCP is consistent with the State statute. Sonoma County has such a certified LCP. Given the significance of the coastline in California, the Coastal Act sets a very high bar for development to demonstrate consistency with numerous policies that protect resources such as wetlands, environmentally sensitive habitat areas, agricultural lands, public access and scenic areas. Thus, a variety of Coastal Act and LCP standards must be met, apart from NEPA and CEQA requirements, in order to allow development to proceed along the coast of California. While environmental assessments done under NEPA and CEQA provide helpful information to the coastal development permit process, the Coastal Act, including as implemented through LCPs, is a separate State law that establishes the standard of regulatory review for projects in the coastal zone. The differences between the three separate laws are particularly important regarding allowable uses and necessary mitigation relative to certain coastal resources.

Gleason Beach Project Need and Description

The proposed realignment of State Highway 1 at Gleason Beach (between PM 15.1 and 15.7) in Sonoma County is needed as the highway is extremely vulnerable to erosion from storms, landsides, drainage issues, and ongoing sea level rise. Caltrans has struggled to keep Highway 1 open over the last three decades as the shoreline has experienced an average rate of erosion of approximately 1-foot of erosion per year, with episodic storm events whittling away even larger segments through bluff failure. In fact, a portion of Highway 1 at the site today sits at the very edge of the bluff where it is being closely monitored by Caltrans for stability. Similarly, the properties seaward of the highway alignment have continued to erode, with at least 11 of the homes that were built on this stretch having been lost or removed as a result of collapses of the bluff. Attempting to combat this process over the years, property owners have installed shoreline armoring measures, both on the upper bluff and at the bluff toe, in an effort to protect their structures. Many of these measures failed to receive the necessary permits and are under active enforcement investigation by the Commission and the County. The disrepair and structural collapse of these homes and the armoring measures—along with efforts to shore up the highway—have resulted in hazardous and impassable areas along the bluff and shoreline.

Debris on Beach, Northern Aspect – Gleason Beach
Source: https://www.youtube.com/watch?v=7lxVzi37w04&feature=youtu.be

Culminating over a decade of planning with Sonoma County, the Coastal Commission and other agencies, Caltrans has proposed a carefully-designed realignment/planned retreat project to provide a safe, sustainable transportation facility for motorists, bicyclists and pedestrians that will survive coastal erosion over its design life and restore the lower reach and ocean outfall of Scotty Creek. Spurred by the urgency to keep Highway 1 functional in this fairly remote area, Caltrans is proposing a 4,000-foot long realignment that includes an 850-foot long and 28-feet high bridge that will avoid fill of wetlands and impacts to cultural resources. This alternative was chosen as the least-environmentally damaging feasible alternative after careful study of 20 other options. Notably, the overall effort represents a

significant achievement of the State's policies to resiliently adapt to climate change, particularly sea level rise. The project package also includes parallel construction of the California Coastal Trail with a pedestrian bridge over Scotty Creek following the removal of an existing box culvert and fill that will restore fish passage. Finally, the project additionally incorporates the necessary follow up actions required by earlier emergency permit issued by Sonoma County to allow roadway and bluff repairs to protect Highway 1.

Debris on Beach, Southern Aspect – Gleason Beach
Source: https://www.youtube.com/watch?v=7lxVzi37w04&feature=youtu.be

Standard of Review: California Coastal Act and the Sonoma County Local Coastal Program (LCP)

It is anticipated that the proposed project, which falls within the jurisdiction of both the Coastal Commission and Sonoma County, will be processed by the Coastal Commission as a consolidated permit. Therefore, the Coastal Act, with the Sonoma County LCP serving as guidance, will be the binding law upon which rests any approval of this project. Given the resource richness of the Gleason Beach area, including coastal wetlands, environmentally sensitive habitat areas (ESHA) (for such species as the endangered Myrtle Spot Butterfly, California Red-legged Frog and Coho Salmon), agricultural lands, ancient cultural resources, highly scenic visual resources and public access, the project presents special challenges for conformance under the Coastal Act. At the same time, it must also be noted that important aspects of the project respond to Coastal Act policies that require providing access to and along the coast and avoiding hazards.

A brief review of Coastal Act policy concerns raised by this realignment include Section 30240 which protects environmentally sensitive habitat areas against any significant disruption of habitat values and only allows uses dependent on those resources within those areas. In addition, Section 30233 generally prohibits any fill of wetlands, with allowances made only under a very strict set of circumstances.

Moreover, Section 30242, limits the ability to convert agriculture lands to nonagricultural uses unless continued agricultural use is not feasible. Each of these guiding policies is also reflected within specific Sonoma County LCP policies. Even though the realignment project has been designed to minimize impacts, it unavoidably remains at odds with aspects of each of these policies. In addition, for this memo, we delve more specifically into the visual resource protection policies of the Coastal Act and LCP and overview some of the inconsistencies raised by the project below.

Visual Resource Protection Policies and Impacts

Specifically, Coastal Act Section 30251 requires the protection of the scenic and visual qualities of coastal areas and establishes them as a resource of public importance. This section further dictates that permitted development be sited and designed to protect views to and along the ocean, that landform alteration be minimized, and that scenic coastal areas and be visually compatible with the character of surrounding areas. In addition, where feasible, Section 30251 requires restoration and/or enhancement of visual quality in visually degraded areas. Moreover, development "in highly scenic areas such as those designated…by local government" is required to be subordinate to the character of its setting. As previously stated, this area of the Sonoma County coast is especially visually unique and is designated by the County LCP to be a "key visual attribute and attraction." The project requires constructing a bridge that will be one of the largest man-made structures on all of the Sonoma Coast. Visual impacts created by this massive structure, set against the backdrop of the historic agriculture fields and rolling coastal hills, are squarely inconsistent with both Coastal Act and LCP requirements to protect coastal scenic and visual qualities.[1] At the same time, the project's overall design to avoid fill of wetlands and impacts to cultural resources requires this bridge structure.[2]

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[1] The County's LCP specifically amplifies these visual resource protection policies in several sections. For example, the LCP Land Use Plan (LUP) Rural Issues section explains that the most important rural design issues are visual quality and compatibility of development with the natural landscape. This section discusses ridgeline views, where "the contrast between the land and the sky make structural intrusions very obvious." Similarly, the LUP's Urban Design Concerns Building Scale section emphasizes giving particular attention to the integration of design with on-site conditions, notably with the size of structures in relation to surrounding features. LUP Policy 4 aims to minimize visual impacts to hillsides by constructing roads to fit the natural topography, and LUP Policy 6 similarly requires that visual impacts on terraces be minimized by designing structures in scale with the region's rural character. LUP Policy 7 expressly prohibits development in rural areas that projects above the ridgeline silhouette. The existing viewshed looking east from Gleason Beach and the existing Highway 1 is composed of layers of hillsides, terraces and ridgelines. The proposed 28-foot bridge structure will be directly in the foreground of these protected features and will extend above natural topography in full view in a predominantly rural area that would significantly obstruct the view looking inland from areas seaward of it, including Gleason Beach, one of the few accessible sandy beaches in Sonoma County.

The proposed bridge design also presents incompatibilities with the LUP Visual Resource community character policies. For example, LUP Policy 9 requires that development be sited and designed to fit the setting and be subordinate to the preexisting character of the site, and LUP Community Compatibility Section Recommendations 10 and 11 emphasize compatibility with existing community characteristics and establishes that structures be relatable in size and scale. Because this region is designated with the highest rating (i.e., "outstanding views") on the LCP's Visual Resources Map, it is also subject to criteria ensuring that development design compliments, and is in scale with, the surrounding environment and existing community characteristics. Caltrans' clear aim is to reflect the aesthetic qualities of the surrounding environment through the design selection of physical features of the bridge; however, the size and scale of the proposed structure nonetheless is visually obtrusive regardless of which design specifications for the roadway and bridge are selected. Since there is no other feasible alternative to minimize impacts of the large scale of the bridge, this feature is rendered inconsistent with the LUP policies that protect visual qualities in the project area. In addition, LUP Visual Resource policies require that special considerations be given to coastal views from vista points, stating that "(t)he viewshed from a vista point is even more sensitive than a major view since the viewer is stopped and can take full advantage of the visual experience."

[2] Caltrans' Final EIR/EA (dated June 2016) further confirmed that "the proposed project's aesthetic impacts would be significant and unavoidable and is therefore a mandatory finding of significance under CEQA because the project has the potential to degrade the quality of the environment and could have substantial adverse effects on human beings from a scenic resource standpoint." (Page 3-24).

Gleason Beach is a popular recreational area where future visitors will have prolonged views of the new bridge structure blocking inland ridgelines as demonstrated by the existing and simulated photos below. Moreover, current and proposed rock slope protections of the roadway at Scotty Creek add visual impacts to the overall viewshed. In addition, visitors are and will be exposed to views of the northern beach areas where substantial amounts of hazardous debris from collapsed structures and various shoreline armoring efforts are scattered across the bluff faces and along the shoreline. Caltrans' previous efforts to maintain Highway 1 have affected some 450 linear feet of this area in this manner. As such, this northern area affords many opportunities for restoring and enhancing visual quality subject to degradation, as articulated by Section 30251, through clean up and restoration as well as for providing mitigation of unavoidable visual impacts from the overall project.

Current Conditions at Scotty Creek on a Sunny Day
Source: Caltrans

Proposed Project – Visual Simulation
Source: Caltrans

Source: Sonoma County

Coastal Act Policy Conformance and Conflicts

Finally, while the realignment project raises inconsistencies with some Coastal Act policies, it also conforms to other policies, most notably public access and hazard avoidance policies. One cornerstone of the Coastal Act is Section 30210, which requires the Commission to provide "maximum access and recreational opportunities consistent with public safety needs." Sections 30211-30214 and 30221 similarly require that new development protect and affirmatively provide public access and recreational opportunities. Highway 1 is a critical transportation link to the rural Sonoma Coast, relied upon by residents, businesses and visitors for access and recreation purposes—as such, it is the primary, and often only, public access facility along the coast. When combined with robust multimodal and other mitigation measures, such as the California Coastal Trail and public parking provisions, the project can fulfill these important public access provisions.

Caltrans Work Area – Gleason Beach
Source: Coastal Commission

The proposed project also conforms to hazard avoidance policies in the Coastal Act such as Section 30253 which requires that new development minimize risks to life and property in areas of high geologic hazard; assure stability and structural integrity; and, not create or contribute to erosion or instability. By realigning the most vulnerable sections of Highway 1 inland to a location that will protect the roadway

connection from ongoing hazards for the design life of the new facility, particularly in light of sea level rise, Caltrans is achieving the policy direction of the Coastal Act and related LCP policies. Caltrans' required follow up actions under the Sonoma County emergency permit for previous storm repairs are also designed to achieve the hazard avoidance policies through this project and to lessen or mitigate other resource impacts. For example, the portion of the old Highway 1 alignment that is no longer needed and/or is actively subject to hazards will need to be removed/stabilized and restored, as will the debris field on the bluff and shoreline from previous failed road protection efforts. Not only will this reduce maintenance costs and help ensure stability, but restoration of the areas impacted by those activities will also add to minimizing and offsetting visual, habitat and public access impacts. And, finally, the restoration of the Scotty Creek floodplain will not only promote habitat values but it will also help reduce hazards created by flooding in the watershed.

When passing the Coastal Act, the Legislature recognized that projects may on occasion raise unavoidable conflicts between one or more of the statute's policies. Thus, Section 30007.5 directs that "such conflicts be resolved in a manner which on balance is the most protective of significant coastal resources." In this case, the Highway 1 realignment project appears to raise such conflicts, between hazard avoidance and public access on the one hand, and ESHA, wetland, agricultural and visual resource protection on the other. When applying these conflict resolution provisions, the Commission has a long precedential history of being very careful to discern if an unavoidable conflict in fact exists and whether there are no feasible alternatives that would achieve the objectives of the project without violating any Coastal Act resource protection policies. Moreover, the Commission has ensured that any approved project is fully consistent with a policy that affirmatively requires protection or enhancement of those resources and that the resulting project will result in tangible resource enhancement over existing conditions. In practice, another important aspect of determining what is "most protective" of significant coastal resource is ensuring that impacts are avoided, minimized and fully mitigated. In many such analyses, and as fully appears to be the case here, the nature and extent of the mitigation package becomes a critical piece of the analytic balancing.

Relative to the project impacts from wetland fill, encroachments into environmentally sensitive habitats and conversion of agricultural lands, Caltrans, the Commission and Sonoma County have negotiated certain project features and an important mitigation package. This includes restoration of Scotty Creek and other natural habitats onsite that support sensitive species present (such as salmonids, California Red-Legged Frog, and Myrtle Silverspot Butterfly) as well as implementation of native planting plans, performance criteria monitoring and an endowment for restoration management. Agricultural impacts are being mitigated through providing continuing agricultural grazing with appropriate buffers around habitat areas and pursuing conservation easement opportunities. The mitigation package for public access includes providing for California Coastal Trail improvements, including a pedestrian bridge over the restored Scotty Creek, ensuring adequate public parking opportunities, providing direct sandy beach access at Scotty Creek beach and creating a new regional park in partnership with Sonoma County in the project area.

The primary components of the mitigation package that require *additional* funding from the California Transportation are summarized below:

Caltrans' Request to CTC March 2018 for Additional $10 million

Final Components of Gleason Beach Coastal Development Permit Mitigation Package

1. **Offsetting Visual Resource Impacts**
   Funding contribution to Sonoma County for coastal hazards clean-up through a cooperative agreement focused on debris cleanup along shoreline and abandoned alignment area.

2. **Offsetting Public Access Impacts**
   A. Fund improvements to beach access south of Scotty Creek
   B. Fund pedestrian/bicycle bridge over the Creek to be managed by County
   C. Fund coastal trail improvements and repurpose remnants of existing State Route 1 to be transferred to County

3. **Offsetting Habitat Impacts**
   A. Implement Scotty Creek restoration for salmon and other species and on-site wetland mitigation plan during project construction
   B. Fund improvements to Scotty Creek riparian, Myrtle's Silverspot Butterfly, and California Red-Legged Frog habitat through Gold Ridge Resource Conservation District. Funding would provide for the acquisition of a conservation easement on the adjacent Ballard property, implementation of native planting plans, and an endowment for restoration management.

Part of the overall mitigation package will also include incorporating components that also mitigate hazards and visual resource impacts, and these too will be crucial for the Commission to be able to find that the project is – on balance – most protective of coastal resources, and to approve the project under the Coastal Act's conflict resolution provisions. In particular, and as emphasized above, visual mitigation will be critical in this spectacular coastal visual setting, particularly given the scale of bridge necessary for the project and its attendant impacts. Importantly, not only are there good opportunities at the site for removing visual blight, but those same actions also provide the added benefits of cleaning up debris from Caltrans' previous activities, removing public access impediments, and restoring the beach and bluff ecosystem to a more natural state.

Accordingly, through extensive collaboration, the Coastal Commission, Sonoma County and Caltrans have reached consensus on a mitigation package proposal that identifies a "Coastal Hazards Clean Up Area" along the bluff centered around the stretch where Caltrans' road stabilization efforts have occurred. The total length of the beach Clean-up Area is 1,114 linear feet for 15 properties. The 1,114 feet consists of 764 feet for 11 already demolished houses and segments of failed repairs of Highway 1,

Source: Sonoma County

50 feet for 1 red-tagged house, and 300 feet to be applied to properties that may become red-tagged in the future due to existing erosion conditions.

Within the 1,114 feet of Clean-up, 850 feet would be for the mitigation of the visual impacts being created by the introduction of the significant new bridge into this highly picturesque coastal setting. (Note that this subarea includes 450 linear feet of *upper* bluff debris area from Caltrans' efforts to repair and protect Highway 1 that must be cleaned up under emergency permit requirements; below that, on the *lower* bluff and *shoreline*, there is debris from failed homes and other structures that will be cleaned up as well, allowing Caltrans to receive mitigation credit to contribute toward offsetting the visual impacts of the bridge.) The overall result of this work is that there will be a remaining balance of 264 feet available as mitigation credit for future Caltrans improvements along the corridor with significant unavoidable visual impacts. Caltrans estimates the Clean-up cost at $4.2 million for the 1,114 feet ($3,770/LF), and would provide the funds to Sonoma County to implement the Clean-up.

If the California Transportation Commission approves the $4.2 million:

- Caltrans would be able to proceed in a timely fashion with the realignment project to protect and preserve the State's asset; provide for cost effective transportation and mobility for the community along the corridor; minimize future emergency repairs; meet mitigation requirement upfront through a financial contribution; secure sizable mitigation credit to be applied to offset significant impacts from future projects; and demonstrate partnering collaboration with CCC and Sonoma County to serve public needs.
- CCC and Sonoma County would meet their legal obligations in processing regulatory requirements for the project; expedite project delivery by as much as 24 months through a consolidated permit process; enhance coastal resources; and, achieve significant clean-up of sensitive beach areas within the project limits.
- Sonoma County would have sufficient funding to manage and implement the beach Clean-up and enhancement, along with taking over responsibilities for managing the remnant old Highway 1 access ways as part of a new regional park.

Gleason Beach Coastal Hazards Clean Up Proposal				
	Linear Feet	**Calculation** $3,770/LF	**Total**	**Rounded**
Project hazard/visual mitigation	850	Multiplied by $3,770	$3,204,500	**$3,200,000**
Future available mitigation credit	264	Multiplied by $3,770	$ 995,280	**$1,000,000**
Total	**1,114**		$4,199,780	**$4,200,000**

Remediating all of the Gleason Beach Coastal Hazards Clean Up Area at the same time will have cost savings. Moreover, combining the work with the removal of unneeded areas of pavement from the old Highway 1 alignment will reduce maintenance costs that are expected to transfer to Sonoma County Regional Parks when they assume management of the new park, including driveways to the existing houses and parking areas to serve the CCT and beach access. This final mitigation component proposal includes setting up a cooperative funding agreement between the County and Caltrans as a Shoreline Clean Up and Managed Retreat Fund that will be administered by the County per conditions of the eventual coastal development permit.

Source: Sonoma County

Caltrans 2017 Shotcrete Wall and Sluffing Debris along Highway 1, Bluff Face and Shoreline
Source: Caltrans

It is important to emphasize that the Coastal Act and the LCP mandate protection and restoration of visual resources in the Sonoma County coastal zone for present and future generations. The Coastal Commission has a long history of LCP and regulatory requirements for preserving the scenic character of the coastline and requiring mitigation for any unavoidable impacts, including in visually sensitive areas such as this. For example, Caltrans is familiar with requirements that the Commission has imposed for a number of years to ensure that bridge and roadway railings in coastal zone projects are see-through and attractive. In another example, the Commission required that the visual impacts created by the replacement of the Noyo River Bridge in Ft. Bragg in 1999 be mitigated by Caltrans as well. In that case, the new bridge was blocking several scenic views, including to the harbor area below. The Commission imposed a $1 million visual impact fee that Caltrans transferred to the City to support a new trail and other vista points to create alternative views. Notably, the landscape at Gleason Beach is a much more rural and scenic visual resource compared to the more urban cityscape of the town of Ft. Bragg, making the visual impacts created at Gleason's much more significant than those at Noyo. Of course, the Commission also commonly requires visual mitigation of impacts from projects by applicants other than Caltrans. One example is requirements for the protection of view corridors seaward of the Pacific Coast Highway in Malibu, either through the reservation of open space on developed lots or through the opening up of view corridors offsite by removing development that obstructs views.

In closing, the Gleason Beach Realignment is an opportunity for Caltrans to build a legacy project for the Sonoma coastline that not only provides a sustainable multimodal transportation facility that will be resilient to anticipated sea level rise changes during its design life, but that also dramatically improves the Scotty Creek riparian corridor and cleans up a section of shoreline to produce visual, resource and

public access benefits to offset project impacts. This forward-thinking project will additionally provide significant improvements to public coastal access as called for in the Sonoma County LCP and will allow Caltrans to avoid the rising costs of attempting to maintain the existing alignment as the public avoids experiencing repeated closures of Highway 1 within that precarious alignment. Undoubtedly, the final project will serve as an exemplary model of how to effectively meet various State mandates to address climate change, particularly sea level rise, in infrastructure planning, design, construction and operation.

Shoreline perspective of debris along Gleason Beach bluffs
Source: Sonoma County

Source: Sonoma County

CALIFORNIA COASTAL COMMISSION
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July 7, 2017

Mr. Gary Helfrich, Planner III
Sonoma County Permit & Resource Management Department
2550 Ventura Avenue
Santa Rosa, CA 95403

Subject: Sonoma County Coastal Development Permit Application CPH17-0003, Gleason Beach Realignment Project at Highway 1 PM 15.1-15.7, Sonoma County

Dear Mr. Helfrich:

Thank you for requesting our comments on the coastal development permit (CDP) application submitted by Caltrans for the proposed realignment of State Highway 1 at Gleason Beach (between PM 15.1 and 15.7) in Sonoma County. Storm, erosion, and other related damage over the years, including as showcased over the past few winters, have exposed the significant vulnerabilities of the roadway and underscored the importance of realigning the highway inland to resiliently adapt to the onward march of the ocean, particularly as sea level rise is expected to increasingly exacerbate those hazards. At the same time, the coastal resource value of this special area of the coast makes such a project difficult, even as Caltrans has attempted its best to try to avoid impacts to such resources as much as possible. We recognize and appreciate all of the collaborative efforts over the past nearly two decades to arrive at an appropriate project, and strongly believe that much has been accomplished to bring us to this point in time. Thus, we encourage the County to keep all of those past efforts and decisions in mind as the project is reviewed, as we want to be able to continue to move the project forward with that foundation as a base. We also need to ensure that we all carefully examine the project for its consistency with all applicable Coastal Act and Sonoma County Local Coastal Program (LCP) policies, including to determine if impacts to resources have been avoided and minimized, and that any remaining unavoidable impacts have been appropriately mitigated.

Thus, the purpose of this letter is provide you and Caltrans our feedback on the proposed project, both in terms of the CDP application process and the substantive resource issues engendered. On the former, and as we have long advised, the proposed project raises LCP inconsistency issues that will require an LCP amendment to resolve if the County chooses to continue with a CDP application locally as opposed to allowing Caltrans to pursue a consolidated CDP application through the Commission. We continue to recommend that a consolidated process would clearly be the most streamlined approach available, and stand ready to pursue that route if the County changes its position and agrees to same. With respect to the latter, the proposed project raises a slew of coastal resource issues, including inconsistencies with certified LCP policies regarding

Source: Sonoma County

Attachment B

Exhibit 17
CDP 2-20-0282
Page 23 of 35

public access, public views, environmentally sensitive habitat, coastal hazards and agriculture. This letter provides our current best recommendations on both the process and the resource issues associated with the project.

CDP Application Process

As we have long discussed with both the County and Caltrans, the proposed project raises certain LCP inconsistencies that cannot be mitigated away (see also further detailed discussion on such inconsistencies below). For example, the project is not an allowed use in either environmentally sensitive habitat area (ESHA) or agriculturally-designated land. Unlike more subjective policies, such as those that require compatibility, for example, such use restrictions are absolute and objective, and no amount of mitigation can change the project in such a way as to make it an ESHA or agriculturally allowed use. Similarly, certain LCP policies are also objective and absolute in similar ways, such as LCP Land Use Plan (LUP) Policy 7 that outright prohibits development in this location that would silhouette above the ridgeline. Again, no amount of project modifications or mitigations will be able to make the project consistent with the LCP for such a standard.

When a project cannot be made consistent with the LCP through project changes and/or other mitigations, such as this project, the County cannot approve a CDP consistent with the LCP. Put a different way, the County lacks the legal authority to approve such a project as consistent with the LCP. Absent an LCP amendment specifically designed to modify the LCP to explicitly allow for the project under the LCP, any County approval – no matter the mitigation associated with it – would be extremely problematic, including the potential for such an approval to be appealed to the Commission and denied because it cannot be found LCP consistent.

In such a situation, the County has a choice: either first amend the LCP to allow an LCP-consistent CDP approval, or, because the project also requires a Commission CDP, agree to a consolidated CDP process where the Commission processes a CDP application for the entire project. The reason that the consolidated CDP process can be pursued without an LCP amendment is because it would be processed under the Coastal Act with the LCP as guidance, and the Commission has the unique ability to balance conflicting Coastal Act requirements in a way that can allow development that might otherwise require denial (such as in this case, non-resource dependent development in ESHA). Under the Coastal Act, Caltrans has requested a consolidated CDP process, and we have agreed that this makes the most sense in this case, but it requires consent of all three parties. We strongly suggest that the County agree to such a consolidated process.

Absent consolidation, at least three separate processes will be required for the proposed project: (1) a LCP amendment to address LCP inconsistencies, (2) a County CDP (appealable to the Commission) *after* the LCP amendment is certified by the Commission, and (3) a Coastal Commission CDP for project elements located in our retained jurisdiction. In the case of an appeal of a County CDP action, a fourth process would be required, namely the appeal process through the Commission. Even on parallel tracks, such processes are complicated, and each will take significant time. With consolidation, there is only one process, and this has the potential to significantly streamline the ability to permit the project. That is not to say that the process would be 'fast-tracked' in some sort of way that would preclude meaningful review and input. Quite to

Source: Sonoma County

the contrary, we would aim to ensure maximum participation, including local County hearings, to facilitate the public's ability to participate as required by the Coastal Act.

Thus in short, the County has a choice of procedural paths. Like the applicant, we strongly encourage a consolidated permit, primarily because it is much more efficient and because it is very likely that regulatory review of the proposed development could proceed many months (if not years) sooner, delivering the important safety benefits of the project to the public in a more timely manner. The County could still hold hearings and take comments on any required non-CDP discretionary approvals locally to facilitate local public participation, and we are more than willing to work with the County to ensure additional local input occurs as well, possibly through local workshops and/or Commission hearings near the project area. Absent consolidation, we strongly encourage the County to work with us as soon as possible on the necessary LCP amendment so that consideration of same does not completely sidetrack the CDP review process.

Coastal Resource Issues

Sonoma County's Permit and Resource Management Department (PRMD)'s May 16, 2017 letter to Caltrans outlines project aspects that raise questions about consistency with the LCP. Included in the County's concerns are impacts to visual resources, coastal access, recreation, and hazard mitigation. In addition to such impacts and issues, the discussion below identifies additional inconsistencies with the project as it is currently proposed, and identifies potential mitigations (separate from the need for an LCP amendment, as discussed above).

Public Views

The proposed project is within an area of outstanding scenic quality that shapes the character of the local community and is a "key visual attribute and attraction" to many coastal visitors every day. The County's May 16, 2017 letter reviews some of the significant visual impacts associated with the Scotty Creek Bridge, particularly the introduction of a large urban structure against the backdrop of the historic Ballard Ranch and windswept coastal hills.

As indicated in the LCP LUP Rural Issues section, the most important rural design issues are visual quality and compatibility of development with the natural landscape. This section discusses ridgeline views, where "the contrast between the land and the sky make structural intrusions very obvious." The LUP's Urban Design Concerns Building Scale section emphasizes giving particular attention to the integration of design with on-site conditions, notably with the size of structures in relation to surrounding features. LUP Policy 4 aims to minimize visual impacts to hillsides by constructing roads to fit the natural topography, and LUP Policy 6 similarly requires that visual impacts on terraces be minimized by designing structures in scale with the region's rural character. LUP Policy 7 specifically prohibits development in rural areas that projects above the ridgeline silhouette. The existing viewshed looking east from Gleason Beach and the existing Highway 1 is composed of layers of hillsides, terraces and ridgelines. The proposed 28-foot bridge structure would be erected directly in the foreground of these protected features, in front of protected ridgeline/hillside views, above natural topography in a predominantly rural area that would significantly obstruct the view looking east from Gleason Beach. All of these project elements are significantly inconsistent with multiple LUP policies.

Source: Sonoma County

The proposed bridge design also appears to be incompatible with LUP Visual Resource community character policies. LUP Policy 9 requires that development be sited and designed to fit the setting and be subordinate to the preexisting character of the site, and LUP Community Compatibility Section Recommendations 10 and 11 emphasize compatibility with existing community characteristics and establishes that structures be relatable in size and scale. Because this region is designated with the highest rating, of "outstanding views," on the LCP's Visual Resources Map, it is also subject to criteria ensuring that development design compliments and is in scale with the surrounding environment and existing community characteristics. Though it is clear that the applicant's aim is to maintain the aesthetic qualities of the surrounding environment through the design selection for physical features of the bridge, the size and scale of the proposed structure would be visually obtrusive regardless of which design specifications for the roadway and bridge are selected. If there is no other feasible alternative to minimize impacts of the scale, this feature of the project will be inconsistent with the LUP policies that protect visual qualities in the project area.

In addition, LUP Visual Resource policies require that special considerations to be given to coastal views from vista points, stating that "(t)he viewshed from a vista point is even more sensitive than a major view since the viewer is stopped and can take full advantage of the visual experience." Similarly, Coastal Act Section 30251 calls for considering and protecting the scenic and visual qualities of coastal areas as resources of public importance, and it also protects views, aims to minimize landform alterations, and requires development to be designed to be visually compatible with the character of the surrounding area, "and, where feasible, to restore and enhance visual quality in visually degraded areas." The proposed bluff top viewing area overlooks existing development, failing shoreline protective devices, and debris along the bluff face and shoreline from collapsed structures. Clearly, this area affords many opportunities for restoring and enhancing visual quality within the project site through visual impact avoidance and mitigation.

In addition to requiring an LCP amendment due to fatal LCP inconsistencies related to projecting above the ridgeline, all of these significant public viewshed impacts will require mitigation. Fortunately, the project area's resource richness also provides a strong foundation for an appropriate mitigation package that can help to offset such impacts, including through reenvisioning the area seaward of the Highway realignment north of Scotty Creek as a public access and open viewshed area (see Potential Project Mitigations section below).

Public Recreational Access

The Commission has given high priority to completing and maintaining the California Coastal Trail (CCT) for pedestrian and other users with an alignment of the Trail that is suitable to the landscape, including connecting historically-used paths and public recreational areas. The optimal CCT location for lateral pedestrian and recreational bicycling access is an alignment within the sight, sound and scent of the sea, not along a highway that would result in close exposure to motor traffic and its attendant noise, fumes, and hazards. When no other option exists, then the Commission and our local government partners often look to public road right-of-ways for CCT connections as a last resort. The LUP's Recreation Chapter reflects a desire for the establishment of a CCT system and the County has been a pioneer in championing its completion. Although the CDP application alludes to the consideration of a recreational trail

Source: Sonoma County

spanning Scotty Creek, if feasible, the County should require the applicant to analyze which metrics are used to determine feasibility, and request that the applicant present a feasible alternative beyond locating this segment of the CCT directly adjacent to the proposed realigned highway. We continue to believe that options exist for using prefabricated, rustic-styled, fiberglass pedestrian bridges that are easily placed by cranes and can be moved to accommodate changing conditions. Examples of such bridges can be found at many State Parks, including the Pescadero Marsh in Central California.

The LUP's Recreation Allowable Activities section suggests that accessways should be developed to provide disabled people with the opportunity to enjoy the shoreline. The Access Plan and LUP Policy 54 ("Gleason Beach Subdivision Access") declares that "the possibility of developing [disabled] access is excellent here, but area for parking and restrooms is limited." The Plan also assigns a Priority 1 (highest) to the site for both acquisition and development. Caltrans' proposed boardwalk and stairway proposed in the pending application do offer some improvements for public access opportunities, but they may not be the best location or configuration. The incorporation of a high quality, disabled-accessible vista site within the project area should receive further consideration. Moreover, a full range of potential pedestrian access ways to Gleason Beach should be explored, including a stairway over the rock slope protection (RSP) (if that feature remains in the final design), and potential acquisition of any needed public access easements. In addition, if the RSP is included as part of the final project design the applicant will likely have to mitigate for its coastal resource impacts, including its footprint, its effect on retaining sandy materials, and its passive erosion (or 'coastal squeeze') impacts, such as through in-lieu beach and shoreline access mitigation. The County should require that the applicant develop a feasible alternative that identifies an access point south of Scotty Creek consistent with Coastal Act and LUP policies. LUP Recreation Policy 2 requires a mandatory offer of access dedication as part of any CDP that involves an accessway listed on the Access Plan, and thus this sort of dedication must also be evaluated.

Finally, the CCT might take advantage of disturbed areas along the existing Highway 1 alignment as it is rehabilitated as part of this project. The trail should be designed with managed retreat in mind as shoreline and bluff top conditions change. Of course, both termini of the CCT segment at this site must be carefully planned to connect to desired trail extensions to the north and south. Finally, more discussion is needed with various stakeholders about the long term operation and management of all public access components associated with this project prior to the completion of permit processing. In addition, it is important to note that because Highway 1 is between the first public road (i.e., the current inland extent of the right of way) and the sea and it provides public access to the coast, Coastal Act Section 30609.5 prohibits its transfer to any private entity unless public access, including access through the CCT, is permanently protected.

Again, as with public view impacts, all of these significant public recreational access impacts will require mitigation. In addition to the mitigations identified above, the area seaward of the Highway realignment north of Scotty Creek also presents potential to help offset such impacts as a fundamental part of the project (see Potential Project Mitigations section below).

Coastal Habitats

The Coastal Act defines environmentally sensitive habitat areas (ESHA) as any area in which

Source: Sonoma County

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. The project site is rich with biological resources, significantly including California Red Legged Frog (CRLF), Myrtle Silverspot Butterfly (MSB), and Coho and Steelhead Salmon. Habitat categories present at the site that are considered ESHAs by the LCP include coastal terrace prairie, wetlands, Scotty Creek (an anadromous fish stream), sandy beach and coastal bluff. Sonoma's LUP and Coastal Act Section 30240(a) protect ESHA against significant disruption of habitat value and only allows uses dependent on the resources in ESHA.

Myrtle Silverspot Butterfly
The MSB is a federally endangered species that uses dog violet (*Viola adunca, or V. adunca)* as a larval host. *V. adunca* is distributed throughout the impacted project area, and MSB's use of the plant qualify them as ESHA. Section 30240(b) requires that development adjacent to ESHA be sited and designed to prevent impacts which would significantly degrade those areas. Similarly, LUP Policy 58 specifies that development "shall be compatible with continuance of such resources." In order to be consistent with Coastal Act Section 30240 and LUP Policy 58, the project would have to avoid the designated *V. adunca* stands altogether. As currently designed, project impacts cannot be mitigated since both the Coastal Act and LUP prohibit non-resource dependent uses in ESHA (as indicated above, requiring an LCP amendment) and prohibit adverse impacts to ESHA.

Between the two proposed northern access roads near post mile 15.6, Figure 7 of the CDP application shows a significant tract of MSB habitat permanently impacted by the new realigned right of way. However, as the project need relates to avoiding coastal hazards, it is imperative that the new highway be protected from erosive forces for at least the project lifetime. The section of proposed roadway most impacting ESHA is more than 250 feet inland from the existing highway. Overlap between larval habitat and highway occurs for approximately 50 feet on the northbound route of the highway. The proposed north access road at PM 15.6 would also impact ESHA, inconsistent with Coastal Act and LUP policies.

Commission staff is in the process of drafting a separate memo describing how impacts to sensitive species may be avoided, minimized, and appropriately mitigated when unavoidable (i.e., through and LCP amendment and/or a consolidated CDP). These suggestions will be made available at a later date. We recommend that County staff work with the applicant to include measures from this guidance into the project or as conditions of approval to achieve consistency with LUP (and cited Coastal Act sections) policies requiring protection of ESHA.

California Red-Legged Frog
The seven pilings that are proposed to support the bridge, and the bridge itself will be over wetlands, thereby constituting wetland fill by causing shading impacts. The pilings' installation will likely affect populations of wetland species, most notably the California Red Legged Frog (CRLF), in addition to other sensitive plant and animal species. The applicant should provide a map of the proposed pilings in relation to wetlands and uplands and clarify the impacts in square footage to these habitats.

With a primary goal to restore habitat for Coho and Steelhead Salmon, Caltrans' Gleason Beach

Source: Sonoma County

Riparian Restoration Plan element of the proposed project may not adequately address restoration measures appropriate for sustaining CRLF populations. Improvements to Scotty Creek implemented through this Plan may provide benefits to species of special biological significance, such as Coho and Steelhead, but will not necessarily substitute for additional mitigation requirements for impacted CRLF habitat. As it is further developed, the County should ensure that the applicant's Restoration Plan emphasizes restoration of habitat suitable for this species. Recommended mitigation approaches can be found in the following paragraphs.

Wetlands, Creeks and Riparian Areas
Section 30231 establishes that water quality shall be maintained and restored by controlling runoff and "maintaining natural vegetation buffer areas that protect riparian habitats, and minimizing alteration of natural streams." The project's proposed construction of new roadway will introduce new sources of stormwater runoff, and the bridge and pilings will alter the wetland community by creating newly shaded areas, which will alter the shade regime for wetlands below the roadway and impact vegetation. In order to assure consistency with Section 30231, the applicant should address how revegetation efforts in these impacted areas will be appropriate in this changed environment. It is unclear whether such a change could meet the definition of a temporary impact. The application materials submitted thus far reference that compensatory mitigation for temporary habitat impacts to wetlands will occur on or off-site. Replacement off-site may only be a suitable option for mitigating permanent impacts, where onsite mitigation is infeasible.

The application includes a description of how roadway runoff directly into the wetland and riparian area will be captured and filtered, but does not include a description for the management or treatment of stormwater runoff from the bridge above. The applicant should produce a drainage plan for the bridge, outlining how the project will avoid, minimize and mitigate impacts to the wetland and riparian area, and maintain water quality.

Echoing Coastal Act Section 30231, LUP Policy 11 prohibits the removal of vegetation from the riparian corridor, while Policy 24 prohibits the removal of vegetation from wetlands unless it is shown to be essential for the habitat viability. Sonoma County's Implementation Plan defines a riparian corridor as a line or belt of vegetation following the course of a river or stream on the immediate banks and appearing visually or structurally separate from the surrounding landscape. Also, riparian habitat existing outside of the designated Biological Survey Area – such as around the lagoon where Scotty Creek empties onto Gleason Beach – will be impacted by project activities, and this also must be understood as a part of project impacts. Likewise, Policy 17 of the LUP Environmental Resources Management Recommendations excludes all vehicles from wetlands. With construction of the bridge and pilings occurring directly adjacent to and over wetlands, the applicant should include measures to ensure that construction vehicles avoid wetland and upland areas and can obtain consistency with this policy. Also, the applicant should produce a map to illustrate the location of construction and staging areas in relation to wetlands, riparian areas, and upland ESHA.

The County LUP cites Coastal Act Section 30233 and allows for dredge and fill for certain uses and the realignment may not qualify as an incidental public service (see Section 30233(a)(4)). If it is an allowed use, dredge and fill of wetlands is permissible "where there is no feasible less

Source: Sonoma County

environmentally damaging alternative, and where feasible mitigation measures have been provided to minimize adverse environmental effects." The applicant explored a range of potential alternatives to relocating the highway through a wetland, but was constrained to the chosen area, which was identified as the least damaging project alternative. The proposed highway realignment does not appear to qualify as an incidental public service. If the proposed highway realignment is not an allowable use under 30233, some proposed dredge and fill may not be permissible. Specifically, portions of the proposed project area are comprised of seasonal wetlands. Sonoma County LUP Policy 22 prohibits the fill of seasonal wetlands "to accommodate development." Consistency with LUP Policy 22 might be possible through requiring the applicant provide project construction plans, which specifically illustrate proposed locations of highway pilings in relation to the 2.29 acres of seasonal wetland, the 3.56 total acres of wetland, and Scotty Creek, to assure that fill will not occur in wetlands. Where infeasible to modify the project, such issues could be resolved through the required LCP amendment or the consolidated CDP process.

Finally, the applicant's proposed mitigation ratio of 1:1 for permanent impacts, in the applicant's Restoration Plan, may not satisfy Commission requirements for mitigation for all habitats, since generally accepted mitigation ratios are 3:1 for permanent impacts to the CRLF and 4:1 for permanent impacts to wetlands. The preferred strategy is for in-kind onsite mitigation; off-site mitigation efforts do not necessarily replace the complexity of habitat mosaics that currently exist in the project area.

Other Terrestrial Species

The application includes the statement that sensitive wildlife receptors such as avian species within the Biological Survey Area may not be affected by project-related noise. This conclusion does not adequately assure protection of species in accordance with the LUP and is silent regarding impacts to nesting habitat in a locale on which nesting birds depend. In order to assure consistency with LUP Policy 19, buffers of 250 feet for any avian species, and up to 500 feet for raptors are recommended to protect nesting birds. As a last resort, where noise will unavoidably exceed 60 decibels in the vicinity of nesting birds, such as roadwork directly adjacent to riparian areas, the Coastal Commission has required use of sound barriers for maintaining noise levels below 60 decibels. The County should require that the applicant establish the suggested avoidance protocols and additionally require the design of additional project mitigation measures for any sound levels reaching higher than 90 decibels. Additionally, LUP Policy 19 favors minimizing construction during bird breeding season. This LUP Policy suggests restricting activity between March 1 and July 1. In addition to avoiding work during this time period, the project timeline should be designed to avoid impacts to special species present onsite.

Thus, many of the habitat issues lead to inconsistencies requiring an LCP amendment or a consolidated CDP process, and others will require mitigation regardless. The mitigations and analyses identified above can form the basis for these approaches, in addition to the opportunity to address some of such impacts on the area seaward of the Highway realignment and north of Scotty Creek (see Potential Project Mitigations section below).

Source: Sonoma County

Coastal Hazards
The LCP cites Coastal Act Section 30253, which requires new development minimize risks to life and property in areas of geologic hazard. The proposed project is moving an existing highway inland in order to further avoid geologically hazardous areas. While this proposed highway realignment will remove the existing Highway 1 corridor away from areas threatened by coastal bluff erosion, the Ballard Ranch, the area in which the new highway alignment is proposed, is designated on the County Zoning Maps as a Geologic Hazard Combining District. Pursuant to IP policy 26C-252, impacts to this portion of the project area will require a geologic survey. The applicant should complete such an investigation, using the PRMD geologic review procedure. The investigation should describe the hazards associated with the area and include mitigation measures to reduce risks to acceptable levels. Policy 8 of this section encourages that resource uses proposed for lands in Hazard Combining Districts be suitable to other surrounding development and uses. The applicant should include assurances that the proposed highway realignment can be considered a suitable use on the Ballard property and that this new development will not increase risk or geologic instability.

Agriculture
Coastal Act Section 30242, as cited in the LUP page 39, limits the ability to convert agriculture lands to nonagricultural uses unless continued agricultural use is not feasible. The proposed project cannot meet the exception criteria for this policy, thus requiring an LCP amendment or a consolidated CDP process. Specifically, agricultural use is feasible on this land, and per Section 30242, conversion would be inconsistent with the Coastal Act as cited by the LUP. The condition or quality of this agricultural land is not a determining factor in whether impacts would be considered negligible or require mitigation. The application seems to diminish the significance of the conversion of existing agricultural land by referring to existing cattle grazing as a disturbance to the wetlands and ESHA that exist on the Ballard property. The Coastal Act and the LCP both recognize agriculture as a high priority use in the coastal zone, worthy of preservation. The applicant should include a commitment to support continued grazing and agricultural use on the property. The applicant should quantify the acreage of grazing land lost and describe a plan for compensating for this resource impact. As it currently stands, the conversion of agricultural land to roadway use is inconsistent with Coastal Act Section 30242 as cited by the LUP.

State law requires all lands subject to a Williamson Act Contract, such as the Ballard property, be zoned to prevent land uses incompatible with continued agricultural use in the preserve. The proposed project may cause inconsistencies with the Contract by proposing to bifurcate the property with the realignment and construction of a highway, rendering a portion of the property inoperative as a cattle ranch. LUP Resources Policy 1 recommends that uses on these properties should not conflict with resource production activities, and LUP Policy 3 instructs that land divisions relate only to the pursuit of agriculture.

Potential Project Adjustments and Mitigations
As County and Commission staff evaluate the completeness of the information submitted for CDPs for this project, and continue discussions with Caltrans for measures to bring the overall development into compliance with Coastal Act and LCP policies, including through the requisite

Source: Sonoma County

LCP amendment if a consolidated CDP process is not pursued, we briefly note a few other potential issue areas that will need more attention moving forward.

One key area where resource impacts may be both avoided and/or mitigated to help arrive at an approvable project is how Caltrans approaches the existing residential development on the bluff top north of Scotty Creek and westward of the proposed new alignment. Bluff top residences are in various states of repair, ranging from inhabitable to nearing collapse, creating several impacts to visual quality, public access opportunities and environmental resources. Such resource impacts could be avoided by eliminating all or a portion of the checkerboard of pavement connections for vehicle access to service these mapped lots and houses. Staff notes that the Commission and County have contacted the owners of most lots of record westward of Highway 1 regarding possible Coastal Act/LCP violations associated with unpermitted development on or adjacent to these properties. Moreover, additional land area could become available for potential mitigation of resource impacts from the project and enhancement of degraded resources in the area that will be needed for regulatory approvals. Please encourage the applicant to consider acquiring some or all of the bluff top properties to obviate the need for continued road access and avoid costly repair and maintenance of the existing Highway 1. Providing for the removal of structures and debris on the bluff top/face and shoreline also would be a path to incorporating multi-modal public access features and mitigating for several significant impacts, including those to ESHA and visual resources.

An evaluation of this approach should be part of the alternatives analysis of the current CDP application. One of the first pieces of supporting information needed from Caltrans is the legal basis upon which Caltrans staff concludes that they have a responsibility to provide vehicular access to lots on record, and whether or not the lots are viable to future development or continued access to the lots needs to be maintained. The County should request further detailing of impacts that would be avoided through eliminating the need for some or all of the vehicular access and removing and restoring various structures. In addition, this alternatives analysis needs to describe how necessary mitigation of impacts from other portions of the project could be carried out on the acquired properties, as well as on a rehabilitation of the old Highway 1. A necessary component of such an alternatives analysis will be accounting of the costs to maintain Highway 1 at this location over the past 20 years and projections of what those costs could be expected to be over the 100 year design life of the project, so that the full context of both resource and monetary costs and benefits can be understood. Since the County has said that it is not interested in accepting a relinquishment of the old Highway 1 as a vehicular access road with high maintenance costs, Caltrans needs to assume that it will continue to be responsible for those costs unless another configuration of the project in relation to this bluff top area can be developed. Those costs would need to include anticipated demolition and restoration over time as coastal erosion continues to threaten all structures, including Highway 1.

In closing, we very much appreciate this opportunity to provide feedback on the proposed project, including potential processing options and coastal resource concerns. We note in advance that we may have additional comments as project plans and/or the process evolves over time. In the meantime, we strongly reiterate our recommendation that the County agree to a consolidated CDP application process to avoid significantly complicating the process, and to allow appropriate project review streamlining. If the County continues to choose to process a

Source: Sonoma County

separate CDP application, then we strongly encourage that we begin discussion immediately on the required LCP amendment, as it would need to be approved by the County Board of Supervisors and certified by the Coastal Commission before the County can legally take a final CDP action on a County CDP application. If you have any questions regarding these comments, please contact Sara Pfeifer of my staff at sara.pfeifer@coastal.ca.gov or (415) 904-5255.

Sincerely,

Nancy Cave
North Central Coast District Manager

cc: Lilian Acorda, Project Manager, Caltrans
Stefan Galvez, Chief, Office of Environmental Analysis, Caltrans
Jeanette Weisman, CH2M Hill Biologist & Coastal Specialist, Caltrans contractor

Source: Sonoma County

Integrated Waste
Northern Sonoma County Air Pollution Control District
Road & Bridge Operations
Sonoma County Airport
Sonoma County Transit

Susan R. Klassen, Director

Deputy Director, Road & Bridge Operations: John McCarthy
Deputy Director, Integrated Waste, Airport, Transit: Johannes J. Hoevertsz

February 16, 2017

Ms. Lilian Acorda
Project Manager, Sonoma County
Department of Transportation District 4
Project Development North
P.O. Box 23660
Oakland, CA 94623-0660

Subject: Route 1 Realignment at Gleason Beach

Thank you for your letter, dated January 24, 2016. The Sonoma County Department of Transportation and Public Works (DTPW) has reviewed the proposed project, and continues to have significant concerns related to the relinquishment of the Old Route 1 alignment to the County. Recent studies indicate that we can expect that the old road and most of the remaining houses will be lost to the ocean within the next several decades. As stated in your letter the Old Route 1 would serve local interests, I would further add that it primarily would serve private property interests, not the greater interests of the citizens of Sonoma County. Therefore, it will be very difficult for me to recommend to my Board of Supervisors that we accept the road into the County maintained system without significant mitigation from the State.

As such we will be happy to enter into discussions with Caltrans towards development of a relinquishment agreement that does not increase the County's liability. I would invite you to come up to Sonoma County at your convenience. Please contact Caren Larkin, my Executive Assistant at Caren.Larkin@sonoma-county.org or (707)565-2231 and she can work with you to schedule a meeting.

Thank you,

Susan R. Klassen, Director
Department of Transportation and Public Works.

C: Tennis Wick, Director, Permit and Resource Management Department
Caryl Hart, Director, Sonoma County Regional Parks Department
John McCarthy, Deputy Director – Sonoma County DTPW
Steve Fredericks, Surveyor – Sonoma County DTPW

California State Senate

SENATOR MIKE MCGUIRE

NORTHERN CALIFORNIA'S SECOND SENATE DISTRICT

April 5, 2018

Susan Bransen
Executive Director
California Transportation Commission
1129 N Street MS 52
Sacramento, CA 95814

Dear ~~Ms. Bransen~~ Susan!

I want to thank you and your staff for all of the work on this important project. As you are aware, the Gleason Beach Realignment Project is a critical transportation safety project that would realign a section of highway 1 that has been rapidly deteriorating due to erosion. This project is a precursor of projects to come as we work to adapt to climate change around the state. This section of highway is extremely important for North Coast residents and the thousands of visitors who rely on the highway as the primary transportation link along the picturesque coastline. Given the vulnerability of the roadway caused by severe erosion at Gleason Beach, it is essential that this carefully planned and designed realignment project stay on track to meet its delivery schedule. In addition, this project should move ahead in a timely fashion as a model for California's ability to deliver multi-modal transportation projects and respond to the effects of sea level rise. This project does not just meet the needs of the motoring public, but is also designed to be completed in an environmentally sensitive way.

The resource sensitivity and richness of the project site cannot be overstated. Not only are there endangered species habitats, extensive archaeological sites and accessible beach areas that must be protected, but there also are working grazing lands and unsurpassed scenic landscapes that underpin the County's thriving agricultural and tourism economies. The direct and indirect impacts on these resources from this important infrastructure project must be addressed. As such, it is critical that the complete resource protection and mitigation package identified for the project be fully funded.

I urge you to secure the financial resources necessary to build this vital project. Please keep me updated on your progress in expeditiously moving forward the comprehensive construction and mitigation proposal developed by Caltrans District 4. If you have any questions or need additional information, please feel free to contact me at 916.651.4002.

Warmest Regards,

Executive Director—
Thank you for your
hard work on this important
Project!

MIKE McGUIRE
Senator

04-SON-01
PM 15.1/15.8
EA 0A0200

Gleason Beach HWY 1 Relocation
Sonoma County, California

Coastal Erosion Analysis at Gleason Beach

Prepared for:

Prepared by:

WRECO

September 2020

Source: Caltrans/WRECO (2020)

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Source: Caltrans/WRECO (2020)

Gleason Beach HWY 1 Relocation
Sonoma County, California

Coastal Erosion Analysis at Gleason Beach

Submitted to:

California Department of Transportation

This report has been prepared by or under the supervision of the following Registered Engineer. The Registered Civil Engineer attests to the technical information contained herein and has judged the qualifications of any technical specialists providing engineering data upon which recommendations, conclusions, and decisions are based.

Jennifer Abrams
_____

Jennifer Abrams, P.E.
Registered Civil Engineer

September 2020

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Source: Caltrans/WRECO (2020)

Table of Contents

Source: Caltrans/WRECO (2020)

Figures

Tables

Source: Caltrans/WRECO (2020)

Photos

Appendices

Source: Caltrans/WRECO (2020)

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Source: Caltrans/WRECO (2020)

Executive Summary

The purpose of this study was to evaluate the bluff erosion at Gleason Beach on Highway (HWY) 1 in Sonoma County for the proposed realignment of HWY 1 at this location. The future bluff erosion due to coastal processes was evaluated in order to determine the stability of the proposed alignment in light of predicted sea-level rise. The method of analysis was based off of a report by Philip Williams and Associates, *California Coastal Erosion Response to Sea-Level Rise – Analysis and Mapping* (2009) for the Pacific Institute. The report presents a methodology for predicting future erosion rates based on historical rates, incorporating sea-level rise. The rate of erosion was assumed to be proportional to the frequency with which the total water level (TWL), the sum of mean sea-level and wave runup, reaches the toe of the bluff. Modifications to the method presented in the PWA report were made to tailor the method to the Project site.

There is significant uncertainty in the predicted erosion rates for the site due to the limited data availability and the lack of calibration opportunity. The following are some of the more pressing data deficiencies:

- Detailed survey of the beach and nearshore bathymetry does not exist. This would affect number of waves that would reach the bluff, their intensity, and elevation which the runup would achieve.
- Records of the numerous slope protections in place could not be found. The date that these seawalls and slope paving locations were installed, the toe elevation of the seawalls, and the top elevation of the seawalls are important to interpreting the historical erosion rate. Effectively, it was assumed that the future effects of these slope protection implements would simply be similar to the current and historical condition.
- The historical erosion rate is uncertain as there was limited information available from which to calculate it. The calculation of the erosion rate in the future is directly dependent on the historical erosion rate.

A historical rate of erosion was determined from USGS coastline survey data, and assumed to be representative of the recession rate for the bluff. The rate of sea-level rise was obtained from *State of California Sea-Level Rise Guidance* (2018). Data representing future sea levels and wave parameters were generated assuming that these quantities would be statistically similar to historical data obtained from the nearest NOAA tide gage and buoy, except for the inclusion of sea-level rise. The portion of erosion due to coastal processes was assumed to be about 25%; other causes of erosion (earthquakes, groundwater, animals, etc.) were implicitly included in the analysis as occurring at the same rate as historically. Several variables in the calculations were varied to demonstrate the significant uncertainty in the prediction due to the inability to calibrate to any data.

The predicted shoreline was mapped for 2050 and 2100. The bluff retreat is not expected to reach the realignment by 2100 except at the conforming ends of the Project site, where the proposed alignment would join with the existing alignment and the intermediate

connections for residential access. The end points of the realignment may be threatened before 2050, based on the results of the analysis.

Source: Caltrans/WRECO (2020)

Acronyms & Abbreviations

CA	California
Caltrans	California Department of Transportation
CCC	California Coastal Commission
CEM	Coastal Engineering Manual
HWY	Highway
MHHW	Mean higher-high water
MHW	Mean high water
MLLW	Mean lower-low water
MLW	Mean low water
MSL	Mean sea-level
NAVD 88	North American Vertical Datum of 1988
NGVD 29	National Geodetic Vertical Datum of 1929
NOAA	National Oceanic and Atmospheric Administration
PWA	Philip Williams and Associates, Ltd.
TWL	Total water level
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
WSE	Water surface elevation

Source: Caltrans/WRECO (2020)

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Source: Caltrans/WRECO (2020)

1 INTRODUCTION

1.1 Project Description

For the Gleason Beach Highway (HWY) 1 Relocation Project (Project), Caltrans proposes to construct at Gleason Beach, in unincorporated Sonoma County (PM 15.1-15.7), a two-lane roadway along a new alignment 370 feet eastward and inland of the current alignment (see Figure 1 and Figure 2). The new alignment will consist of one 12-foot lane in each direction and 8-foot standard shoulders. The new roadway will be placed on a new bridge structure spanning the Scotty Creek floodplain. The existing box culvert and grade-separation structure at Scotty Creek along with portions of the existing adjacent roadway will be removed. Drainage systems will be constructed where needed at cut slopes and fill slopes. The project will also construct three access roads to connect to sections of the old alignment, a parking pad, and a section of California Coastal trail through the project area.

Following damage to Route 1 by storms in 1996 and subsequent winters, Caltrans' site investigations in 1998 and 2003 determined that coastal erosion at this location is advancing by approximately one foot per year. An 87' section of roadway at the edge of pavement abuts the edge of the coastal bluffs in the project area and is vulnerable to further erosion. This section may be undermined by coastal erosion within the next five years. The adjacent sections of highway are vulnerable to coastal erosion over the broader year 2100 planning horizon.

Evidence of the bluff erosion at the Project site can be seen in Photos 1 through 6, which were taken during site visits by WRECO on March 9, 2010 and September 9, 2020. In Photo 1, piles supporting the roadway are exposed, and piles supporting land adjacent to the highway have been undermined and are failing. This location is where the encroachment of the coastal bluff on the roadway is greatest. Photo 2 shows the same location in 2020. Photo 3 and Photo 4 show the remains of a house that was removed adjacent to this critical point in 2010 and 2020, respectively. In Photo 5, the bare slope toward the top of the bluff is evidence of recent slope failure. In addition, in this image, the magnitude of erosion is evident by the degree of undercutting of the stair structures built onto the slope. A similar view in 2020 is included in Photo 6.

The purpose of the Project is to maintain a safe transportation facility for motor, bicycle, and pedestrian traffic that is no longer vulnerable to rapidly advancing coastal erosion.

1.2 Purpose of Analysis

The purpose of this study is to provide information to the California Department of Transportation (Caltrans) for the assessment of this Project and use in the California Coastal Commission (CCC) permit. The analysis includes the calculation of projected erosion rates along Gleason Beach through 2100. Analysis of the adjacent roadway to remain is presented as well.

Source: Caltrans/WRECO (2020)

1.3 Tasks Performed

The key tasks performed as part of this study were:

- Review and collection of available data
- Review of related literature
- Calculation of the historical bluff erosion rate
- Calculation of the predicted future erosion rate incorporating climate change projections

1.4 Scope of Analysis

The goal of this analysis is to provide the necessary erosion information required for Caltrans to plan the realignment of the road and to address questions posed by the CCC. Included in this scope is the need to determine the adequacy of the adjacent segments of roadway that would not be relocated. For this reason, the limits of the study were extended beyond the limits of the realignment, for a distance that is reasonable relative to the intended scope of the realignment Project. The limits that were chosen for this study are shown in Figure 3. The analysis spanned from Duncan's Point in the north to the headland between Portuguese Beach and Schoolhouse Beach in the south. North of Duncan's Point, Highway 1 is aligned further from the bluff, and there is a wide beach and vegetated slope protecting the Highway from coastal erosion. In the southern third of the analysis limits, the highway is further from the shoreline and there is a wide and steep beach between the shoreline and the highway.

The Project team recognizes that there is erosion along much of the coast outside the limits of the analysis; however, the limits of the analysis encompass enough distance to address the scope of the Project.

1.5 Vertical Datum

Unless otherwise noted, all elevations presented in this report are in North American Vertical Datum of 1988 (NAVD 88). The conversion between National Geodetic Vertical Datum of 1929 (NGVD 29) and NAVD 88 is as follows: NGVD 29 + 2.84 feet = NAVD 88. This datum conversion was obtained from the National Oceanic and Atmospheric Administration (NOAA) Oblique Height Conversion website.

Source: Caltrans/WRECO (2020)

Figure 1. Project Location Map

Source: United States Geological Survey (USGS)

Source: Caltrans/WRECO (2020)

Figure 2. Project Vicinity Map

Source: USGS

Source: Caltrans/WRECO (2020)

Photo 1. Exposed piles and pavement failure, facing south (March 2010)

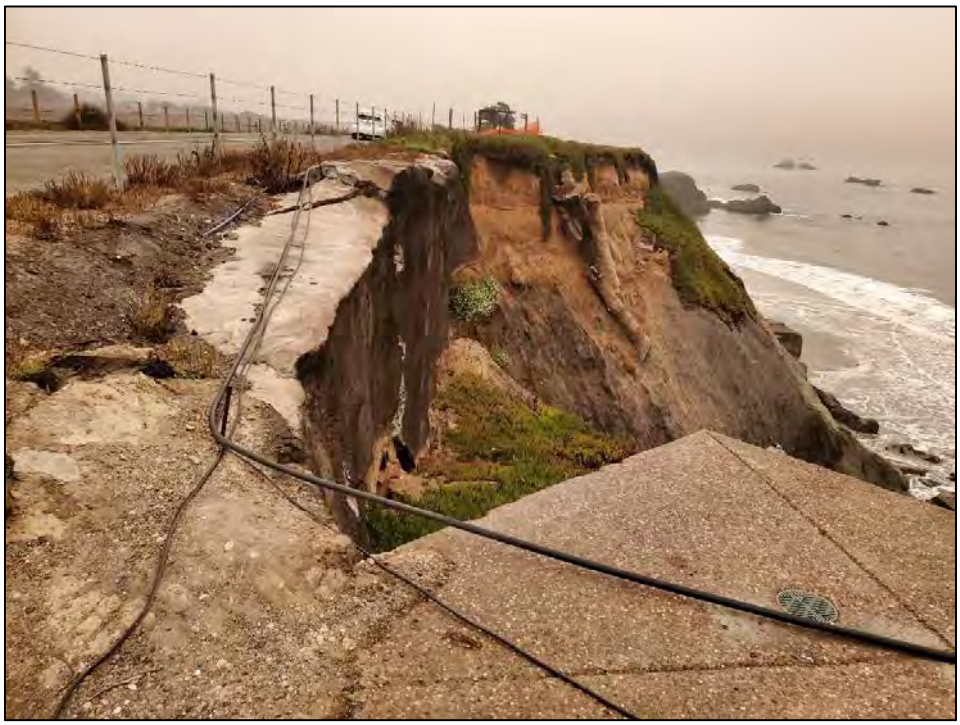


Photo 2. Piles and pavement failure location, facing south (September 2020)

Source: Caltrans/WRECO (2020)

Photo 3. Barrier rocks typical of the site and exposed piles of removed house, facing south (March 2010)

Photo 4. Similar view to Photo 3, in September 2020

Source: Caltrans/WRECO (2020)

Photo 5. Evidence of recent slope erosion and undercutting of stair structures, facing east (March 2010)

Photo 6. Approximate location shown in Photo 5 in September 2020

Source: Caltrans/WRECO (2020)

Figure 3. Limits of Analysis

Source: Caltrans/WRECO (2020)

2 LITERATURE REVIEW

2.1 Method of Analysis

A study performed by Philip Williams & Associates, Ltd. (PWA), *California Coastal Erosion Response to Sea-Level Rise – Analysis and Mapping* (2009), was chosen as the model for this analysis. In the PWA report, a method for predicting future coastal erosion based on historical erosion rates and climate change projections was described. Historical total water levels (TWL) were defined. The TWL included sea-level, the incident wave shoaled to the 10 m (33 feet) water depth, and runup at the beach. These TWLs were compared with bluff toe elevations to determine the historical incidence of waves that would reach at least to the toe of the bluff. This incidence was related to the historical erosion rate. Future rates of erosion were calculated including effects from climate change, particularly sea-level rise.

The procedure was adapted to the data available at Gleason Beach and to the specific goals of this analysis. The analysis procedure used for this Project is described in Section 5.1.

2.2 Coastline Change

The *National Assessment of Shoreline Change, Part 4: Historical Coastal Cliff Retreat along the California Coast* (Hapke and Reid, 2007) was reviewed for information regarding historical erosion rates. Gleason Beach is within the Russian River region analyzed in this report. This region spans from 7 mi south of Point Arena to Tomales Point. The average cliff recession rate found in this region was 0.7 feet/year with the maximum rate calculated to be 2.6 feet/year at Tomales Point. The average cliff retreat in this region was the lowest of all of Northern California; however, it was similar to the average retreat in the San Francisco South and Big Sur regions. The largest cliff retreat rate in California was 10.2 feet/year at Rockport Beach near Cape Vizcaino in Mendocino County.

An illustration from this report of the cliff recession in the Russian River region is included in Figure 4. The approximate location of the Project site relative to the y-axis is shown in this figure. The cliff retreat rate at the locations adjacent to the Project site is about 1.0 feet/year.

Source: Caltrans/WRECO (2020)

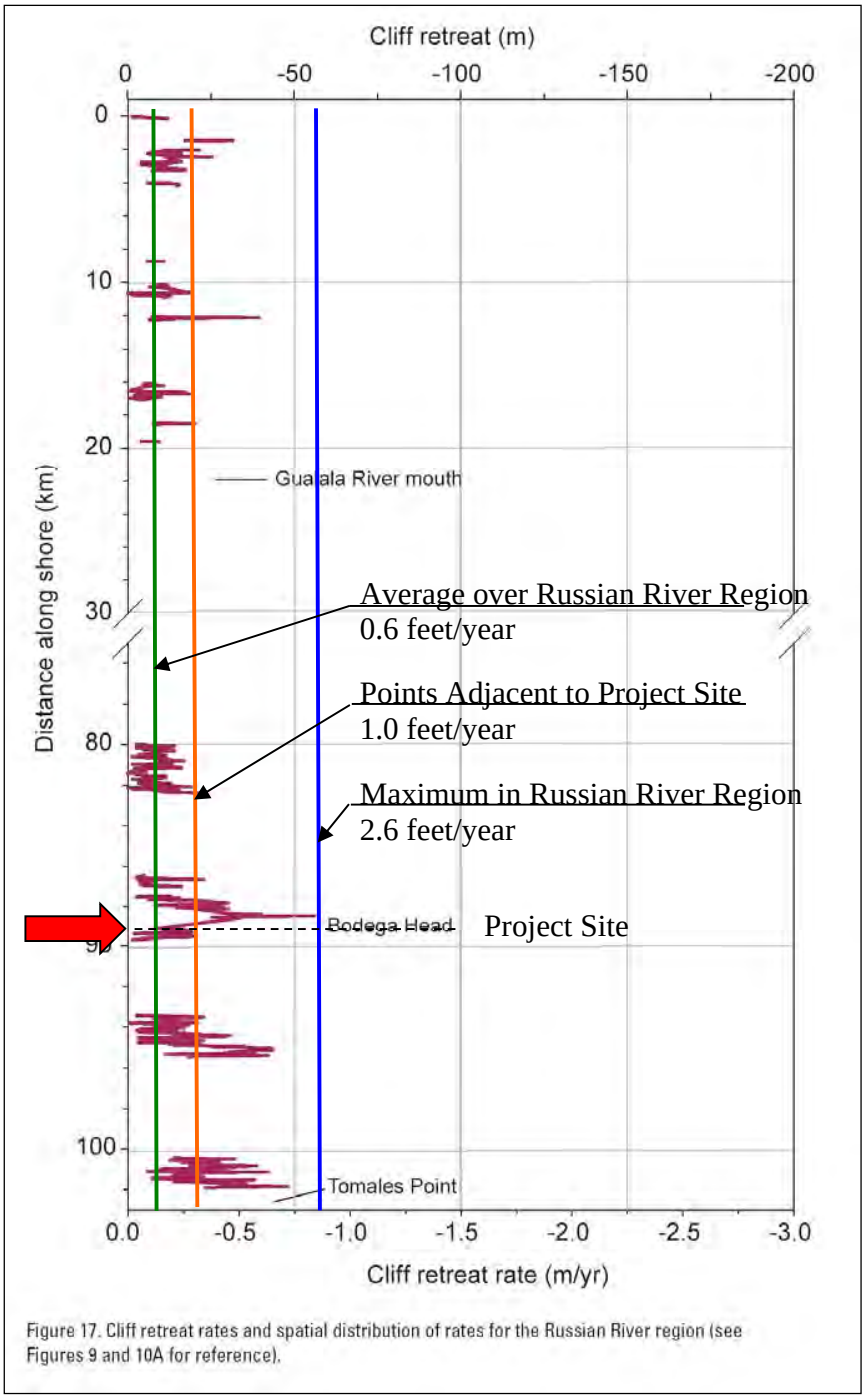


Figure 4. Historical Cliff Retreat in the Russian River region

Source: Hapke and Reid (2007)

Source: Caltrans/WRECO (2020)

2.3 Geotechnical Resources

Landslides in the Highway 1 Corridor Between Bodega Bay and Fort Ross, Sonoma County, California (California Geological Survey, 2006) was reviewed for geotechnical information in the Project vicinity. According to this report, the site is located on the Franciscan Complex mélange geologic unit. This unit is characterized by weak material that is easily erodible, punctuated by occasional blocks of harder, intact rock. Evidence of the presence of this geologic unit is found at the site in the form of the scattered rocks that remain in the ocean just seaward of the Project site. These rocks are evident in Figure 3, Photo 1, and Photo 2. Photo 7 is a closer view of some of the blocks that remain at sea after the cliff has retreated.

At PM 15.5, the type of hazard affecting the highway was listed in the report as bluff failure, of moderate to rapid rate, caused by erosion or seismic activity.

Photo 7. Close-up of Rocks that Remain from Historical Cliff Positions (March 2010)

2.4 Runup Resources

The parameterization shown in *Empirical parameterization of setup, swash, and runup* (Stockdon, 2006) was used to calculate the runup at the site. This method was chosen over the methods in the United States Army Corps of Engineers (USACE) Coastal

Source: Caltrans/WRECO (2020)

Engineering Manual (CEM) because it was more appropriate for the data available at the site. It is also more recent than the CEM. The following is the equation that was used for the Project:

$$R_2 = 1.1\left(0.35\ \beta_f(H_0L_0)^{1/2} + \frac{1}{2}\left[H_0L_0\left(0.563\beta_f^2 + 0.004\right)\right]^{1/2}\right)$$

Where:

$R_2 =$ runup height (feet)
$\beta_f =$ beach slope (feet/feet)
$H_0 =$ deepwater wave height (feet)
$L_0 =$ deepwater wavelength (feet)

2.5 Climate Change

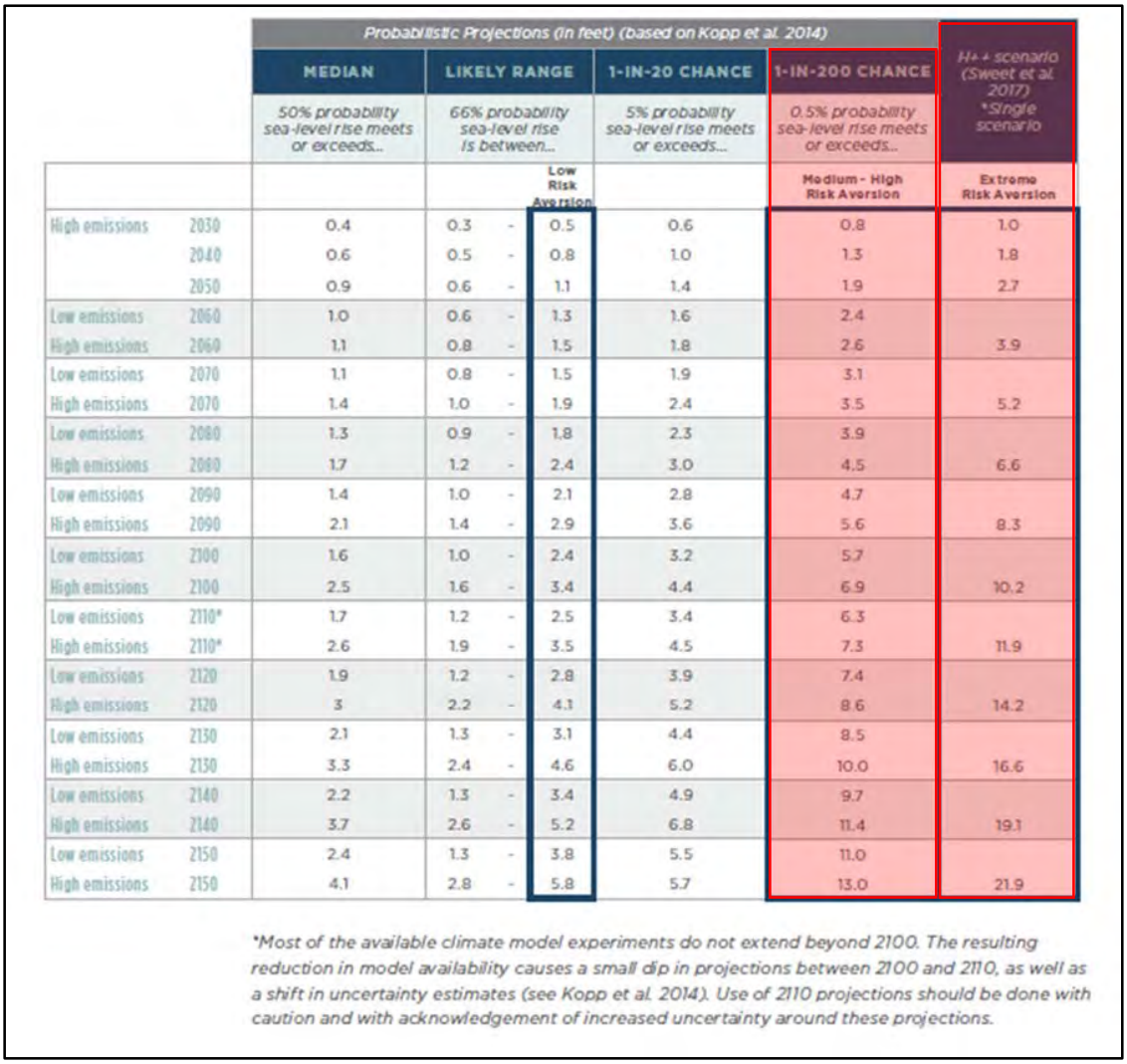
State of California Sea-Level Rise Guidance (2018) (SLR Guide) was used as the reference for the changes in sea-level. Several probabilistic projections with respect to a baseline year of 2000 are available and can be seen in Figure 5. The projections for a 0.5% probability sea-level rise occurrence for Medium-High Risk Aversion and the H++ Extreme Risk Aversion were selected. For the purpose of this study, where projections for both low and high emissions are given the projections were averaged. For comparison to previous studies on SLR in California the average of low and high predictions from Cayan et. al. (Cayan) have been included in this analysis. The base year for the predicted SLR is 2000.

Historical hourly water surface elevation (WSE) data from NOAA gage 9414290 for San Francisco, CA (Water Levels, 2020a) was collected from January 1898 through April 2020. There is a notable gap in data from March 1970 to January 1972. The decade for 1890 contained 2-years of data and the decade for 2020 4-months of data. These two decades were neglected. Other data gaps are not significant.

Table 1 contains the results of the analysis for the historical data by decade, and Figure 6 shows the historical and projected change in sea-level rise for both the Medium-High and Extreme Risk Aversion scenarios given in SLR Guide and average projection from Cayan. A local regression model for the combined historical and projected SLR by decade was developed that provides the modeled SLR value as a function of year. Decades not included in the model are indicated in red. Predicted SLR is adjusted for a base year of 1900 to align with the historical data.

In addition to sea-level-rise data, information regarding predicted wave heights was gathered from Cayan. The climate change models predicted that wave heights would stay the same or decrease slightly in the future. The predicted increase in El Nino years in the future was not quantified.

Source: Caltrans/WRECO (2020)



		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	1.0
	2040	0.6	0.5 -	0.8	1.0	1.3	1.8
	2050	0.9	0.6 -	1.1	1.4	1.9	2.7
Low emissions	2060	1.0	0.6 -	1.3	1.6	2.4	
High emissions	2060	1.1	0.8 -	1.5	1.8	2.6	3.9
Low emissions	2070	1.1	0.8 -	1.5	1.9	3.1	
High emissions	2070	1.4	1.0 -	1.9	2.4	3.5	5.2
Low emissions	2080	1.3	0.9 -	1.8	2.3	3.9	
High emissions	2080	1.7	1.2 -	2.4	3.0	4.5	6.6
Low emissions	2090	1.4	1.0 -	2.1	2.8	4.7	
High emissions	2090	2.1	1.4 -	2.9	3.6	5.6	8.3
Low emissions	2100	1.6	1.0 -	2.4	3.2	5.7	
High emissions	2100	2.5	1.6 -	3.4	4.4	6.9	10.2
Low emissions	2110*	1.7	1.2 -	2.5	3.4	6.3	
High emissions	2110*	2.6	1.9 -	3.5	4.5	7.3	11.9
Low emissions	2120	1.9	1.2 -	2.8	3.9	7.4	
High emissions	2120	3	2.2 -	4.1	5.2	8.6	14.2
Low emissions	2130	2.1	1.3 -	3.1	4.4	8.5	
High emissions	2130	3.3	2.4 -	4.6	6.0	10.0	16.6
Low emissions	2140	2.2	1.3 -	3.4	4.9	9.7	
High emissions	2140	3.7	2.6 -	5.2	6.8	11.4	19.1
Low emissions	2150	2.4	1.3 -	3.8	5.5	11.0	
High emissions	2150	4.1	2.8 -	5.8	5.7	13.0	21.9

*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 5. Projected Sea-Level Rise (in feet) for San Francisco Base Year 2000
Source: State of California Sea-Level Rise (2018)

Source: Caltrans/WRECO (2020)

Table 1. Change in Sea-Level by Decade

Decade	Mean WSE (feet NAVD 88)	Cumulative Change in WSE (feet)	Number of Missing Data	Percent Data for Decade
1890	2.45	0.00	7	20
1900	2.65	0.20	0	100
1910	2.67	0.22	0	100
1920	2.65	0.20	0	100
1930	2.75	0.30	0	100
1940	2.85	0.40	525	100
1950	2.93	0.48	0	100
1960	2.98	0.53	926	100
1970	2.99	0.54	2003	80
1980	3.16	0.71	0	100
1990	3.21	0.76	0	100
2000	3.16	0.71	1	100
2010	3.32	0.87	552	100
2020	3.27	0.82	0	2

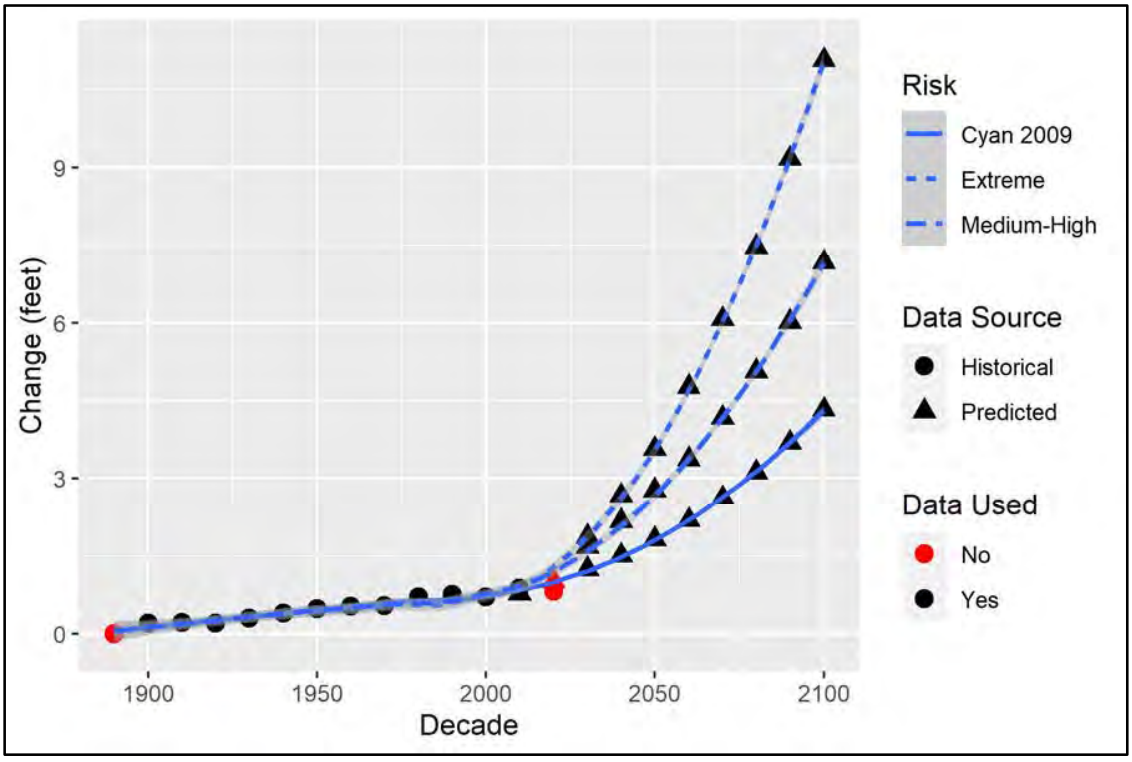


Figure 6. Sea-Level Rise with Base Year 1900
Source: NOAA Gage 9414290, State of California Sea-Level Rise (2018), Cayan (2009)

Source: Caltrans/WRECO (2020)

2.6 Previous Studies

There are two previous studies, one by PWA in 2010 and the other by WRECO in 2014. The PWA study was a review of a more extensive PWA study results specific to this location and were commissioned for reference in the WRECO study. The PWA memorandum summarizing their results and analysis is included in Appendix B. The sea-level rise was assumed to be 1.3 feet by 2050 and 4.6 feet by 2100. These amounts correspond to the high sea-level rise scenario used in the 2014 WRECO study.

PWA used a historical rate of erosion of 5 inches for armored segments and 7 inches for unarmored segments, based on USGS rates for similar locations nearby. PWA predicted a maximum cliff retreat of 95 feet by 2100 for unarmored segments of coast. For armored segments, their predicted erosion distance was 82 feet. They note that local conditions may cause higher erosion rates than those used, because the rates used were based on averages for the geologic unit.

WRECO used four classifications for historical rate of erosion that ranged from 0.7 feet/year to 2.2 feet/year. A summary of the classifications and results can be seen in Table 2. The classification segments are identified in Figure 16.

Table 2. WRECO 2014 Study

Erosion Speed Classification	Segments	Average Rate through 2100 (feet/year)	Total Distance by 2100 (feet)
Slowest	A,E,G	0.7	70
Medium Slow	B,F,H	1.2	120
Medium Fast	C	1.7	170
Fastest	D	2.2	215

Source: Caltrans/WRECO (2020)

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Source: Caltrans/WRECO (2020)

3 DATA REVIEW

3.1 Aerial Photos

Historical aerial photos were reviewed from various dates between 1972 and 2018. The available photos are summarized in Table 3. Several of the photos available are oblique views, so a coastline or bluff toe/top would be difficult to pinpoint from them. In addition, the scale of several available photos was such that it is difficult to make out the relevant details. A final complicating factor was that the photos did not all show the entire site. The aerial photos are included in Appendix A for reference. Slope armoring is visible in all of the oblique photos.

Table 3. Aerial Imagery of the Site

Date	View	Site Range	Source
1972	Oblique	Partial	californiacoastline.org
October 1979	Oblique	Partial	californiacoastline.org
March 1986	Aerial	Whole	californiacoastline.org
June 1987	Oblique	Whole	californiacoastline.org
June 1993	Aerial	Whole	californiacoastline.org
July 1993	Aerial	Whole	USDA/USGS/Google
November 2002	Oblique	Partial	californiacoastline.org
November 2004	Aerial	Whole	Google
March 2005	Aerial	Whole	Google
October 2005	Oblique	Partial	californiacoastline.org
June 2006	Aerial	Whole	USDA/Google
October 2009	Oblique	Partial	californiacoastline.org
September 2018	Aerial	Whole	Google

3.2 Historical Coastlines

Historical coastlines were available on CalAtlas (http://projects.atlas.ca.gov/). These coastlines were from the National Assesment of Shoreline Change Part 3: Historical Shoreline Change and Associated Coastal Land Loss Along Sandy Shorelines of the California Coast (Hapke and Reid, 2006). The two data sets that were available in the Project vicinity were from 1928 to 1936 and from 1952 to 1971. The exact years in which the surveys that these sets are based on were taken are unknown. For this study, the survey was assumed to have occurred in the middle of the date ranges – in 1932 and 1962. Therefore, they were assumed to be 30 years apart.

The two data sets appeared to be misaligned, as downloaded from CalAtlas. The data sets were therefore repositioned based on locations of rock outcroppings and headlands that are along the coastline. They were repositioned in ArcMap to match the 2006 USDA aerial photo. It should be noted that these lines represent the coastline, which is not necessarily equal to the base of the bluff. In addition, due to the uncertainty in the

Source: Caltrans/WRECO (2020)

horizontal alignment of the surveys, small changes between the two lines may not be indicative of anything significant.

The repositioned data sets are shown in Figure 7. A more recent coastline is not included in this figure because topography and/or bathymetry data were not available to determine the location of this coastline. Based on the available information, the beach between Scotty Creek and the point to the north where the highway turns toward the northeast is receding. Within the rest of the analysis limits, the survey lines are too close to each other to determine whether the beach is slightly receding or slightly aggrading. To be conservative, these reaches were assumed to be slightly receding.

Although geographic information system (GIS) data of the tops of cliffs was generated as part of *National Assessment of Shoreline Change, Part 4: Historical Coastal Cliff Retreat along the California Coast* (Hapke and Reid, 2007), this data did not include the Project vicinity.

Source: Caltrans/WRECO (2020)

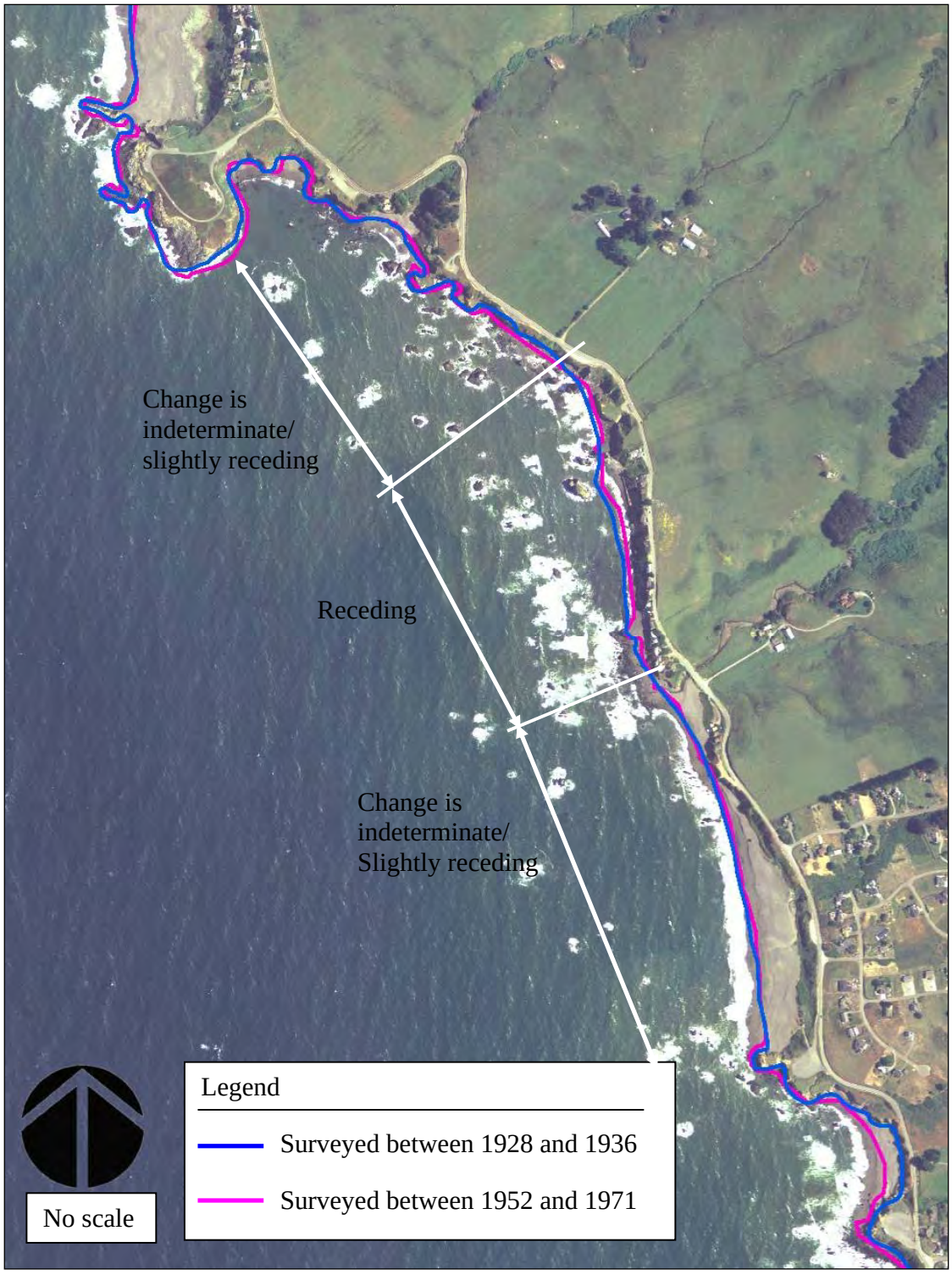

Figure 7. Historical Coastlines

Source: Hapke and Reid, Google

Source: Caltrans/WRECO (2020)

3.3 Bathymetry and Topography

Near shore bathymetry was not available for Gleason Beach. WRECO surveyed the toe elevations and beach slopes, referenced to the elevation of the roadway over Scotty Creek, for the accessible portion of the beach. Toward the middle of the site, the beach was below the low tide level, so it could not be surveyed. This also made the beach beyond it inaccessible. The beach is likely this low at this location because the seawalls and other means of slope protection are blocking the bluff from receding naturally, and therefore removing sediment from the system.

The survey measured by WRECO was placed vertically using the observed low-tide elevation in comparison with the lowest point taken. Setup was not included in this approximation. Elevations in Google Earth were used as a general check. No other way was available to more accurately reference the survey data.

A NOAA bathymetric fishing map from 1990 was obtained. The Project vicinity on this map is shown in Figure 8. This map is included for reference; it was not used for the calculations. The elevations shown are in feet.

Source: Caltrans/WRECO (2020)

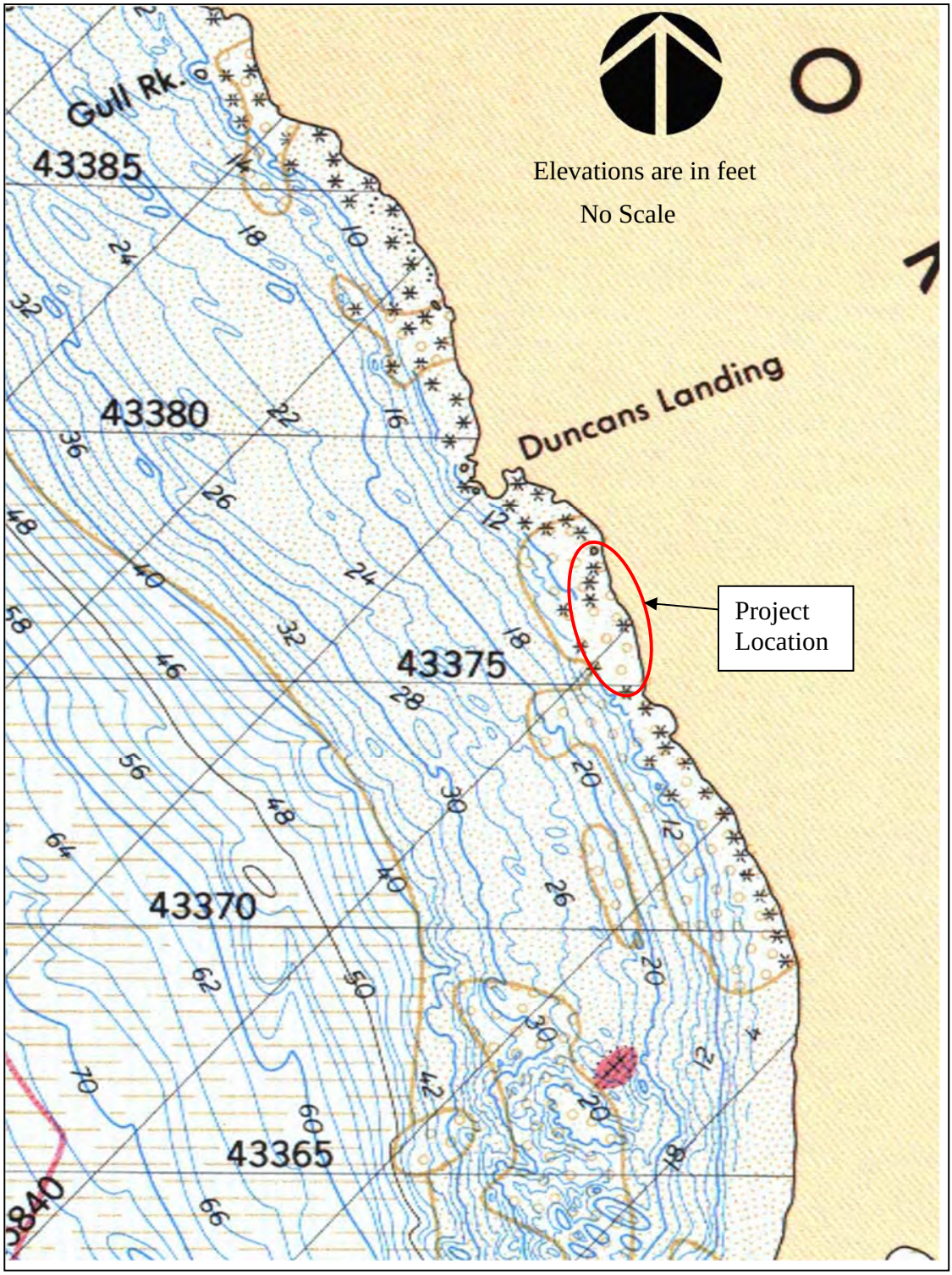

Figure 8. NOAA Bathymetric Fishing Map

Source: NOAA

Source: Caltrans/WRECO (2020)

3.4 Water Surface Elevations

Water surface elevations (WSE) were obtained from the Point Reyes, California (CA) NOAA tide gage station (Station ID 9415020). Measured hourly WSEs from July 1979 to the present were available. Various mean water levels measured by this gage station are summarized in Table 4. The maximum measured water level is recorded as 8.52 feet on February 6, 1998.

Table 4. Water Levels at the Point Reyes, CA Tide Gage Station

	Elevation (Feet NAVD 88)		
Datum	Max	Mean	Min
MHHW	8.52	5.78	3.57
MHW	7.48	4.45	2.39
MLW	5.16	2.38	-0.34
MLLW	3.40	0.03	-2.71

The hourly WSEs that were obtained from this gage station were analyzed to generate a plot of the frequency of occurrence of WSEs. This analysis is summarized in Figure 9. The mean water levels from Table 4 are also shown for reference.

The measured water levels at this tide gage were assumed to be representative of those at the site.

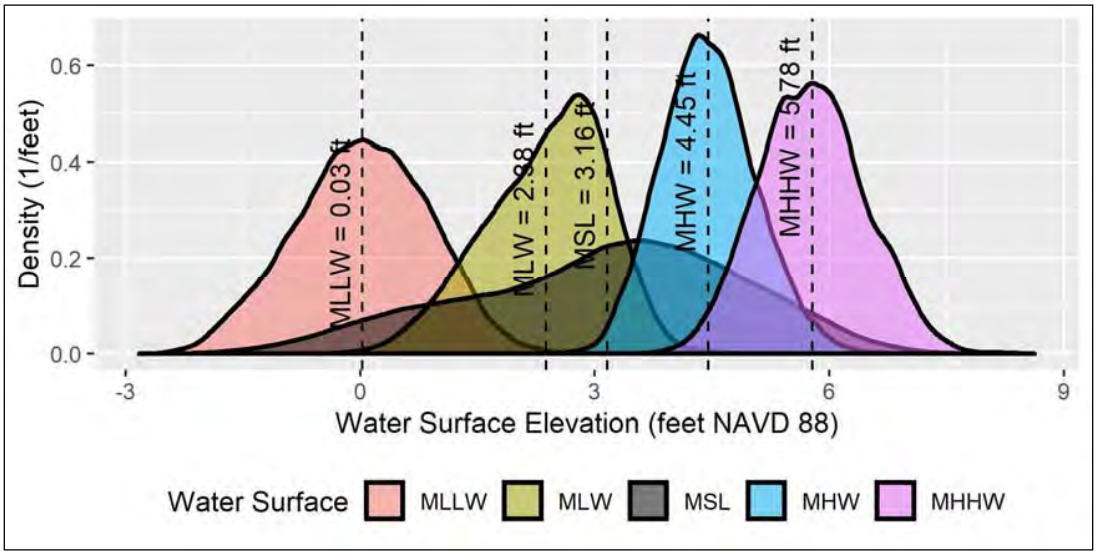

Figure 9. Frequency of Occurrence: WSE

Source: NOAA

Source: Caltrans/WRECO (2020)

3.5 Wave Characteristics

Wave data were obtained for the Bodgea Bay Buoy (Station 46013) from the National Data Buoy Center Website. This was the closest buoy to the site. Hourly data from 1981 to the present were available on this website. The wind speed and direction, significant wave height, and average wave period were recorded for each hour. The wind direction was assumed to be equal to the significant wave deepwater approach direction.

The data obtained from the Bodega Bay Buoy were analyzed over the entire available data range to determine frequencies of occurrence of values of each variable. The wind direction records are summarized in Figure 10, the significant wave height records are summarized in Figure 11, and the average wave period records are summarized in Figure 12.

The most frequently occurring wind direction was from the northwest. The most frequently occurring deepwater wave height was 5.5 feet, with the maximum recorded in 2008 at 32.0 feet. The observed periods ranged from approximately 3 seconds to approximately 16 seconds. The most frequently occurring period was 7 seconds.

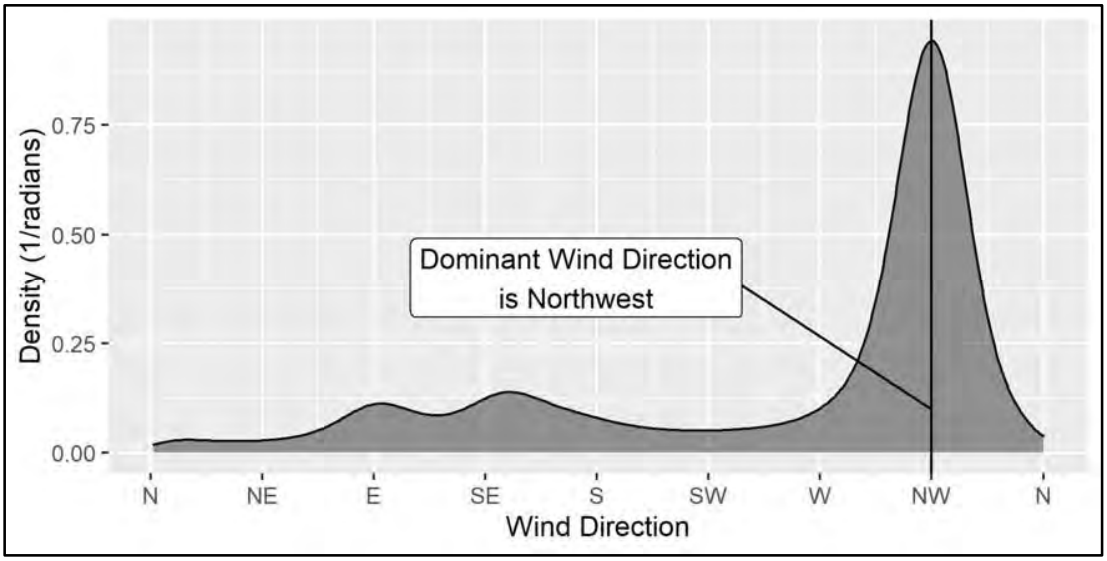

Figure 10. Frequency of Occurrence: Wind Direction

Source: NOAA

Source: Caltrans/WRECO (2020)

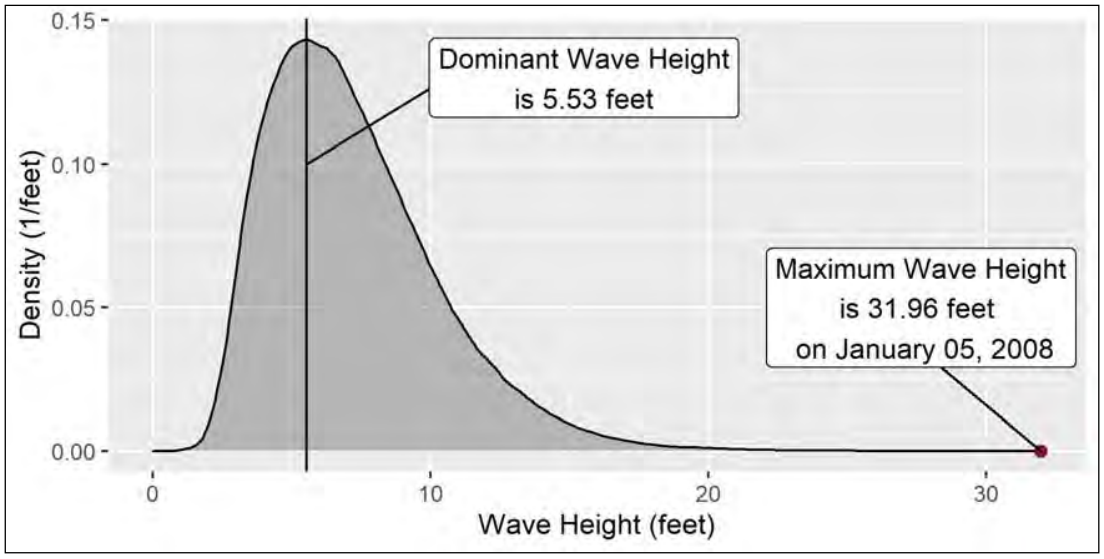

Figure 11. Frequency of Occurrence: Wave Heights

Source: NOAA

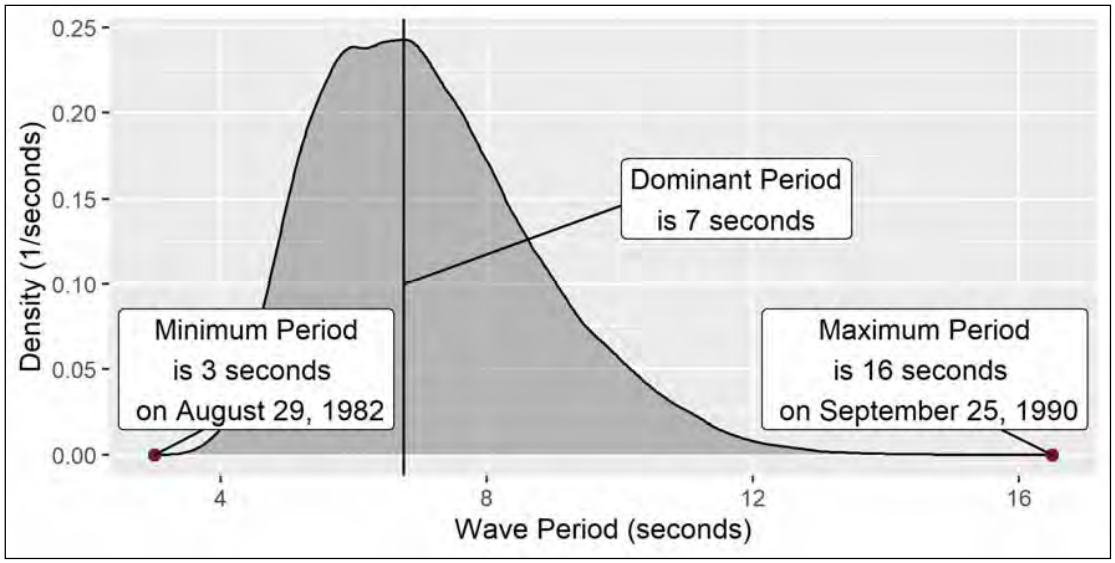

Figure 12. Frequency of Occurrence: Wave Period

Source: NOAA

3.6 Joint Frequencies of Occurrence

In addition to the analyses of the WSE, wave, and wind data individually, joint frequencies of occurrence were determined for the following three relationships, assumed to be the most significant pairings of variables that related all four variables to each other:

- WSE and Wave Height
- Wave Height and Wave Period
- Wave Height and Wind Direction

Source: Caltrans/WRECO (2020)

- Wind Speed and Direction

Only data points that had both of the relevant data measurements were included in this analysis. Therefore, a slightly different set of points was used for the joint frequency analysis from the set used for the individual frequencies.

The results of these analyses are included in Figure 13, Figure 14, and Figure 15. These results were used to generate model data sets for use in the main analysis (see Section 5.3).

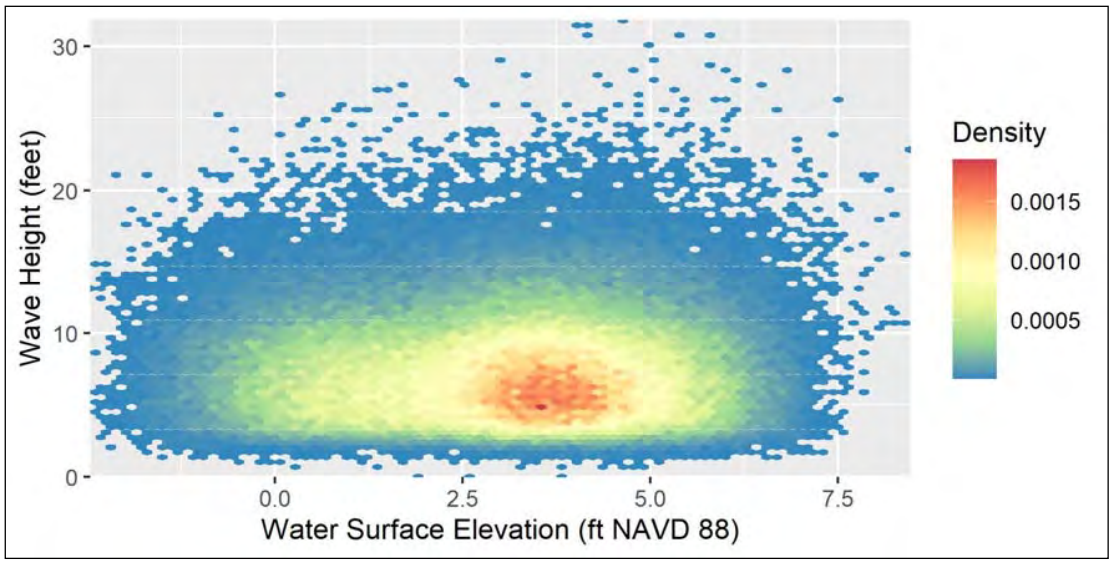

Figure 13. Joint Frequency of Occurrence: WSE and Wave Height

Source: NOAA

Source: Caltrans/WRECO (2020)

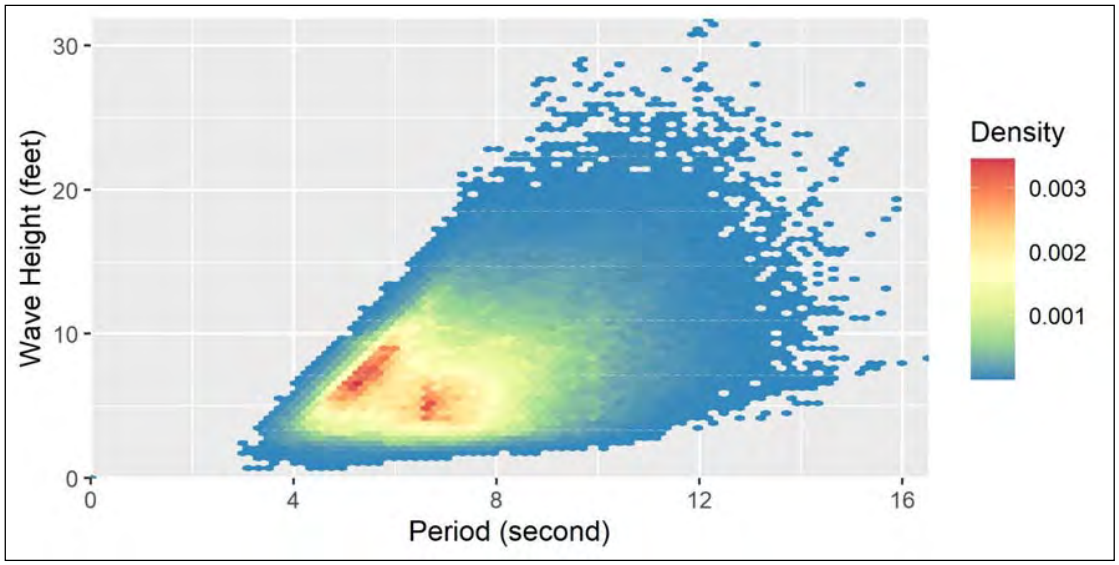

Figure 14. Joint Frequency of Occurrence: Wave Height and Period

Source: NOAA

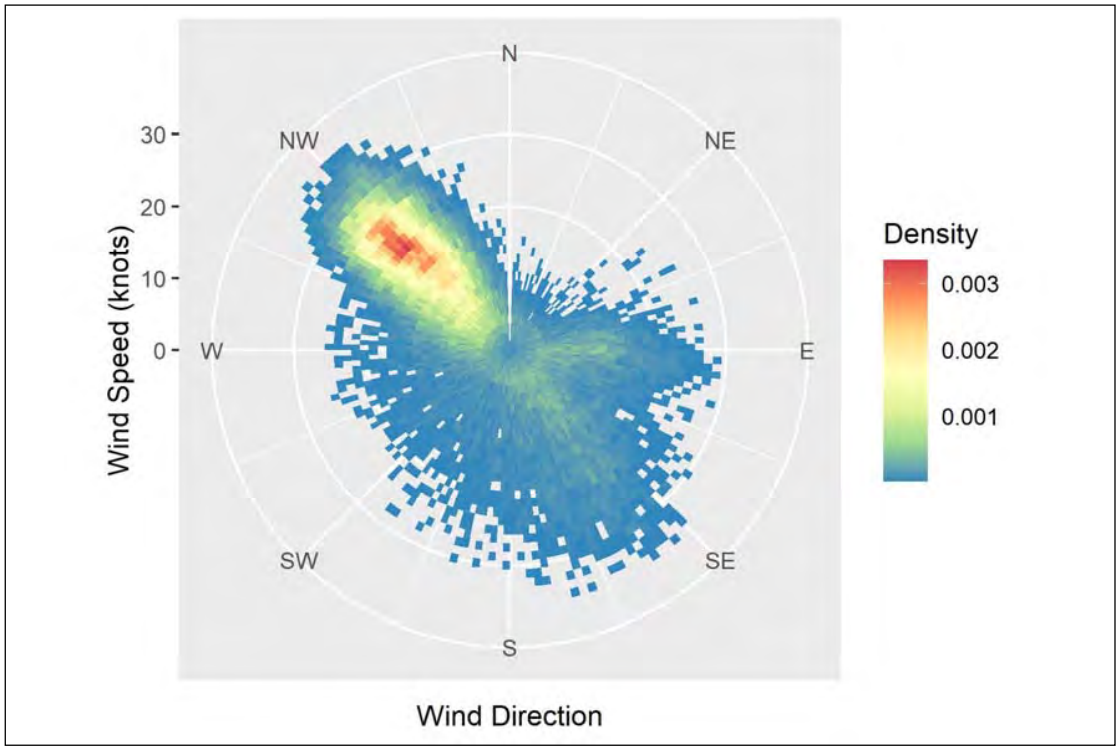

Figure 15. Joint Frequency of Occurrence: Wave Height and Wind Direction

Source: NOAA

Source: Caltrans/WRECO (2020)

3.7 Seawalls and Slope Protection

Several forms of slope protection were observed at Gleason Beach. These structures were generally built by the private property owners, and there are no permits on file with the County for them. Therefore, the dates of placement of the various forms of slope protection were not able to be determined. An example of some of the slope protection implemented at the toe of the bluff is shown in Photo 8. For reference, the same location is shown in Photo 9, showing where the slope protection has failed by 2020.

As sand is removed from the local system, the seawalls are subjected to undermining. This undermining could lead to failure. The predicted year of failure could not be determined due to the lack of information at the site.

At some of the locations where slope paving was implemented, voids were visible beneath the slope paving (see Photo 10). This indicates, as would be expected, that as the adjacent bluffs erode, the bluffs that have been paved erode as well. The same view in 2020 is shown for reference in Photo 11, however the slope paving area cannot be clearly seen.

Source: Caltrans/WRECO (2020)

Photo 8. Gleason beach seawalls and slope protection, facing northeast (March 2010)

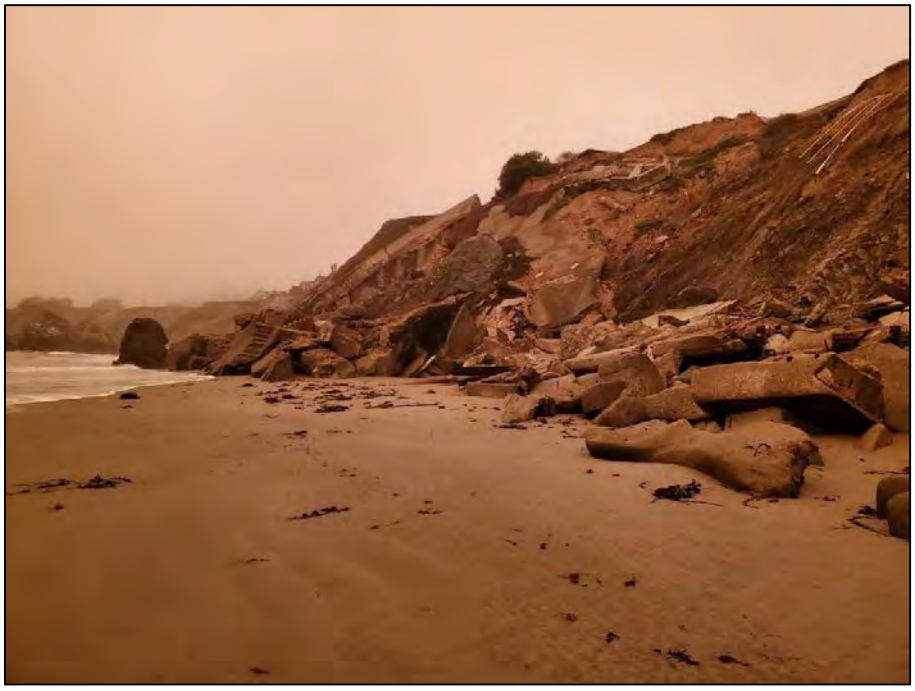

Photo 9. Similar location and view to Photo 8 in September 2020

Source: Caltrans/WRECO (2020)

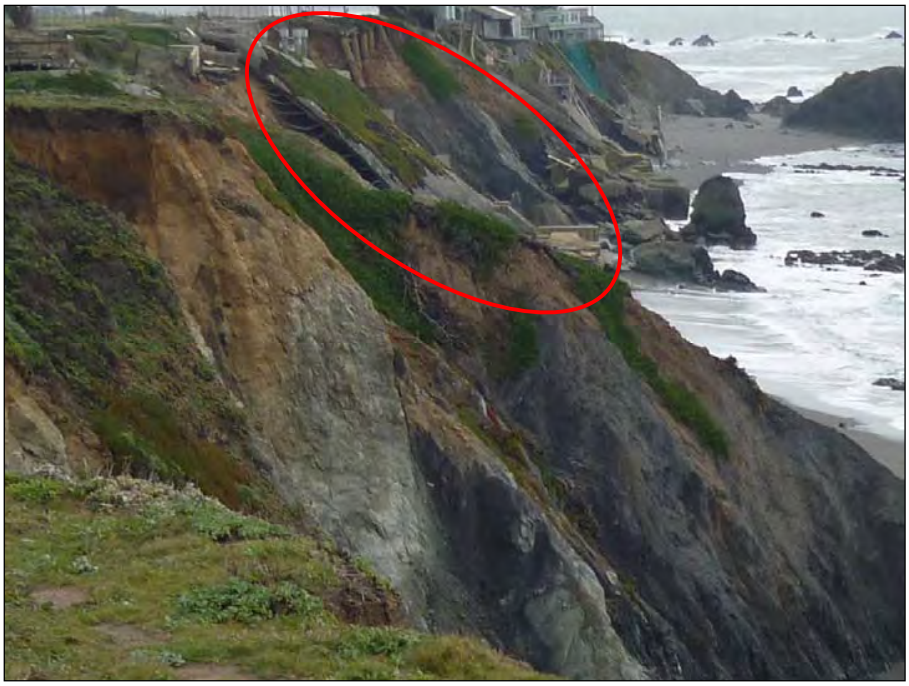

Photo 10. Voids beneath slope paving, facing south (March 2010)

Photo 11. Similar view to Photo 10 in September 2020

Source: Caltrans/WRECO (2020)

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Source: Caltrans/WRECO (2020)

4 BLUFF EROSION RISK EVALUATION

4.1 Evaluation Parameters

Within the analysis limits, the highway was divided into segments of relatively similar coastline condition. The segments are illustrated in Figure 16. The segments were qualitatively evaluated for their risks of bluff erosion from coastal and terrestrial processes based on the following criteria:

- Shore orientation relative to the dominant wind and wave direction
- Sheltering by rock outcroppings, beaches, or headlands
- Potential for groundwater erosion
- Presence of concentrated stormwater runoff discharge points
- Presence of vegetation or indications of recent erosion

These characteristics do not reflect the bluff's stability during an earthquake. Bluff failure during an earthquake is caused by geotechnical processes and is not evaluated in this study.

The dominant wind and wave direction is from the northwest. The maximum bluff erosion due to wave impacts would be along coastline that is perpendicular to the primary waves. As waves change direction in response to the ocean bathymetry, they lose some energy and would therefore cause less erosion than their directly approaching counterparts. The waves that approach at an angle could cause beach erosion via sediment transport along the coast. It was assumed that the energy of the impacting waves is more relevant to bluff erosion than the beach's sediment transport.

Locations that are sheltered from the dominant waves by headlands or other landmass formations were noted. Waves that approach these areas refract around the headlands, but loose a large portion of their energy while doing so. In addition, waves that approach the coastline loose energy by breaking on the rock outcroppings

As waves approach the bluffs, they are dissipated by rock outcroppings and beaches. This diffusion of energy results in less erosion than an unimpeded pathway would cause.

Groundwater appears to be a significant driving force of erosion within the study limits. Most of the land at the coastline is on a plateau relative to sea level. This configuration results in a groundwater table that is higher than the ocean surface. Groundwater that seeps out of the soil typically causes erosion. The water that infiltrates into a leach field enters the groundwater system and may increase the quantity of water that seeps out of the bluff.

Locations where concentrated stormwater runoff is discharged over the bluff are susceptible to erosion from this runoff. This does not include creeks, which act as sediment sources and approach the beach elevation more gradually.

Source: Caltrans/WRECO (2020)

In general, the presence of established vegetation indicates that there has not been excessive erosion recently. The vegetation also protects the slope from erosion. Therefore, vegetation is an indicator that the steady erosive processes are not significant in those areas. Soil that is visible without plant cover is evidence of recent erosion.

Segment Evaluations

Aerial photos from 1972 and 2009 are included in Appendix A. They have been positioned and scaled so that major features are approximately aligned. It should be noted that all of these photos were taken from different angles, so the landscape visible behind the bluff and the ocean in front of the bluff are not aligned. This is especially important for the 2009 photos, which are cropped and inserted next to each other to match the 1972 photos.

The evaluations are discussed below, and the relative rates of expected bluff erosion (neglecting earthquakes) are illustrated in Figure 16.

Segment A
Segment A is a bluff that is vegetated and has a beach toward the north and is a rocky, unvegetated bluff toward the south. It is sheltered from the dominant wave direction by Duncan's Point. However, the highway is on the plateau, indicating potential for erosion due to groundwater. Based on historical oblique photos, the bluff position does not appear to have moved significantly between 1972 and 2009. This indicates that the bluffs may be composed of hard rock or the sheltering is sufficient to prevent visible erosion during that time period.

Segment B
In Segment B, Highway 1 curves around the mouth of a creek at this location. At the mouth of the creek there is a beach. There are dense rock outcroppings which likely minimize longitudinal sediment movement to the south. Therefore, sediment is allowed to accumulate at the mouth of the creek. The slopes are vegetated for the most part and do not appear to have changed significantly between 1972 and 2009.

Segment C
The bluff is relatively close to the roadway within Segment C. The bluff is angled such that the waves would reach the land at an angle. The waves would be further dissipated by the large number of sea rocks to the northwest. The bluffs show signs of erosion and the segment is on the plateau, indicating risk due to groundwater seepage.

Segment D
Along Segment D the most aggressive erosion has been observed. The beach is oriented more normally to the incident waves although there is some degree of sheltering by the sea rocks. There is a leach field to the east of the highway at the center of this segment. The fastest erosion has been observed as occurring directly in front of the leach field. At many locations, seawalls have been constructed at the toe of the bluff. One property lined the slope with concrete, which has since been undercut by several feet, revealing the tie

Source: Caltrans/WRECO (2020)

backs. There was a beach in front of the properties in 1972; however, the seawalls and slope protections have slowed the progression of the bluff erosion, preventing the beach from reforming. At the north end of Segment D, there are three storm drain outfalls that discharge to very eroded portions of the bluff.

Segment E
Segment E is the mouth of Scotty Creek. Currently the creek passes under the highway via a set of box culverts. The beach in front of the highway is large and high. Additionally, the road is closest to sea-level at this point, minimizing the erosion due to groundwater. There is erosion present at the upstream end of the box culverts; however, this erosion is likely due to the culverts being undersized.

Segment F
Within Segment F, the highway is set back from the bluff, but the bluff is not vegetated. There are several small sea rocks in front of the bluff, but they may not have a significant dissipative effect because of their size. The beach is narrow.

Segments G-1 and G-2
Within Segments G-1 and G-2 there is a wide, steep beach that would dissipate wave energy before it reaches the bluff. The highway is on the plateau, higher than sea level, but the bluffs are densely vegetated and rounded.

Segment H
There is a creek that outfalls to the beach at Segment H. The beach is wide in front of this location, but there is a small segment of bluff that is steep. There is no obvious erosion at this location.

Source: Caltrans/WRECO (2020)

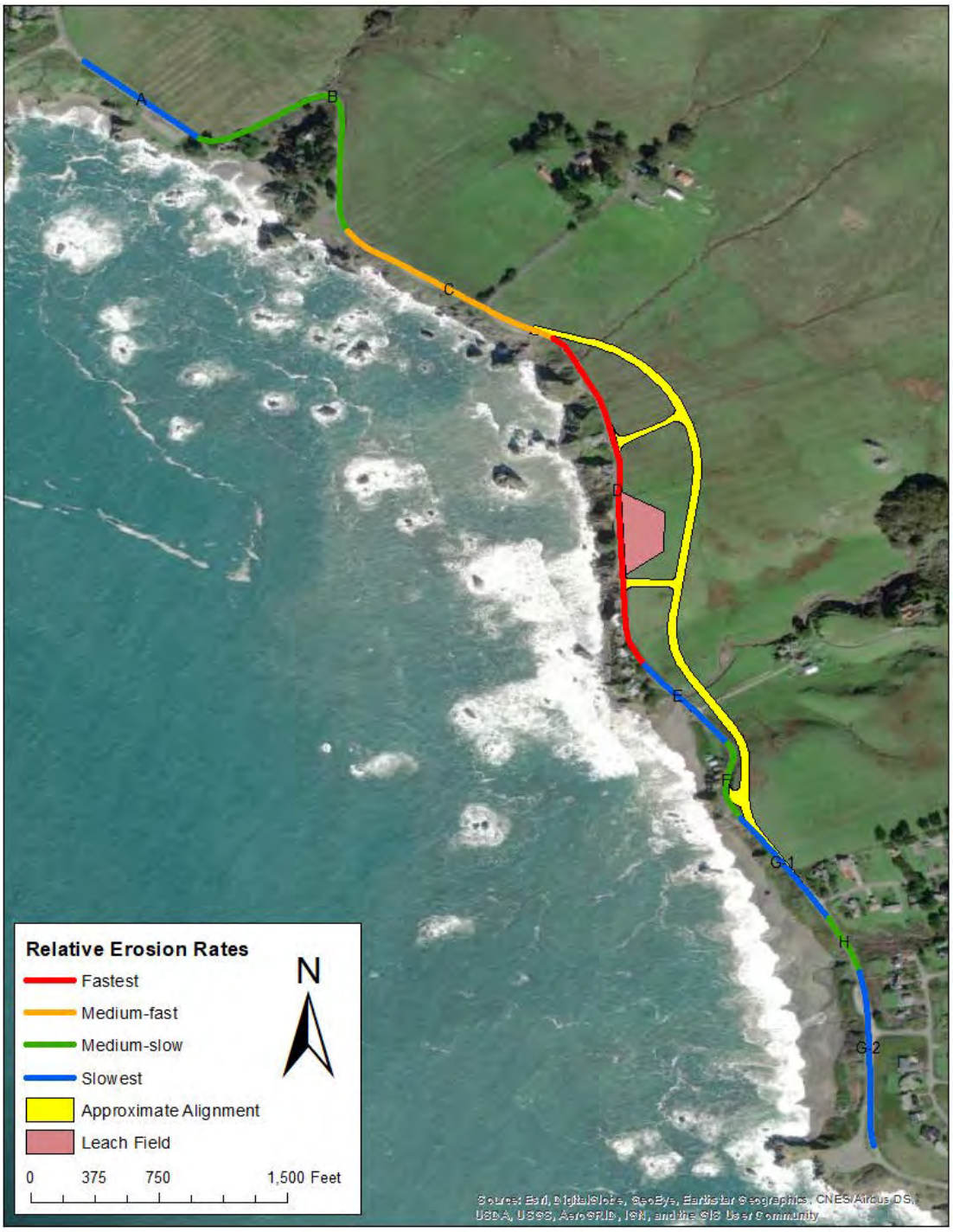

Figure 16. Erosion Rate Segments

Source: Bridge alignment - Caltrans

Source: Caltrans/WRECO (2020)

5 METHODOLOGY AND ANALYSIS

5.1 Overview

The erosion rate at the point with the most erosion was calculated per the descriptions in the sections that follow. There is not enough information to perform similar calculations for all points within the analysis range. Therefore, the erosion rates elsewhere within the analysis limits were estimated based on aerial photos (Appendix A), the rate calculated at the maximum erosion point, and similar locations nearby.

The analysis roughly followed the procedures in *California Coastal Erosion Response to Sea-Level Rise – Analysis and Mapping* (PWA, 2009). After gathering all of the data, a historical rate of erosion was determined to the extent that it was possible. Historic and predicted sea-level rise values where used to produce a local area regression model (SLR model).

The statistical properties of the sea-level, wave, and wind data were analyzed. Wind direction and wave height data from the Point Reyes deep water buoy were used to transform waves based on shoaling and refraction from the buoy water depth to an assumed shallow water depth of 10 feet near the Project site to determine if waves exceeded the breaking height. Deep water waves were adjusted to prevent breaking. These results were then adjusted for wave runup and the SLR model was used to remove the effects of sea-level rise. The resulting TWL data was used to fit Weibull distribution parameters.

The Weibull distribution parameters, in combination with the toe elevation, beach slope, and historical erosion rates, were used to calculate future erosion rates and cumulative erosion. Finally, cumulative erosion was plotted against the proposed highway alignment to determine the proximity of the cliff to the proposed roadway alignment.

The process used and data requirements are summarized in Figure 17, and the steps are detailed in the following sections.

Source: Caltrans/WRECO (2020)

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Source: Caltrans/WRECO (2020)

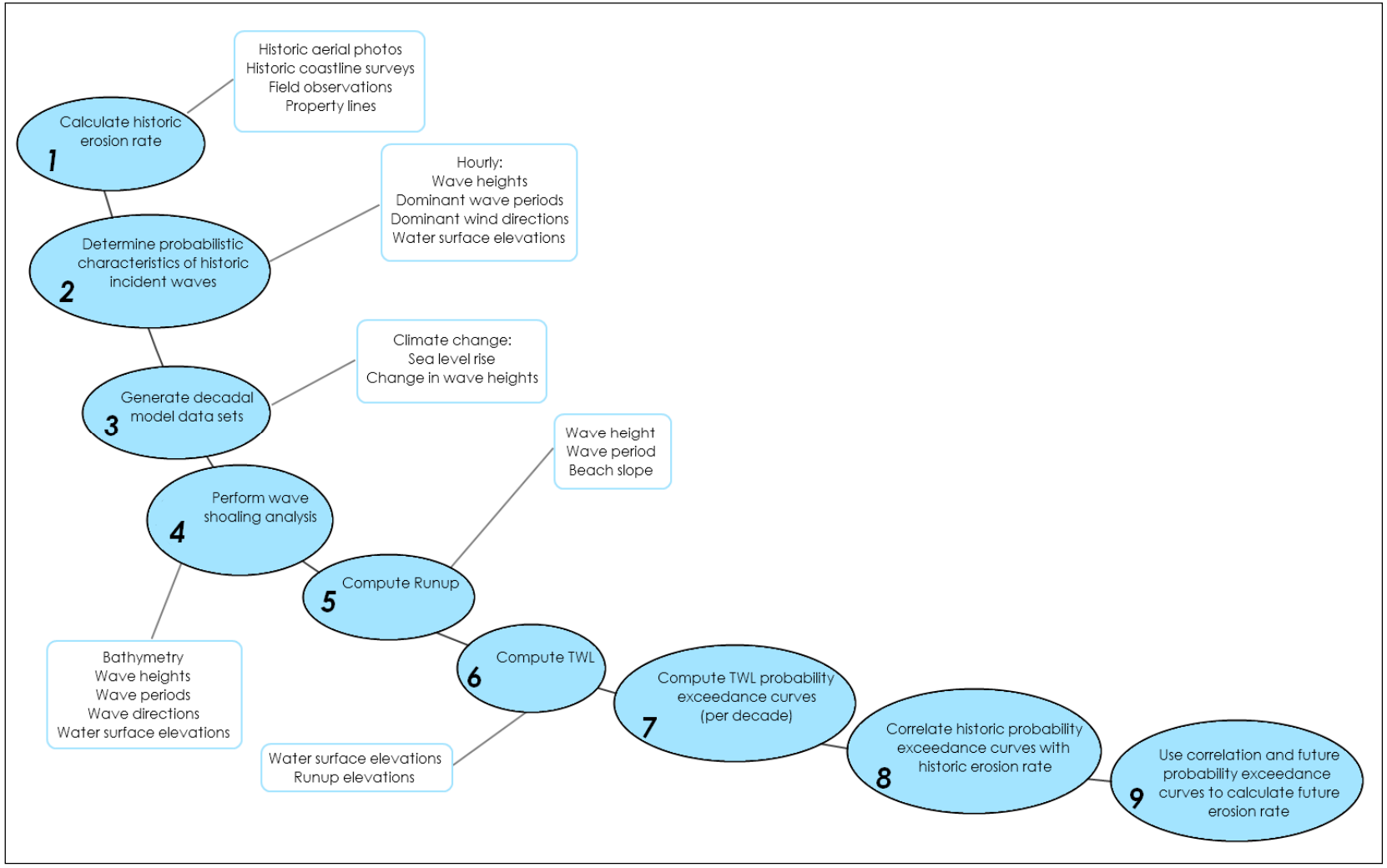

Figure 17. Modeling Process and Data Inputs

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Source: Caltrans/WRECO (2020)

5.2 Historical Rate of Erosion

The historical rate of erosion of the bluff, at the location where the roadway piles have been exposed, was estimated from anecdotal evidence. During the installation of the piles in 2002, the bluff was observed by project engineers to be about ten feet seaward of the piles. The bluff at the time of the WRECO survey was at the piles, so an erosion rate of ten feet over eight years, or 1.25 feet/year, was estimated.

According to the PWA study (see Section 2.6), similar locations nearby have an average historical erosion rate of approximately 5.0 ± 2.8 inches/year for armored coastline. For unarmored coastline, they observe rates of up to 7.0 ± 2.8 inches/year. These rates are based on USGS data between the 1930s and 2002. These average rates are significantly smaller than the 1.25 feet/year calculated based on recent observations. This difference could be due to the episodic nature of failure events averaging out or to increasing erosion as the slope protections fail. Also, the observed rate is based on locally specific events, whereas the USGS rates are based on similar locations nearby.

Using the historical shoreline data, the locations where there appears to be little to no change in the shoreline location were determined (see Figure 18). There is uncertainty in the placement of the shoreline, so the points chosen and the area between the lines may be somewhat off of their true values (see Section 3.2); however there is no better information available.

The average historical rate of erosion between the two points was calculated by dividing the area between the two survey lines (in orange in Figure 18) by the distance between the two points. The resulting bluff recession rate was 1.0 feet/year. This rate is between the recently observed rate and the PWA study's rate.

This study was performed using two scenarios. First, 1.0 feet/year was chosen as the historical rate to be representative of the site because it is based on a longer time difference than the recently observed rate and it was also measured at the Project site, rather than nearby. This rate implicitly includes erosion due to groundwater seepage, leech field seepage, wind, rain, animals, earthquakes, and any other erosive forces active between approximately 1932 and 1962. Due to the uncertainty in the placement of the shoreline as discussed above the more recent and conservative historical rate of 1.25 feet/year was also studied.

Because it is unknown when the toe and slope protections were placed, what the elevations of the top of the toe protections are, and when failure would be expected to occur, the effect of the toe and slope protection in the future could not be removed from the analysis. The calculations presented as part of the study assume that, on average, the slope protection in the future is similar to that in the past in relative duration of protection, effectiveness of protection, and elevations.

Source: Caltrans/WRECO (2020)

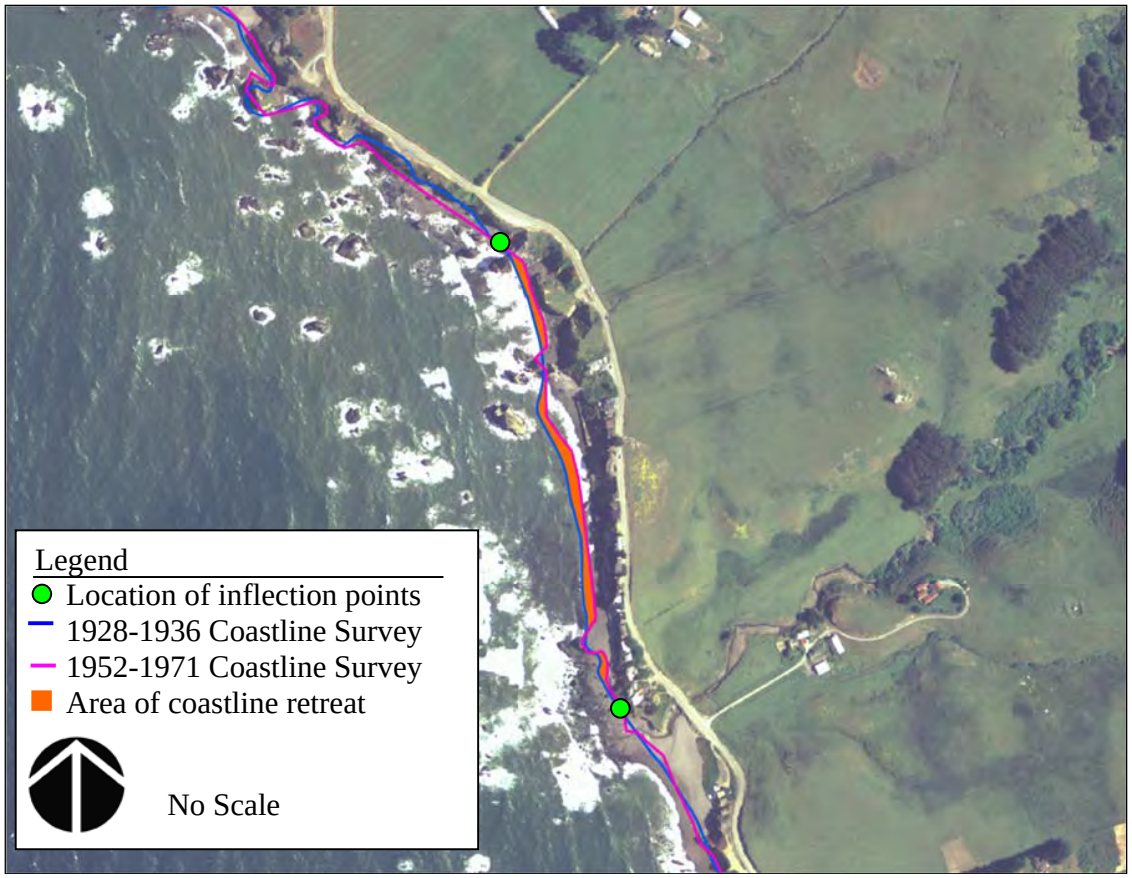

Figure 18. Historical Erosion Rate Calculation

Source: Google

5.3 Analysis of Historical Hourly Data

Historical water level, wave, and wind data were collected and analyzed to determine the probabilities of occurrence of still water levels and the joint probabilities of occurrence of still water level and wave height, wave height and period, wave height and wind direction, and wind speed and wind direction. The data processing is described in Sections 3.4 through 3.6. The local regression model of sea-level rise was used to remove sea-level-rise trend from the still water level of the Point Reyes tide station data. The data was then fit to a Weibull distribution to determine the shape and scale parameters.

5.4 Wave Transformation

Erosion due to wave action is based on the fraction of time the TWL is above the toe elevation. TWL is calculated using data from a deep-water buoy. Waves tend to break as they approach shore if the wave height exceeds 0.78 times the still water depth. As waves approach the shore wave height is affected by the changing bathymetry. Shallower water causes an increase in wave height through conservation of energy and a decrease in wave height due to energy losses from wave refraction.

Source: Caltrans/WRECO (2020)

Following methods presented in the *USACE Coastal Engineering Manual*, Part II, Chapter 3 (Vincent, 2002), wave transformation was performed to a still water depth of 10 feet using a combination of shoaling and refraction to determine if the wave would break before reaching the toe. Ten feet was used as an approximate depth, and was assumed to be sufficient for the purpose of this filter. If the resulting shallow water wave was more than 0.78 times 10 feet (7.8 feet) at the 10 feet depth, then a 7.8 feet shallow water wave was transformed back to deep-water. If the wave would not have broken at a 10 feet depth, then the original deep-water wave height was retained. The wave transformation analysis included the hourly wind directions and still water levels obtained from the Bodega Bay Buoy (see Section 3.5). The equations are presented below.

$$c_0 = \frac{g\,T_0}{2\pi}$$

$$c_1 = c_0\ tanh\left(\frac{4\,\pi^2 h_0}{g\,T_0^2}\right)$$

$$k_0 = \frac{2\pi}{c_0 T_0}$$

$$K_S = \left(\left(\frac{c_1}{c_0}\right)\left(1 + \frac{2 * k_0 h_0}{sinh(2k_0 h_0)}\right)\right)^{-1/2}$$

$$K_R = cos(\alpha_0)^{1/2}, assuming\ \alpha_1 = 0$$

$$H_1 = H_0 K_R K_S$$

Where:

L =	Wavelength (feet)
H =	wave height (feet)
T =	Period (seconds)
h =	undisturbed depth or still water level-surface elevation (feet)
k =	wave number (1/feet)
c =	wave celerity (feet/second)
K_S =	shoaling coefficient
H_R =	refraction coefficient
α =	angle between contour and wave front
g =	gravity (feet/second)
subscript 0	deep water
subscript 1	shoaling depth

Source: Caltrans/WRECO (2020)

5.5 Runup

The modified still-water elevations from the transformation step were used to calculate the wave runup with the following equation, from Stockdon, et. al. (2006):

$$R_2 = 1.1\left(0.35\beta_f(H_0L_0)^{1/2} + \frac{1}{2}\left[H_0L_0\left(0.563\beta_f^2 + 0.004\right)\right]^{1/2}\right)$$

Where:

$R_2 =$ runup (m)
$\beta_f =$ average slope over a region $\pm 2\sigma$ around $< \eta >$ (m/m)
$< \eta >=$ maximum setup (m)
$H_0 =$ deepwater wave height (m)
$L_0 =$ deepwater wave length (m)

The slope of the beach, as estimated from survey performed by WRECO on May 6, 2010, of the accessible portions of the beach, was eight percent (0.08 feet/feet). This is the average slope of a portion of the beach that appeared to be the steepest that was visible during low tide. The actual slope is variable along the length of the beach; however, without more accurate and precise survey data, the slope could not be quantified more specifically over the length of the beach. It should also be noted that the slope was measured for the exposed portion of the beach, but there are segments of the beach at which the toe of the bluff was below the low-tide level and therefore could not be assessed.

5.6 Climate Change Adjustment

The effects of sea-level rise were included in the model by adding the expected sea-level rise to the still water levels. The expected sea-level rise was obtained from the local regression model produced from the combined historical SLR and predicted SLR from the SLR Guide as discussed in Section 2.5. The values from this report are shown in Figure 5. The projection representing a Medium-High Risk Aversion was selected. Projections for decades having both low and high emissions were averaged for the purpose of this study. A plot of historical and projected sea-level rise is seen in Figure 6. Using this method, it is projected the sea-level rise from the year 2000 to 2100 will be 6.4 feet for the Medium-High Risk Aversion, 10.2 feet for and for the Extreme Risk Aversion, and 3.5 feet for Cayan.

In the previous study (WRECO, 2014), values representing the middle year of each decade were added to the data for the entire decade. For example, for modeled data between 2010 and 2019, the predicted sea-level rise for 2015 was used. This study utilized computational methods that allowed sea-level rise to be accounted for on a year-by-year basis. Results are summarized by decade.

Source: Caltrans/WRECO (2020)

Wave heights are not expected to increase in the future due to the effects of climate change (Cayan, 2009). Therefore, no adjustment to wave heights pertaining to climate change were included in the model. El Nino years are expected to occur more frequently in the future. However, information indicating quantitative changes was not available. The estimates in this study assume El Nino events to occur at approximately the same frequency as is included in the historical data set. There were not enough El Nino years in the historical data to develop separate distribution functions for them.

A baseline TWL was produced by removing the effects of sea-level rise from the results of the wave transformation analysis and wave runup.

5.7 Analysis Procedure

Computationally the probability of exceedance can be determined by subtracting the change in sea-level from the toe elevation or adding it to the TWL. Weibull distribution parameters were fitted to the TWL baseline data. The Weibull parameters were used together with the toe elevation and sea-level rise for each year to calculate the probability that the TWL would be at most as high as the toe elevation. Figure 19 is an example probability distribution curve for the year 2000. Each probability subtracted from one gives the probability of exceedance for the TWL. The exceedance probabilities were used to calculate an erosion rate for each decade, using the following equation:

$$R_f = R_h + \alpha R_h \left(\frac{P_f - P_e}{P_e} \right)$$

Where:

$R_f =$ future erosion rate (feet/year)
$R_h =$ historical erosion rate (feet/year)
$\alpha =$ erosion coefficient
$P_e =$ probability of historical TWLs exceeding toe elevation
$P_f =$ probability of future TWLs exceeding toe elevation

A single erosion rate and distance was calculated for each year. The results were summarized by decade and erosion distance was summed to yield the total cumulative erosion that would occur between 2000 and 2100. For simplicity and because the calculations were approximate, the bluff line observed on the aerial photo from 2006 was assumed to represent the bluff line in 2000. The 2100 cumulative erosion distances were mapped relative to this bluff line. In addition, the historical erosion rate was assumed to be the erosion rate in 2000 due to the approximate nature of the rest of the calculations.

Source: Caltrans/WRECO (2020)

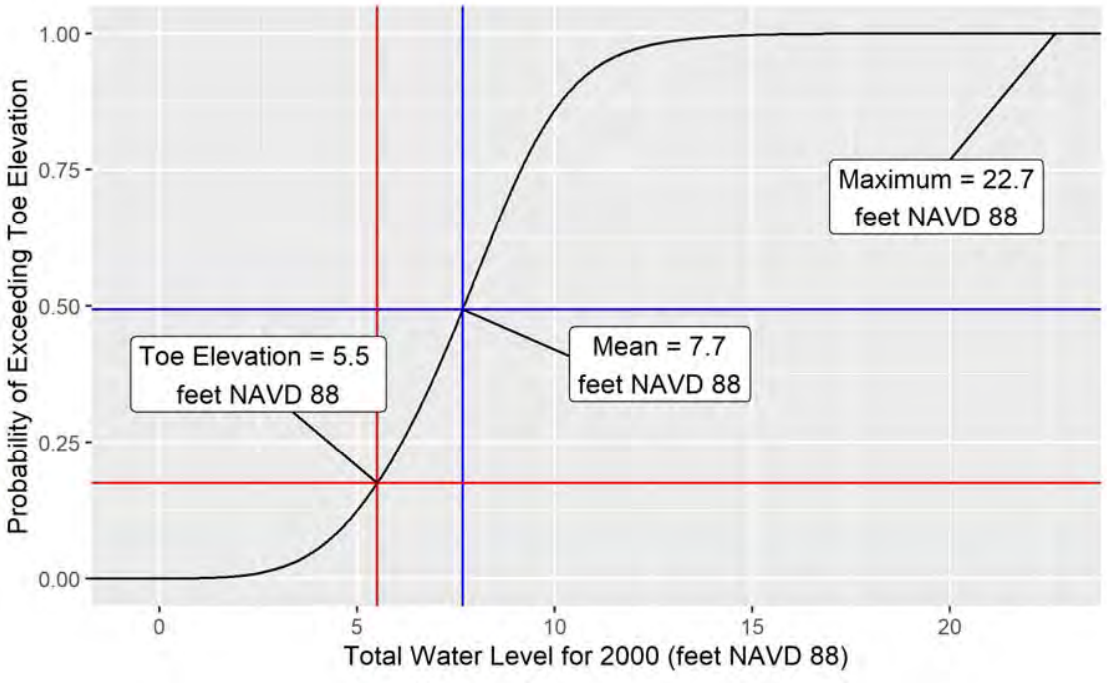

Figure 19. Cumulative TWL Distribution for year 2000

5.8 Sensitivity Analysis

5.8.1 Initial Toe Elevation

Because the toe elevation varies over the length of the site, large portions of the site were inaccessible, and accurate survey data were unavailable, the sensitivity of the erosion calculations to the toe elevation was evaluated.

During the survey performed by WRECO, the toe elevation of the accessible portions of the bluff was estimated to be 5.5 feet NAVD. This value was assumed to be representative of the entire site. However, this value is quite uncertain and could plausibly vary by one foot or more in either direction. Therefore, the erosion calculation was performed assuming a toe elevation of 4.5 feet and 6.5 feet in addition to the estimated 5.5 feet, for comparison.

It should be noted that this discussion does not indicate that if the toe were to be artificially increased, that the erosion rate would increase. Rather, if the historical toe elevation was higher than assumed, than the increase in future erosion rate would be greater.

5.8.2 Change in Toe Elevation Over Time

The toe elevation was assumed to remain constant over time, meaning that the toe elevation in 2100 was assumed to be equal toe elevation in 2000. This is consistent with

Source: Caltrans/WRECO (2020)

the approach presented in the PWA study; however, no evidence is provided to substantiate this assumption in that report. A review of the literature pertaining to sea-level rise and bluff erosion did not indicate whether the toe elevation is expected to increase with the rise in sea level or not. If there is sufficient sediment available, the beach toe elevation could increase in response to the increased sea level.

There is insufficient bathymetric data or historical observation records to determine if the sediment supply is expected to be sufficient to raise the beach in response to sea-level rise. Therefore, various scenarios modeling an increase in the toe elevation were analyzed. The rate at which the beach would rise was assumed to be a fraction of the rate of sea-level rise. This relationship was represented using a variable, gamma, times the greater sea-level rise scenario. Assuming there would be no change in the toe elevation in the future would correspond to gamma equal to 0. If the toe elevation were to increase at the same rate as the sea level, this would correspond to gamma equal to 1. Gamma equal to 0, 0.5, and 0.9 were modeled.

5.8.3 Initial Erosion Rate

The historical rate of erosion is discussed in Section 5.2. An erosion rate of 1.0 feet/year is based on averaging the distance between the available known historical shoreline and the current shoreline. However, the literature suggests it could be as low as 5.0 ± 2.8 inches/year (minimum is 0.18 feet/year) and the information collected by project engineers in 2002 and 2010 indicate the rate could be as high as 1.25 feet/year. Initially sensitivity assessment was performed for initial erosion rates of 0.18, 1.0, and 1.25 feet/year. The results indicated that the calculations had a high level of sensitivity to the initial erosion rates. Since the assumption is that the initial erosion rate is between 1.0 and 1.25 feet/year the sensitivity was reevaluated for a narrower arrange beginning at 0.75 feet/year.

5.8.4 Contribution of Other Erosion Processes

A sensitivity assessment was performed to demonstrate the analysis' dependence on alpha in the equation shown in Section 5.6. This coefficient was taken to indicate the relative contribution of coastal processes to the overall rate of erosion. Other process that are likely to contribute to bluff erosion in the study area include earthquakes, groundwater, and wind. For this site 25- to 50-percent of erosion was attributed to coastal processes. The calculations are based on the point of maximum erosion. At this point, there is significant erosion due to the groundwater, man-made changes, and the leach field. The point is directly in front of the leach field and the erosion is slower further from the leach field. Because there is no quantitative bluff retreat rate data elsewhere within the study limits, varying the alpha within the limits would not be useful. Therefore, the limits of alpha equal to 0.1 (for almost no contribution from coastal processes), 0.25, 0.5, and 0.9 (for almost all erosion due to coastal processes) were assessed.

Source: Caltrans/WRECO (2020)

5.8.5 Sensitivity Results

The four parameters discussed above were each assessed for the indicated values including to demonstrate sensitivity to the assumptions. A total of 108 combinations where assessed for the three SLR scenarios: Medium-High Risk Aversion, Extreme Risk Aversion, and Cayan. The results for Medium-High Risk Aversion can be seen in Figure 20, Extreme Risk Aversion in Figure 22 and Cayan in Figure 24. Figure 21 shows the results for Medium-High Risk Aversion with the selected values of 0.25 for alpha, 0 for gamma, and initial erosion rate of 1.0 foot/year. Figure 23 shows the results for Extreme Risk Aversion with the selected values of 0.5 for alpha, 0 for gamma, and initial erosion rate of 1.25 feet/year. Finally, Figure 25 shows the results for Cayan with the selected values of 0.25 for alpha, 0 for gamma, and initial erosion rate of 1.0 foot/year. The maximum erosion for each Medium-High Risk Aversion scenario is summarized in Table 5, for Extreme Risk Aversion in Table 6, and for Cayan in Table 7.

The analysis is most sensitive to the initial erosion rate. Within the selected values for alpha, gamma, and initial toe elevation the total erosion varies from 78 feet to 129 the using Medium-High Risk Aversion, 81 feet to 135 feet for the Extreme Risk Aversion, and 77 feet to 128 feet for Cayan.

It is possible that the toe elevation increase would lag behind the sea-level increase; this was not included in the model. The two changes were assumed to occur simultaneously for the purposes of this analysis. This is plausible given the potential beach changes that occur in the time span of even one storm.

The impact of the initial toe elevation is not as great as the impact of the initial erosion rate (Figure 21 and Figure 23). For the rest of this analysis, the toe elevation was assumed to remain constant with time to be conservative.

It should be noted that with combination of alpha, gamma, and initial erosion rate of 0.9, 0.9, and 1.25 feet/feet respectively that the probability of exceedance approaches zero over time. This results in an exponential increase in the cumulative erosion. The equations used may not be valid in these conditions, however it is unlikely that if nearly all of the erosion is attributed to wave action (alpha = 0.9) that there would also be sufficient sediment deposit to enable an increase in the toe elevation nearly proportional to the rate of erosion (gamma = 0.9). It is reasonable to neglect the results that show exponential growth.

Source: Caltrans/WRECO (2020)

Table 5. Summary of Results for Each Scenario with Medium-High Risk Aversion

Initial Toe Elevation (feet NAVD 88)	Initial Erosion Rate (feet/feet)	alpha											
		0.1			0.25			0.5			0.9		
		Gamma			Gamma			Gamma			Gamma		
		0	0.5	0.9	0	0.5	0.9	0	0.5	0.9	0	0.5	0.9
4.5	0.75	76	76	77	77	78	79	78	81	84	81	85	93
	1	101	102	103	102	104	108	105	109	118	108	117	144
	1.25	126	127	131	128	131	141	131	139	167	135	152	350
5.5	0.75	76	77	77	78	79	81	80	84	89	85	92	108
	1	101	103	105	103	107	113	107	114	132	113	129	257
	1.25	127	129	134	129	135	152	134	147	244	141	173	322
6.5	0.75	77	77	79	79	81	85	83	89	100	90	104	150
	1	102	104	107	105	110	121	111	123	171	120	151	417
	1.25	128	131	139	131	141	176	138	162	287	150	222	287

Note: The green row and column identifies the selected parameters.

Table 6. Summary of Results for Each Scenario with Extreme Risk Aversion

Initial Toe Elevation (feet NAVD 88)	Initial Erosion Rate (feet/feet)	alpha											
		0.1			0.25			0.5			0.9		
		Gamma			Gamma			Gamma			Gamma		
		0	0.5	0.9	0	0.5	0.9	0	0.5	0.9	0	0.5	0.9
4.5	0.75	76	76	77	77	78	79	79	81	85	82	87	94
	1	101	102	103	103	105	108	105	110	119	110	119	144
	1.25	126	128	131	128	132	141	132	140	164	137	154	605
5.5	0.75	76	77	78	78	80	82	81	85	90	86	94	110
	1	102	103	105	104	107	113	108	115	133	115	132	217
	1.25	127	129	134	130	136	151	135	149	215	144	176	523
6.5	0.75	77	78	79	79	82	86	84	90	101	93	107	152
	1	102	104	107	106	111	122	112	125	167	124	157	515
	1.25	128	131	139	132	142	173	141	165	607	155	229	395

Note: The green row and column identifies the selected parameters.

Table 7. Summary of Results for Each Scenario with Cayan

Initial Toe Elevation (feet NAVD 88)	Initial Erosion Rate (feet/feet)	alpha											
		0.1			0.25			0.5			0.9		
		Gamma			Gamma			Gamma			Gamma		
		0	0.5	0.9	0	0.5	0.9	0	0.5	0.9	0	0.5	0.9
4.5	0.75	75	76	76	76	77	78	77	79	82	79	83	89
	1	101	101	102	102	103	107	103	107	115	106	113	134
	1.25	126	127	130	127	130	138	129	135	159	132	146	324
5.5	0.75	76	76	77	77	78	80	79	81	86	82	87	99
	1	101	102	104	102	105	110	105	111	125	109	121	184
	1.25	126	128	132	128	133	147	131	142	207	136	160	270
6.5	0.75	76	77	78	78	80	83	81	85	93	86	95	124
	1	101	103	106	104	108	117	108	117	150	114	136	234
	1.25	127	129	136	130	137	166	134	152	246	143	191	228

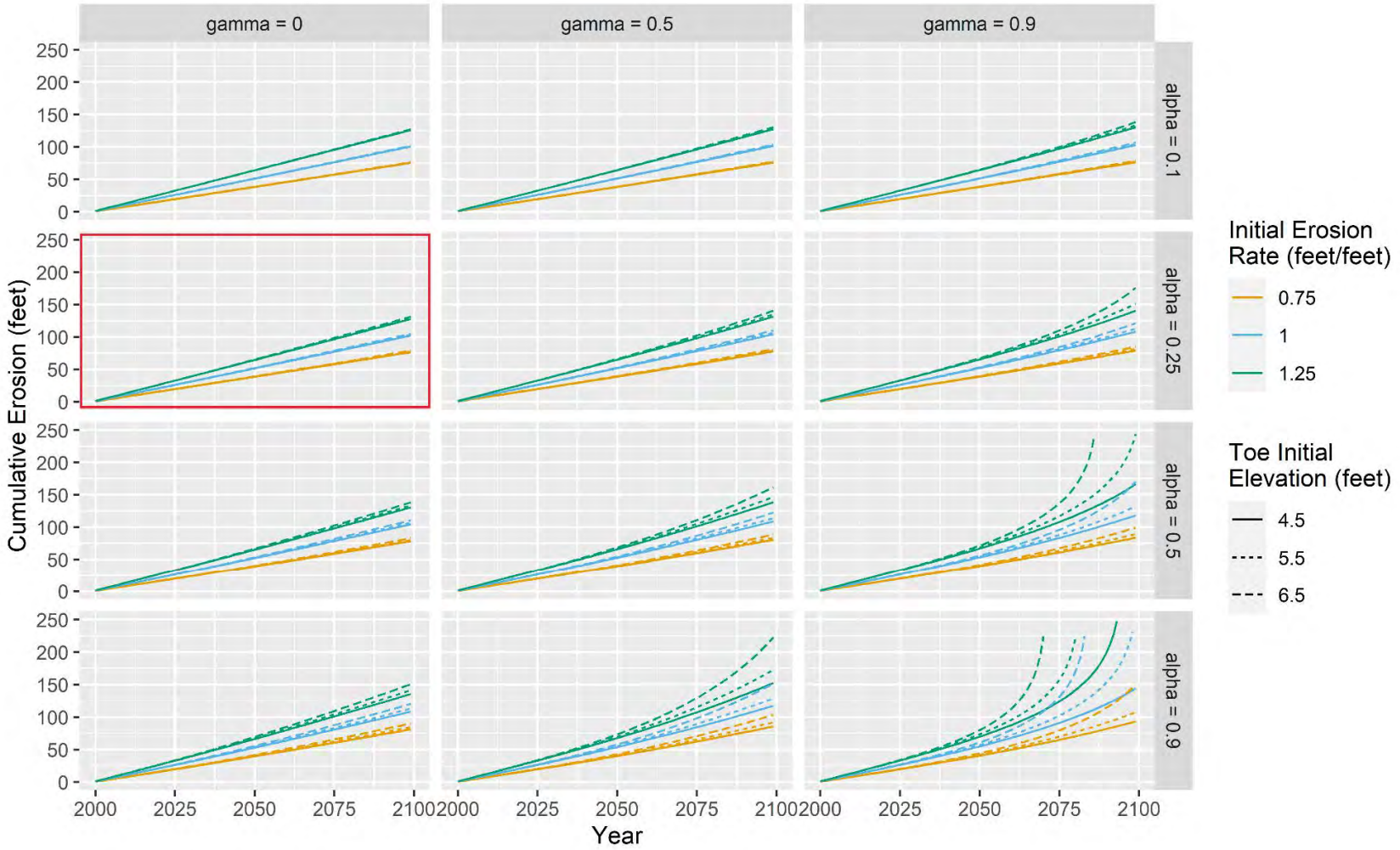

Figure 20. Results of Sensitivity Analysis for Medium-High Risk Aversion
Note: selected values indicated with red box

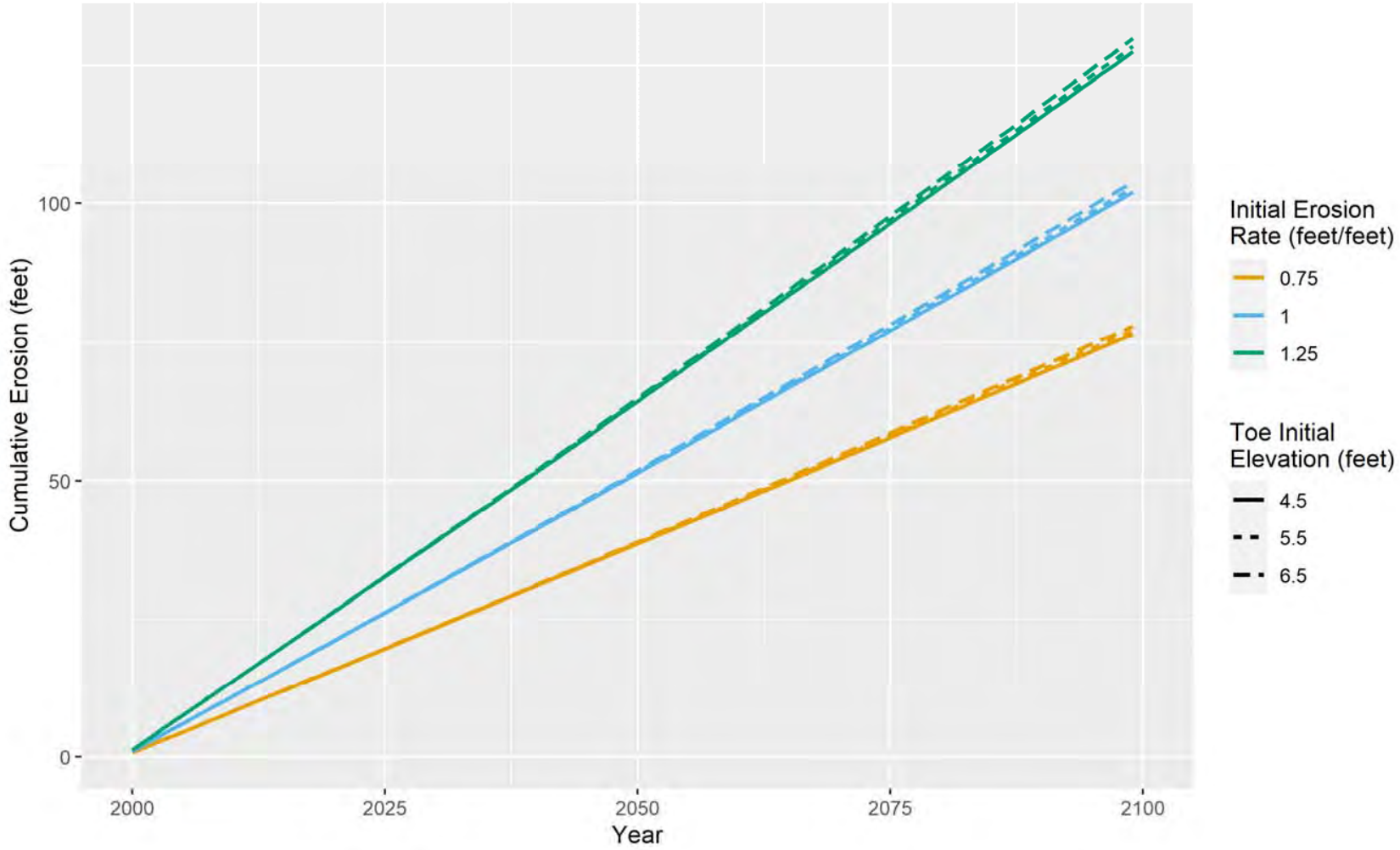

Figure 21. Results of Sensitivity for Selected Values of Alpha and Gamma for Medium-High Risk Aversion

Source: Caltrans/WRECO (2020)

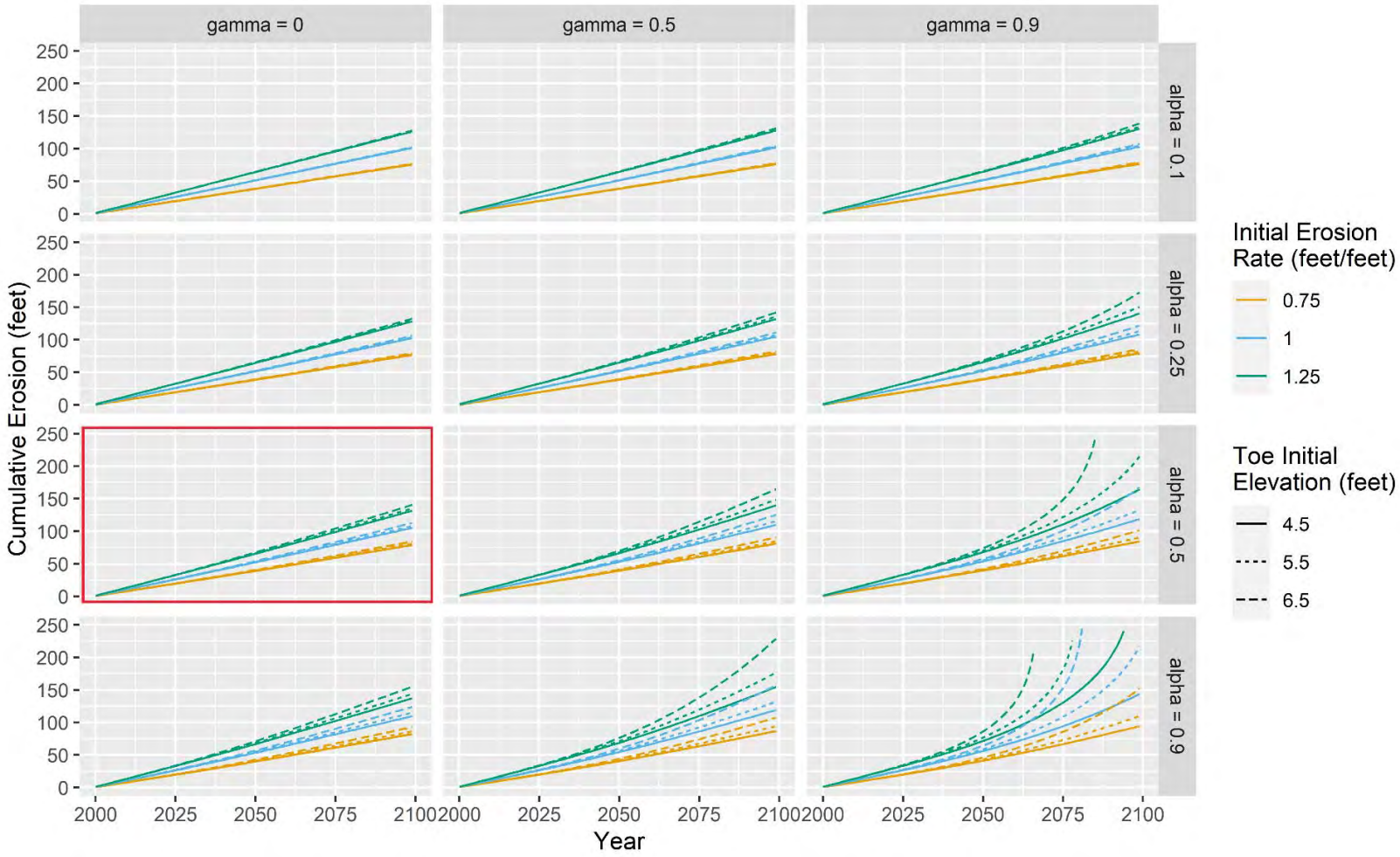

Figure 22. Results of Sensitivity Analysis for Extreme Risk Aversion
Note: selected values indicated with red box

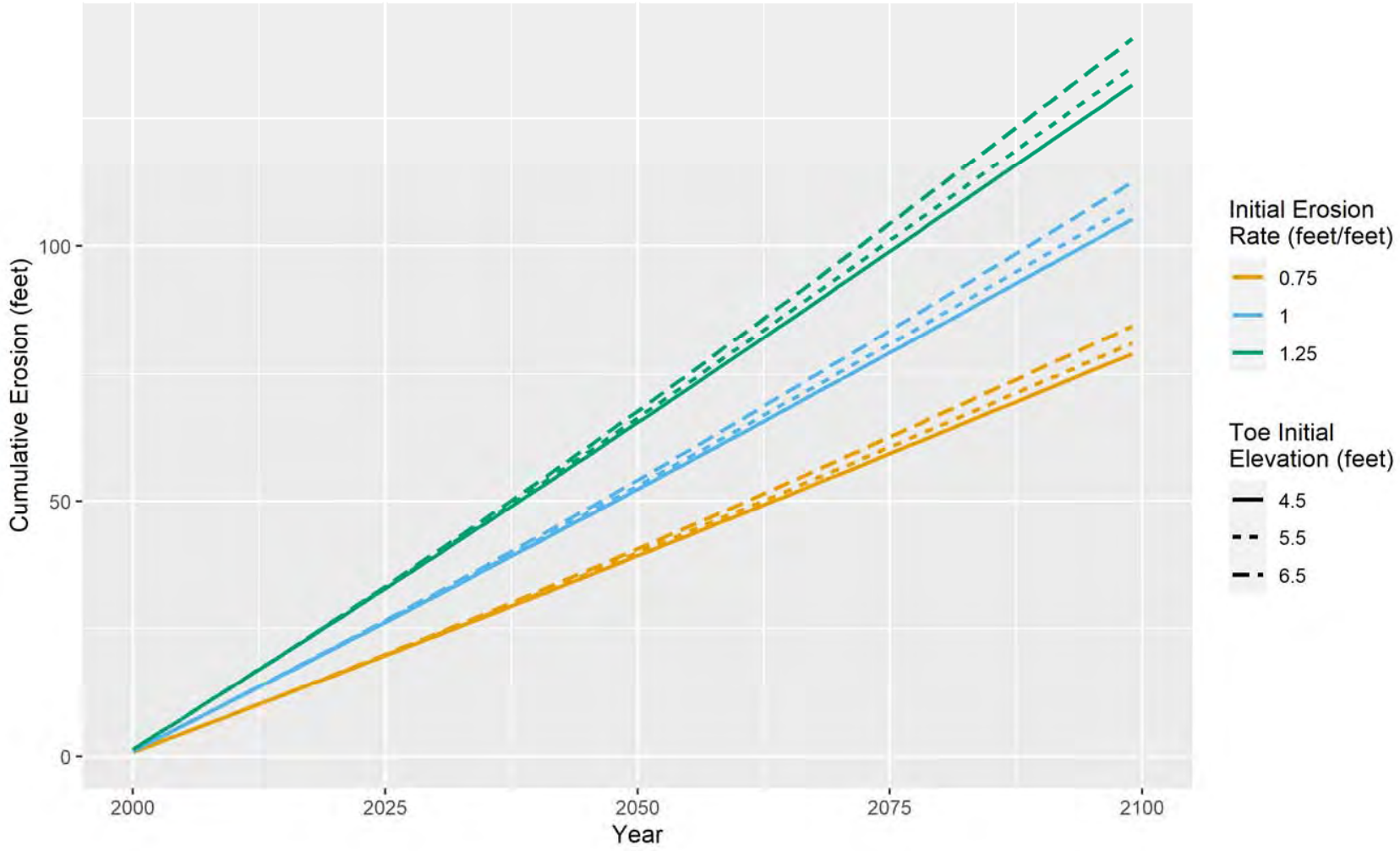

Figure 23. Results of Sensitivity for Selected Values of Alpha and Gamma for Extreme Risk Aversion

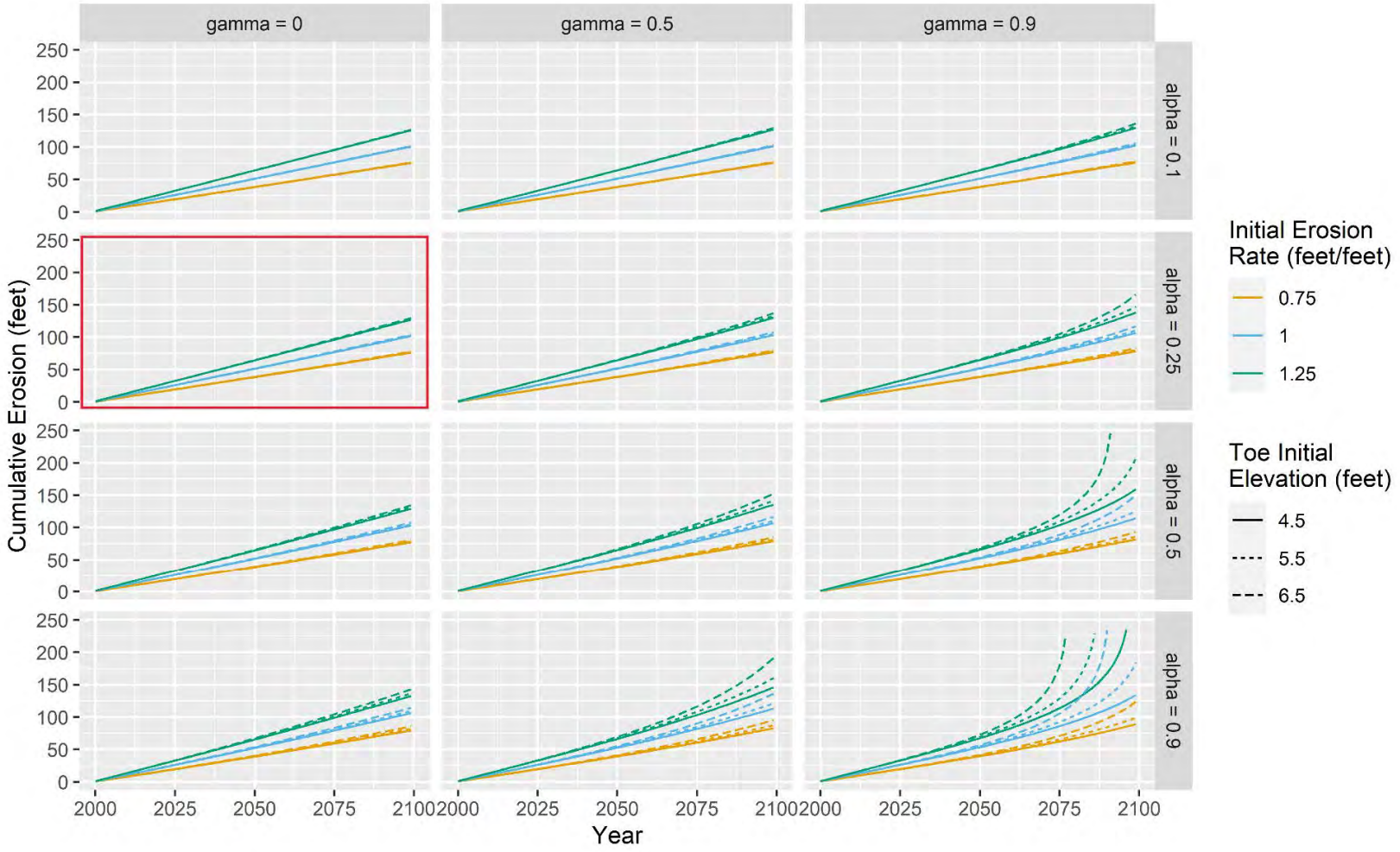

Figure 24. Results of Sensitivity Analysis for Cayan
Note: selected values indicated with red box

Source: Caltrans/WRECO (2020)

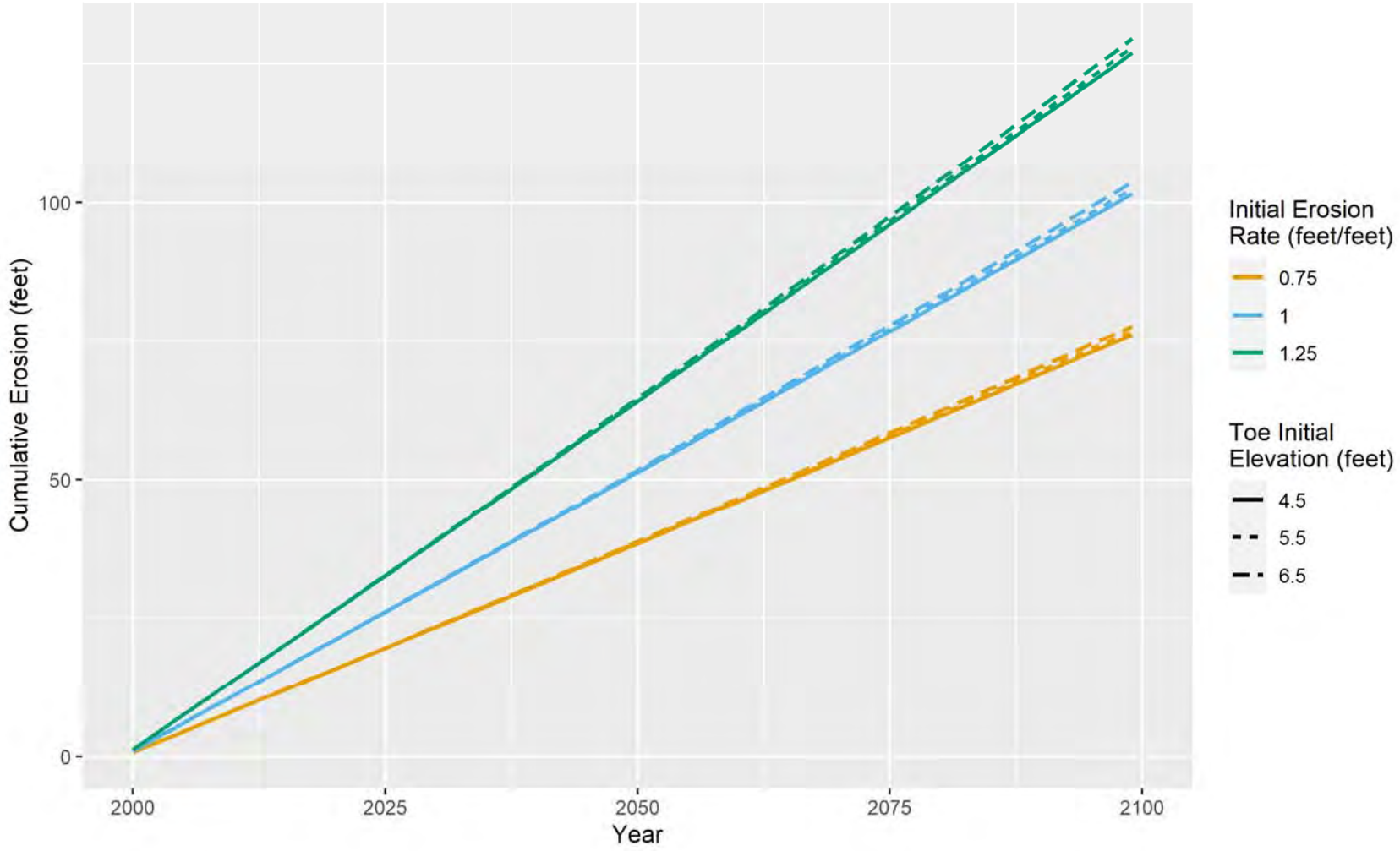

Figure 25. Results of Sensitivity for Selected Values of Alpha and Gamma for Cayan

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Source: Caltrans/WRECO (2020)

5.9 Estimated Erosion in Other Segments of Analysis Limits

The historical erosion at other locations within the analysis limits could not be determined using the same method as at the point in front of the leach field, because there is not sufficient information for the inputs. The rates were therefore estimated using different methods.

In the aerial photos from 1972 and 2009 (see Appendix A), there is no obvious erosion visible at locations other than Segment D. Assuming 10 feet of bluff retreat would be the minimum quantity that would be visible, the maximum rate of erosion that could be present would be about 0.3 feet/year or 3.6 inch/year.

According to the PWA study (see Section 2.6), similar locations nearby have an average historical erosion rate of approximately 5.0 ± 2.8 inch/year for armored coastline. For unarmored coastline, they observe rates of up to 7.0 ± 2.8 inch/year. These rates are based on USGS data between the 1930s and 2002. The segments of the analysis limits other than Segment D are not armored by manmade structures. However, they are sheltered by Duncan's Point, seastacks, and beaches – as discussed in Section 4.1. An average rate between the two PWA values would be appropriate for the well shielded locations.

Based on the estimations above and the maximum rate calculated at the leach filed, the range of initial erosion rates is estimated to be between 0.3 feet/year and 1.25 feet/year. Erosion rates were assumed for each of the rate classifications included in Figure 16. The rates are summarized in Table 8. Other parameters were the same as discussed above.

Table 8. Estimated Erosion Rates

Erosion Speed Classification	Segments	Source	Initial Erosion Rate (feet/year)	Average Erosion Rate through 2100 (feet/year)	Total Distance by 2100 (feet)
Slowest	A, E, G	Empirical	0.3	0.31	31
Medium-slow	B, F, H		0.5	0.51	51
Medium-fast	C		0.7	0.72	72
Fastest	D	Medium-High Risk Aversion	1	1.03	103
Fastest	D	Extreme Risk Aversion	1.25	1.35	135
Fastest	D	Cayan	1	1.02	102

Source: Caltrans/WRECO (2020)

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Source: Caltrans/WRECO (2020)

6 RESULTS AND DISCUSSION

6.1 Future Top of Bluff

The approximate bluff retreat in 2100 that was predicted using the analysis described in Section 5 is shown in Figure 26. A closer view of the site is included in Figure 28. The parameters of this prediction at the Project site are included in Table 9. It should be noted that a change in any of these parameters, the values of all of which are uncertain, would change the results of the analysis. The best estimate that was possible, given the data and calibration limitations, is what is presented. The erosion rates that were calculated implicitly include any processes that occurred during the date range of the historical measurements on which it is based. This includes animal activity, wind, earthquakes, groundwater, and other processes in addition to waves and sea level. An increase in any of these other processes would increase the erosion rate beyond what is calculated here. Of particular note, the additional precipitation from the increasing frequency of El Nino years could accelerate the bluff retreat.

The approximated bluff at the Project site for the years 2000, 2050, and 2100 is included in Figure 26. All of the same considerations discussed above for the year 2100 retreat apply to these bluff locations as well.

Source: Caltrans/WRECO (2020)

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Source: Caltrans/WRECO (2020)

Source: Caltrans/WRECO (2020)

Table 9. Parameters Affecting Bluff Retreat Calculation

Parameter	Represents	Medium-High Aversion Risk	Extreme Aversion Risk	Cayan et. al. 2009
Historical Erosion Rate	Historical bluff retreat rate due to all contributing factors	1.0 feet/year	1.25 feet/year	1.0 feet/year
Sea-Level Rise Scenario (increase measured from 2000)	Rate of sea level rise	1.9 feet by 2050 6.4 feet by 2100	2.8 feet by 2050 10.2 feet by 2100	1.0 feet by 2050 3.5 feet by 2100
Alpha	Proportion of erosion due to coastal processes	0.25	0.5	0.25
Gamma	Beach adjustment to sea-level rise	0	0	0
Toe Elevation	Bluff toe	5.5 feet	5.5 feet	5.5 feet

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Source: Caltrans/WRECO (2020)

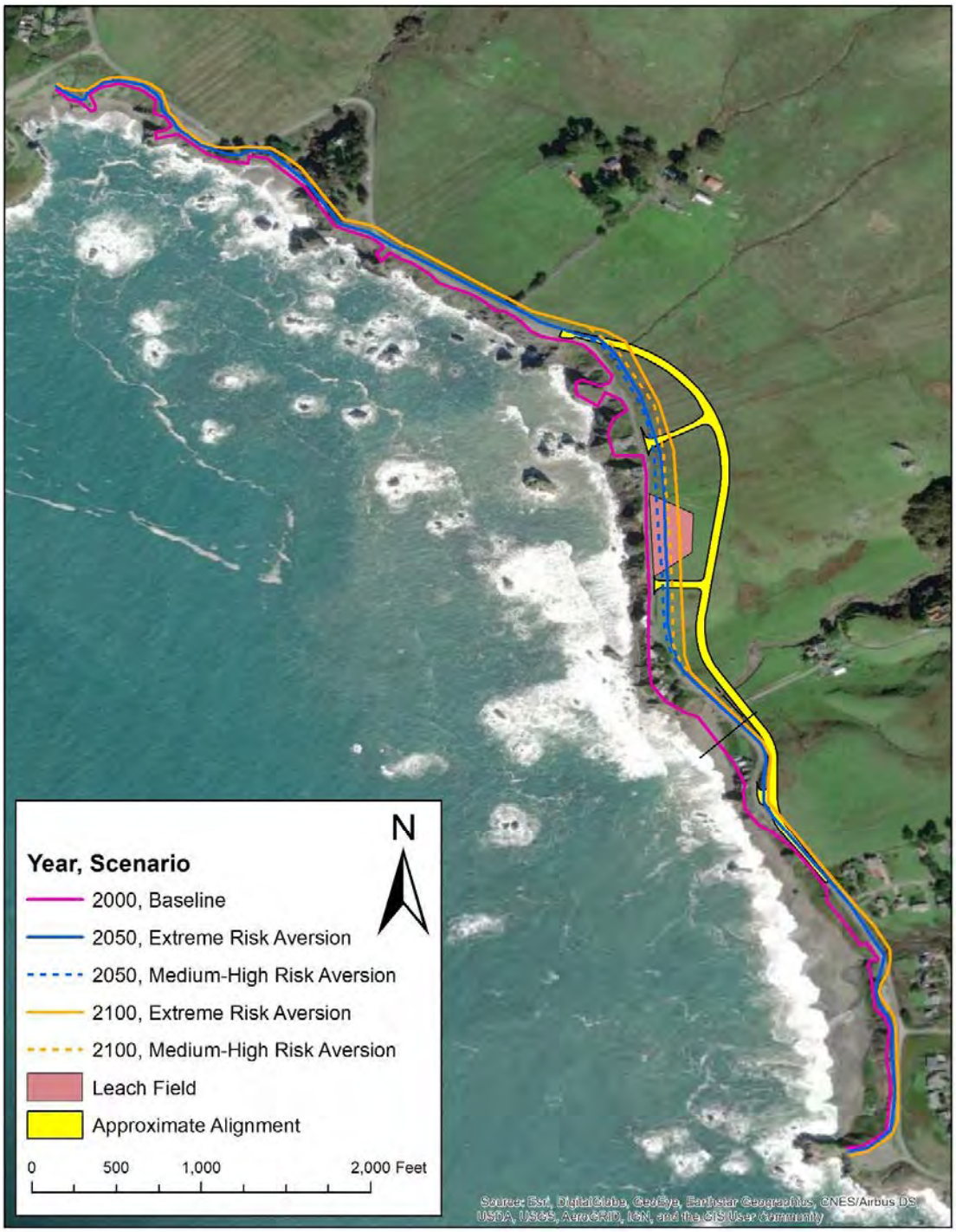

Figure 26. Bluff Retreat in Project Vicinity

Source: Caltrans/WRECO (2020)

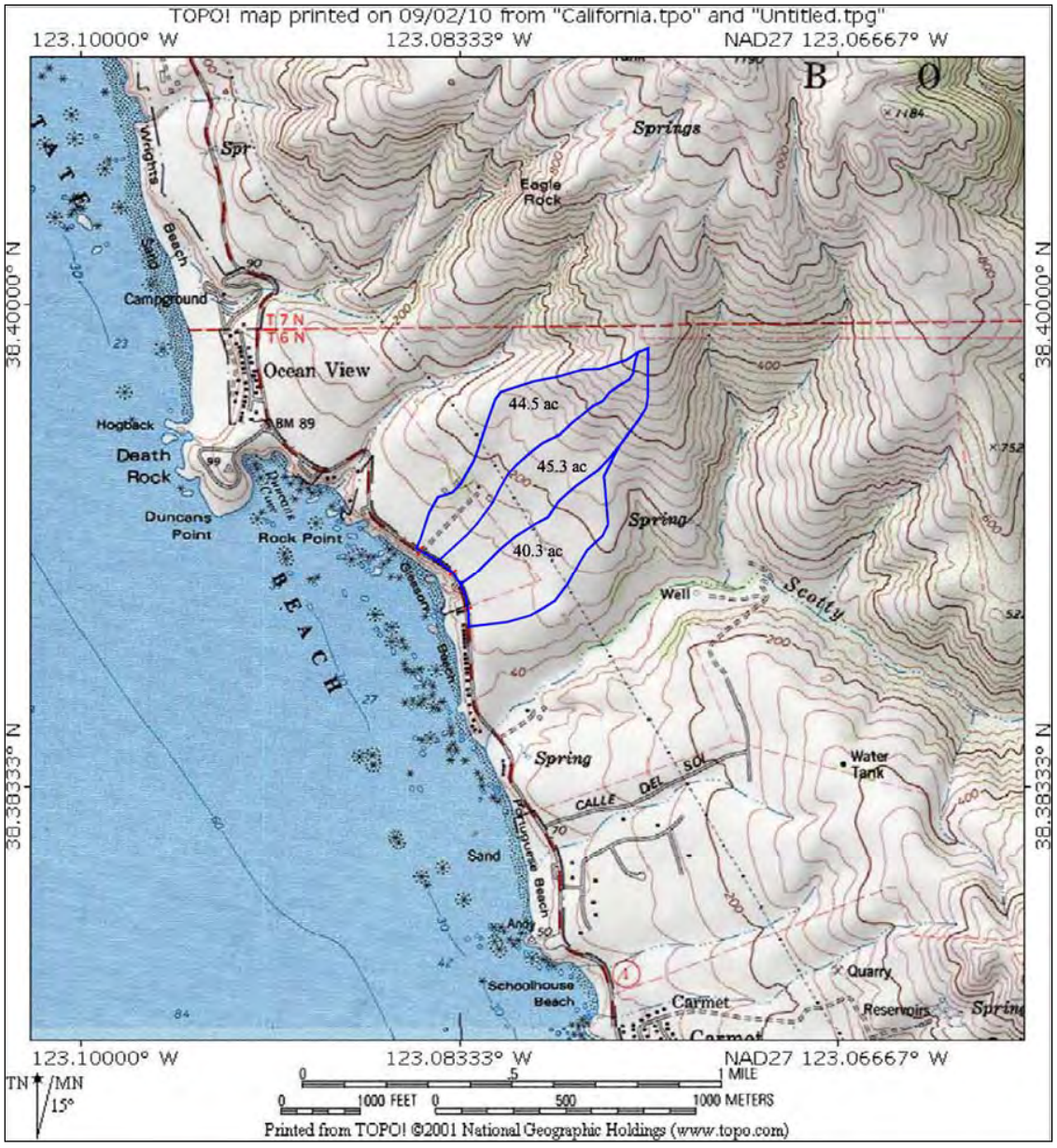

Figure 27. Watersheds of Cross Culverts at North End of Project

Source: USGS

6.1.1 North End of Site

The location where the proposed alignment meets the existing alignment at the north end of the site is likely to be threatened by the bluff retreat. The bluff slopes in this location are more rounded than in the rest of the site, indicating that terrestrial processes, including surface runoff and groundwater seepage, dominate erosion. In the aerial photo included in Figure 26, the greatly eroded locations appear to be caused by the drainage discharges that likely outfall in the locations drawn on the figure. Defined drainage ways are visible in the agricultural land that is landward of HWY 1 at these locations. The

Source: Caltrans/WRECO (2020)

approximate watersheds of these cross culverts are shown in Figure 27. Each of the watersheds is at least 40 acres. Photos taken at the parking area, facing south, are included as Photo 12 and Photo 14.

It is recommended that downdrains be installed at these and any other locations where discharge is currently allowed to run down the bluff. The downdrains should extend to the toe of the bluff and should have rock slope protection or other energy dissipation improvements to minimize the erosion of the beach at the toe as well as the bluff itself.

Another suggested improvement would be to install piles or other slope retention structures at the location where the bluff is most encroaching on the highway, to slow the bluff retreat. According to the historical coastlines and WRECO's observations, this location has the potential to erode further. The necessity and type of improvement at that location should be evaluated by geotechnical engineers.

Based on the estimated bluff retreat rates shown in Figure 26, the location of the Project conform to the existing HWY 1 alignment may be threatened by bluff erosion by 2050. The measures discussed above are implemented, the bluff would still erode from the groundwater seepage, but the rate may be somewhat slowed. Erosion along the rest of the site does not appear to be caused by the same mechanisms, so such improvements would likely be ineffective elsewhere.

Source: Caltrans/WRECO (2020)

Photo 13. Erosion at waterway outfalls, facing south (March 2010)

Photo 14. Similar location shown as in Photo 15 in September 2020

Source: Caltrans/WRECO (2020)

6.1.2 South End of Site

Toward the southern end of the Project site, the bluff retreat, from available data, appears to be slow enough not to threaten the proposed alignment until the conform with the existing HWY 1 alignment.

There is a wide beach where Scotty Creek outfalls to the ocean (Photo 16). Due to the sediment provided by the creek and the wind and the conformation of the shoreline, this location is not likely to retreat due to wave action erosion. However, the shoreline will retreat because even if the beach does not loose material, the rising sea level will cause the tide to reach further landward.

At the southern conform to the existing highway, the bluff retreat may threaten the alignment by 2050.

Photo 16. Beach at outfall of Scotty Creek, facing south

6.2 Comparison with PWA Results

The memorandum provided by PWA indicates that the expected erosion for unarmored bluff is 95 feet by 2100 and the expected erosion for armored bluff is 82 feet by 2100. For unarmored locations in the Project vicinity, the erosion estimates developed in Section 5 are more conservative than the PWA estimate. However, the PWA estimate for armored locations is near equivalent or more conservative depending on the segment. The

Source: Caltrans/WRECO (2020)

PWA study covers a shorter length of coastline in the Project vicinity than this study and the overlapping length contains all four of the erosion rates shown in Figure 24. The two bluff retreat predictions are included in Figure 28. The line that represents PWA's bluff retreat is approximate; PWA's figure is included in Appendix B.

The five parameters that are included in Table 9 are summarized for both studies in Table 10. Of the five parameters, neither study assumed that the beach would adjust to sea-level rise (gamma). All other parameters differed.

Table 10. Comparison with PWA's Assumptions

Parameter	Represents	Value Used (Medium-High Risk Aversion Scenario)	PWA Value
Historical Erosion Rate	Historical bluff retreat rate due to all contributing factors	0.3 to 1.0 feet/year	0.4 to 0.6 feet/year
Sea-Level Rise Scenario	Rate of sea-level rise	2.7 feet by 2050 and 7.2 feet by 2100 (measured from 2000)	1.3 feet by 2050 and 4.6 feet by 2100 (measured from 2000)
Alpha	Proportion of erosion due to coastal processes	0.25	1.0
Gamma	Beach adjustment to sea-level rise	0	0
Toe Elevation	Bluff toe	5.5 feet	Not stated

PWA does not report a toe elevation, however as seen in Figure 20, toe elevation has a minimal effect overt the 2-foot interval tested. Increasing initial erosion rate and alpha both increase the total erosion. PWA used a larger alpha and the upper end of the PWA initial erosion rate is lower than what is used in this study. The higher erosion rate used in this study is based on localized data which are not incorporated into PWA's estimate, such as the presence of the leach field and anecdotal observations.

PWA used an alpha value of 1.0, which assumes that all of the erosion that has occurred historically is due to wave action rather than terrestrial processes. This is a conservative assumption, because it results in a greater multiplier times the sea-level rise. The alpha values used in this study, 0.25 for Medium-High Risk Aversion and 0.5 for Extreme Risk Aversion, are based on site-specific parameters. The effect of alpha on the calculated bluff retreat is illustrated in Figure 20.

Source: Caltrans/WRECO (2020)

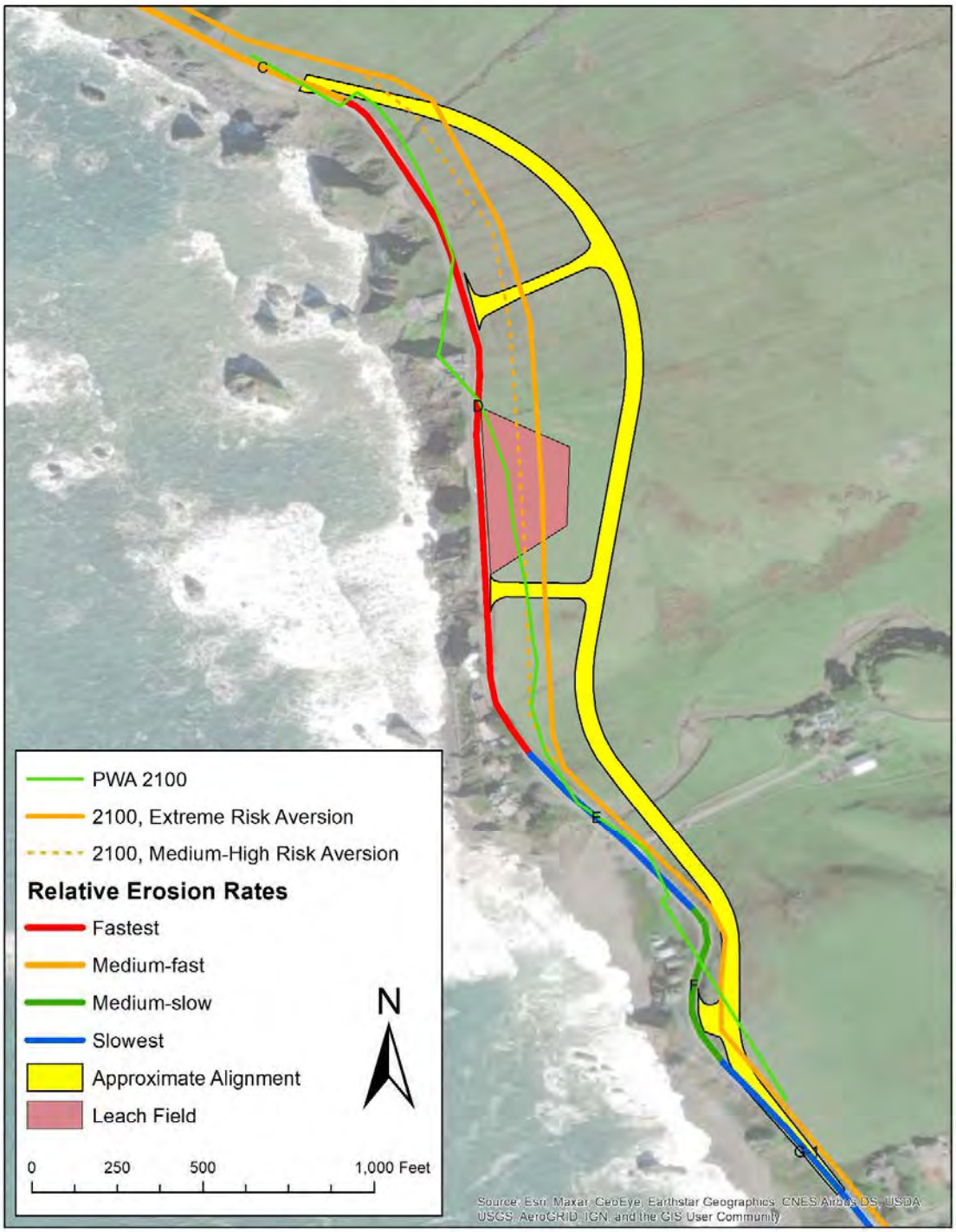

Figure 28. Comparison with 2100 Top of Bluff from PWA Memorandum

Source: Caltrans/WRECO (2020)

6.3 Assumptions and Limitations

Several assumptions had to be made which affect the accuracy of the predictions. These assumptions were required because of the data that was unavailable. A list of the biggest assumptions follows:

- Toe elevation of the bluff
- Historical erosion rate
- Neglect of dissipative effects of near shore rock outcroppings
- Presence/absence of slope protection
- Consistent rock material
- Constant toe elevation in the future
- Neglect of erosive effects that are not proportional to waves and sea-level (such as earthquakes, septic field, animals)
- Neglect of increase in El Nino years
- Sea-level rise rates

These assumptions decrease the accuracy of the rate of retreat calculations presented in this report.

It should also be noted that these rates are averaged over several years, but bluff failures are episodic instead of constant. Therefore, at any location, the bluff could retreat several feet during a sea storm event and then inappreciably for months or even years afterward.

Source: Caltrans/WRECO (2020)

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Source: Caltrans/WRECO (2020)

Appendix A Aerial Photos

Source: Caltrans/WRECO (2020)

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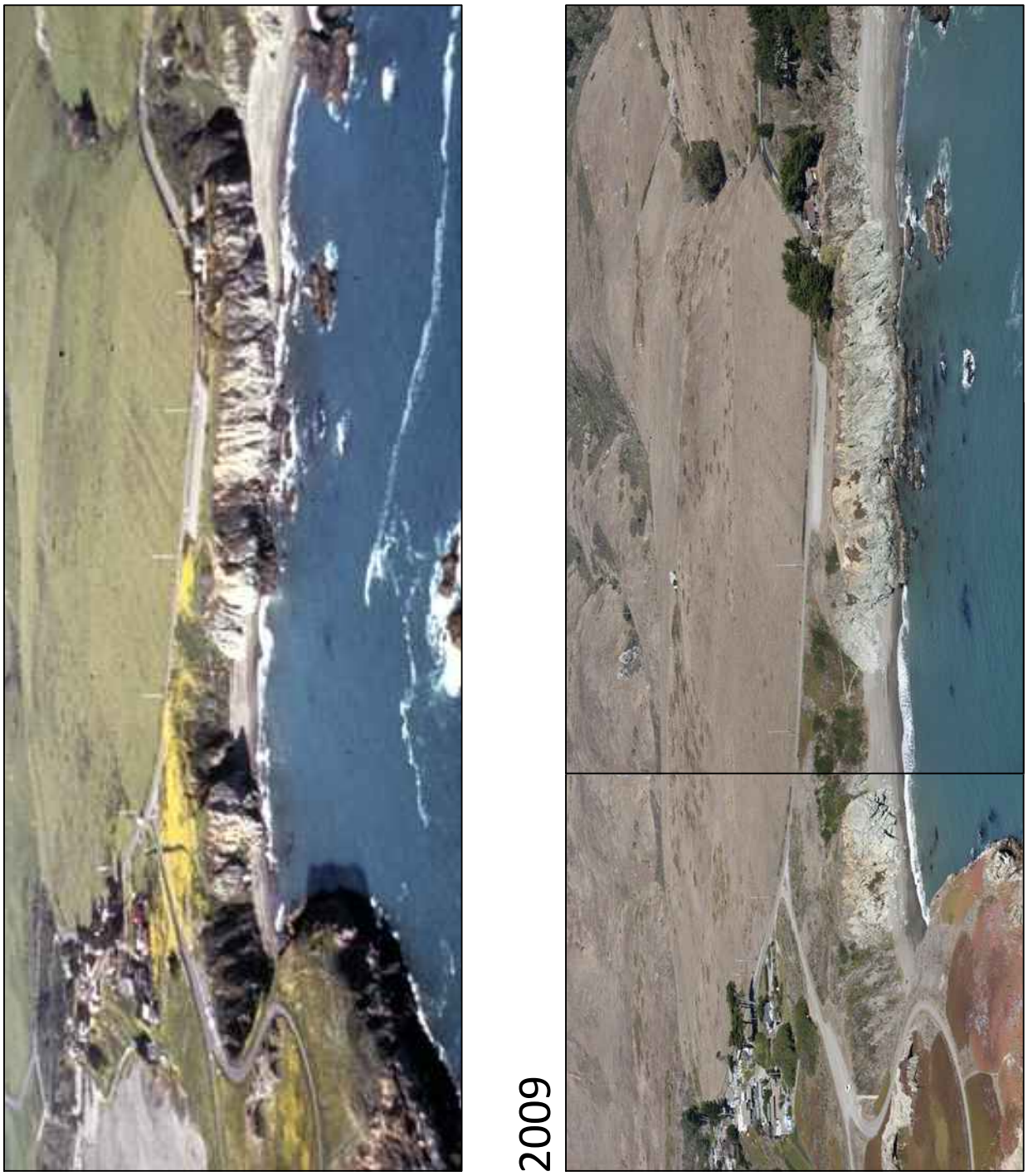
Source: Caltrans/WRECO (2020)



Source: www.californiacoastline.org

Source: Caltrans/WRECO (2020)

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Appendix B PWA Memorandum for the Project Site

September 2020

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Source: Caltrans/WRECO (2020)

PWA
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DRAFT MEMORANDUM

Date:	July 29, 2010
To:	Han-Bin Liang, Ph.D., P.E.
Organization:	WRECO
From:	David Revell, PhD., Justin Vandever, P.E. and Bob Battalio, P.E.
PWA Project #:	2032
PWA Project Name:	Gleason Beach Coastal Erosion Analysis
Subject:	Coastal Hazards Assessment Memorandum - DRAFT

Introduction

The purpose of this memorandum is to provide brief a planning-level review of setback distances for Highway 1 realignment along Gleason Beach, Sonoma County, CA. The current proposed project alignment is to setback approximately 3,300 feet of Highway 1 along Gleason Beach some 300 to 500 feet inland.

Site Setting

The project is located along Gleason Beach in Sonoma County approximately 1 mile north of the town of Carmet. According to the California Geological Survey statewide geology map, the coast is characterized primarily by a cliff-backed shoreline comprised of Franciscan Complex volcanic rocks (KJfv). This formation is subject to various sizes of landslides, slope creep, and mass wasting events (Griggs et al 2005) commonly associated with high groundwater, which can increase both the size and speed of the failures.

Approximately 50% of the project site has been armored to protect private property developments at the top of the cliff (Figure 1). The armoring shown in the 2009 photo appears to be in poor condition with evidence of failed structures along the length of the proposed realignment (Figures 1 and 2: site conditions). It is unclear whether future armoring will occur along this site and its long term affect on the coastal and erosion processes.

Sea Level Rise

Historic measurements of water level at the Point Reyes Tide Station show an observed rate of sea level rise of 2.10 +/- 1.52 mm/yr from 1975-2006 (Figure 3). Extrapolating the historic rate into the future predicts a sea level rise of 8.3 inches over the next century; however, climate change simulations and empirical studies project a substantial increase in the rate of sea level rise over the next century relative to

historic rates due to thermal expansion as the oceans warm and runoff from melting ice accelerates (IPCC 2007, Rahmstorf 2007, Cayan et al. 2008).

To predict the future shoreline change in response to rising sea levels, the PWA (2009) study used the projections of Cayan et al. 2008, which predict a rise in mean sea level of 16" by 2050 and 55" by 2100 (relative to year 2000). This is consistent with guidance currently used by the State of California for projects undertaken by their agencies (Coastal Conservancy, Coastal Commission, etc.).

Methodology

For this assessment, PWA reviewed modeling results and analysis conducted for the Pacific Institute and the California Ocean Protection Council as part of the California Climate Change Impacts Assessment (Pacific Institute 2009, PWA 2009). While no new analysis was completed, a more detailed examination of interim model outputs and discussion of results is presented.

As part of the PWA study, we predicted both future flood and erosion hazards. To evaluate the effects of SLR on coastal flood hazards, we generated two independent estimates of a 100-year flood level. The first estimate updated and expanded the coverage of the 100-year coastal base flood elevations (BFEs) originally published by FEMA using a combination of inverse distance weighting interpolation between known points and professional judgment based on the shoreline orientation for sites with similar exposure. This estimate was used to make the maps publically available from the Pacific Institute website. The second estimate was based on calculating a 100-year Total Water Level (TWL) for selected locations. Total Water Level is the sum total of astronomical tides, storm surge, and wave run-up. TWL was calculated by transforming a modeled time series of deepwater waves to the 10m contour and then calculating wave run-up based on average beach slope characteristics.

Future coastal erosion hazard zones were estimated at three planning horizons: future years 2025, 2050, and 2100. These future erosion hazard zones were calculated based on the assumption that marine processes drive coastal erosion and thus changes in the amount of time that water levels exceed the toe of the seacliff or dune will accelerate the erosion rates. For details on the technical methodology used to predict future erosion rates please see the technical report here: http://www.energy.ca.gov/publications/displayOneReport.php?pubNum=PWAOPC-1000-2009-013.

The sections below summarize the results for historic erosion rates, existing and future flood hazards, and future erosion rates and erosion distances.

Historic Erosion Rates

There are no published USGS erosion rates for this site; however, similar locations nearby have experienced an average historic erosion rate of around 5.0 +/- 2.8 in/yr for the time period from the 1930s to 2002 (Hapke and Reid 2007). The proliferation of shore protection structures clearly visible in aerial photos from the early 1970s along this stretch of coast have likely biased the USGS calculations. As a result, the published USGS rates likely underestimate the natural erosion rate in the absence of armoring. Unarmored segments near the tie-in of the proposed realignment show rates up to 7 +/- 2.8 in/yr. Regionally, the average cliff recession rate reported by the USGS along this stretch of coastline (from Point Arena to Tomales Bay) is 8 in/yr, with a maximum of 31 in/yr at Bodega Head (Hapke and Reid 2007). Statewide, the same geologic unit (KJfv) shows an average rate of 10.6 +/- 5.8 in/yr with maximum erosion rate of 39 +/- 10 in/yr near Cape Mendocino. It is also important to note from observations of the same geologic unit elsewhere in Sonoma County that this formation does not fail in an "average annual" fashion, but rather experiences episodic landslides and mass wasting. Similarly, variability in exposure of faulting and jointing surfaces can result in significant differences in types and rates of failure even within the same geologic unit.

Existing Flood Hazards

FEMA Flood Insurance Studies and Base Flood Elevations (BFE) are not currently available for this segment of coast. For the 2009 study, PWA estimated a BFE for this reach of approximately 28.5 feet NAVD88. Using the TWL methodology we calculated the current 100-yr total water level to be 25-26 ft NAVD88 for the two closest sites at Russian River mouth (5 miles north) and Arched Rock (2 miles south).

Future Erosion Rates

Future erosion rates were calculated by prorating historic unarmored and armored erosion rates by the change in percent exceedance of the cliff toe elevation due to sea level rise. The results show an increase in predicted future erosion rates over time (Table 1). Figure 4 shows the estimated erosion hazard zones in 2025, 2050, and 2100. This translates into an estimated maximum cliff retreat of approximately 95 feet by 2100 with an erosion rate of over 12 inches/year for unarmored segments of coast.

Along the armored portions of this shoreline segment, TWL under current conditions exceeds the toe elevation <85% of the time. Percent exceedance of the toe elevation is predicted to increase to 100% by 2090. This will result in the loss of fronting beach of the armored segments through all tide cycles. The loss of this buffer will result in higher maintenance costs for shoreline armoring as well as a loss of beach recreational opportunities and sandy beach ecosystem values.

It should be noted that local conditions affect erosion rates within the same geology. For example, the orientation and elevation of bedding layers, jointing and faulting, as well as terrestrial processes (e.g. surface and ground water induced erosion) can greatly affect erosion rates. Therefore, the natural (unarmored) erosion rate at this location may be greater than our estimates based on averages for the geologic unit. The geometry of the site implies that higher rates may indeed be possible. A more detailed study is required to assess these issues.

Table 1: Erosion Rates and Percent Exceedance

	Unarmored			Armored		
Planning Horizon	Predicted Erosion Rate (in/yr)	Predicted Erosion Distance (feet)	TWL Exceedance of Cliff Toe (%)	Predicted Erosion Rate (in/yr)	Predicted Erosion Distance (feet)	TWL Excedance of Cliff Toe (%)
Existing Conditions	7+	-	47	5	-	85
2025	7.5	16	48	5.1	13	86
2050	8.3	43	57	5.2	36	91
2100	12.6	95	85	5.5	82	100

Future Flood Hazards

Under future conditions, the BFE elevation at 2100 is predicted to be approximately 33 feet NAVD88 (Figure 5). The future TWL estimate is 29-31 ft NAVD88. The primary area of concern for future flooding within the proposed realignment is the area along Scotty Creek near the southern end of the study area. This area is most susceptible to flooding so bridge design should consider these elevations in designing appropriate freeboard. The elevation used to plot the flood limits is the total water level which includes wave runup. Since wave momentum is dissipated by travel inland, the actual total water level should diminish with distance inland. The limits in Figure 5 may therefore extend farther landward in low lying areas where greater dissipation is likely. However, fluvial flood risk and the interaction of erosion and flooding were also not considered. These localized effects were not considered in the Statewide study.

Conclusions

Overall, the proposed realignment within the study area remains outside of the erosion hazard zone predicted by the statewide study. Coastal flood hazards are of concern along Scotty Creek, so design considerations should consider future water levels, wave energy, and appropriate freeboard. Another design consideration is the rejoining of the current road alignment along a stretch of unarmored coast. While outside the scope of this work, it should be noted that the natural acceleration of erosion from sea

Source: Caltrans/WRECO (2020)

level rise will likely affect the stretch of highway to the north and the south within the 100 year planning horizon even given historic rates.

This assessment of historic and future erosion rates is hindered by the presence of shoreline armoring along much of the study site which has reduced the measured historic shoreline change rates. Additional analysis to evaluate natural erosion rates as well as failure size and mechanisms in the area using more robust methods could be used to bolster the analysis of the future erosion hazards.

While the proposed alignment appears to be outside of the predicted erosion hazard zone based on prorating the historic (armored) erosion rates, proration of erosion rates of natural unarmored sites of similar geologic unit elsewhere in the state may indicate the need for a greater setback distance. For this reason and others, the results produced by PWA for the Pacific Institute and Ocean Protection Council are not intended for local planning purposes. However, we believe the methodology is sound and can be applied in more detail for local planning.

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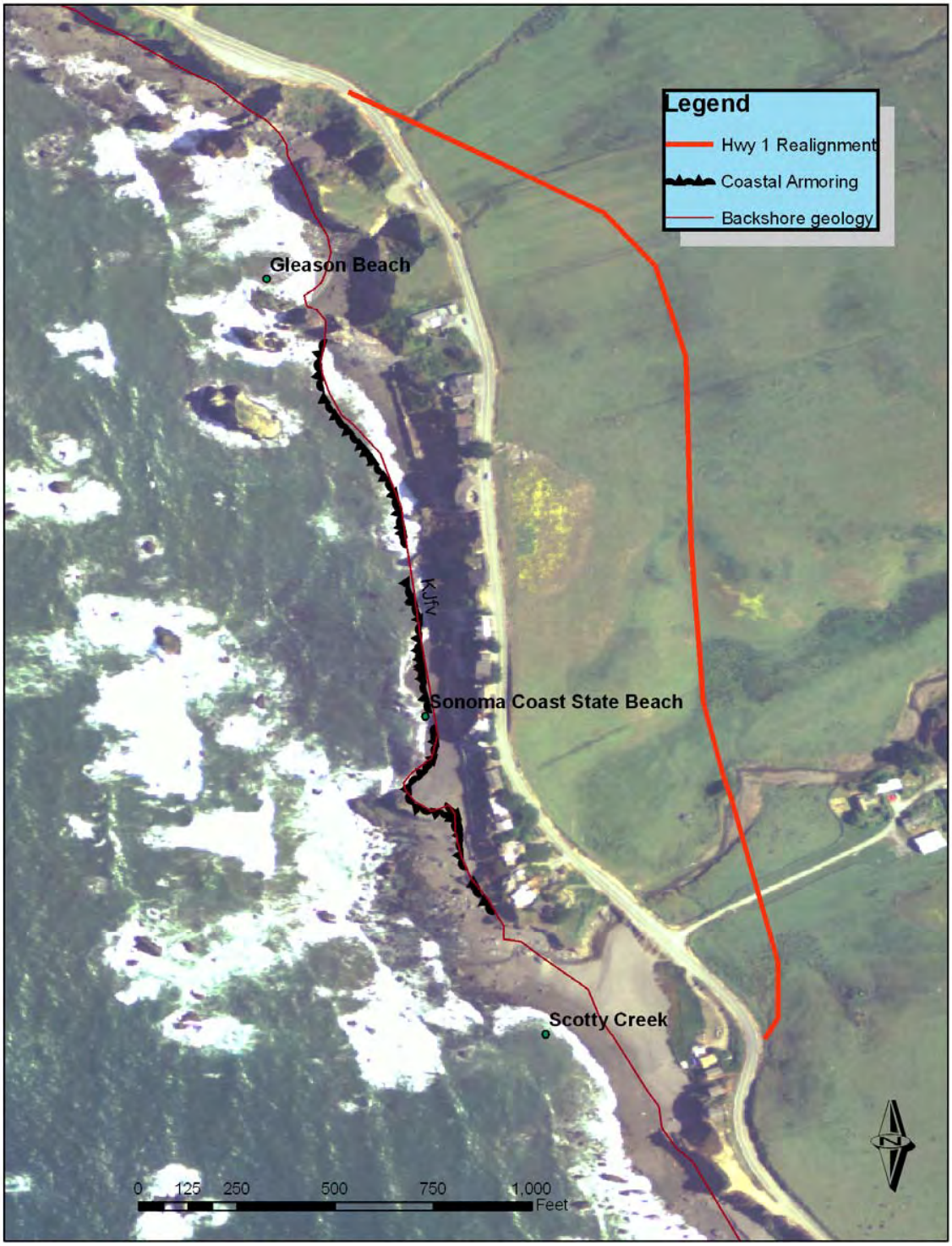


Source: Armoring data from California Coastal Commission
Geology data adapted from California Geological Survey

Basemap is 2005 Air Photo

figure 1
Gleason Beach Coastal Hazard Assessment

Site Setting and Conditions

PWA Ref# 2032.00

PWA

Source: Caltrans/WRECO (2020)

Source: 2009 California Coastal Records Project – Photo copyright Kenneth & Gabrielle Adelman

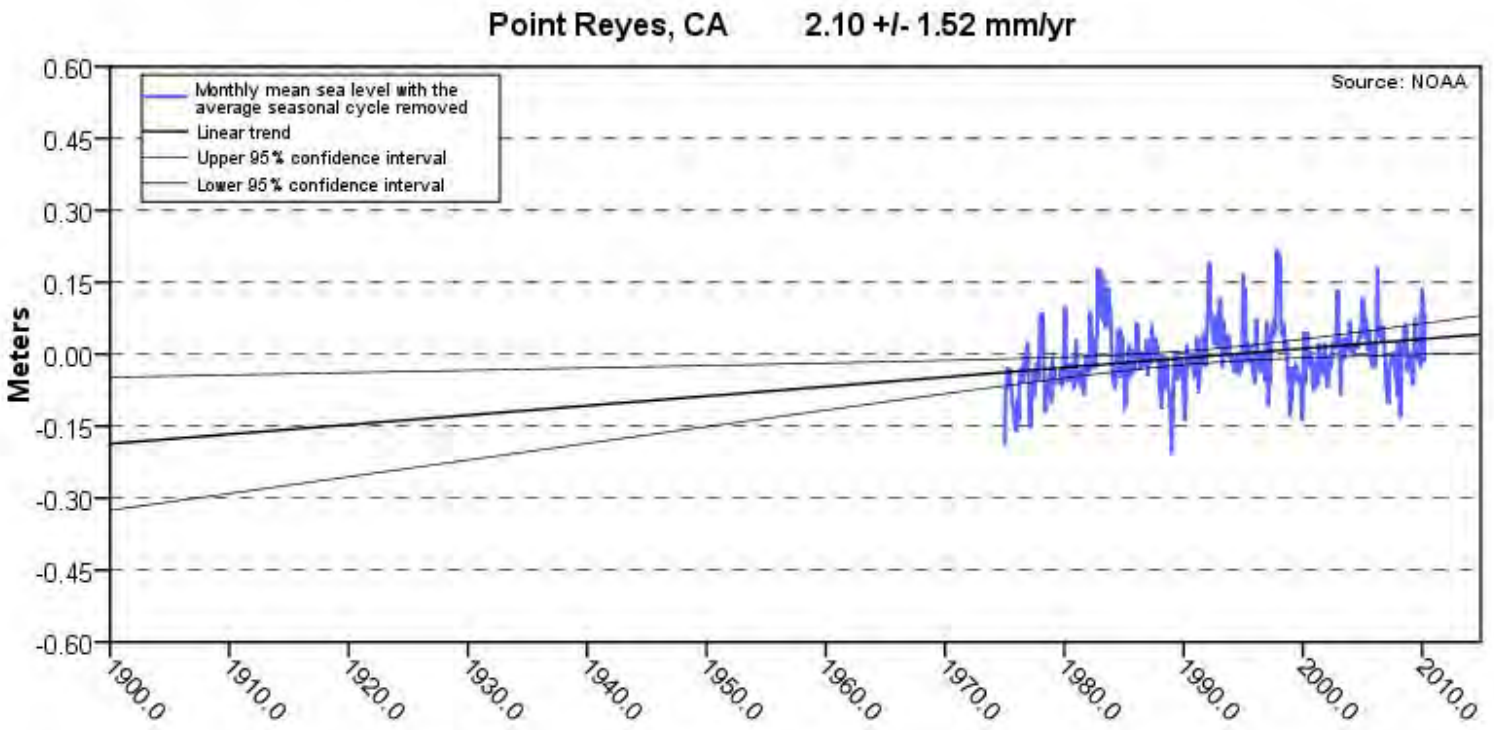
figure 2
Gleason Beach Coastal Hazard Assessment

Oblique Air Photos of Existing conditions

PWA Ref# 2032

PWA

Source: Caltrans/WRECO (2020)



Source: NOAA-NOS Tides & Currents (http://tidesandcurrents.noaa.gov)

figure 3
Gleason Beach Coastal Hazard Assessment

Historic Sea Level Rise Trends – Point Reyes

PWA Ref# 2032

PWA

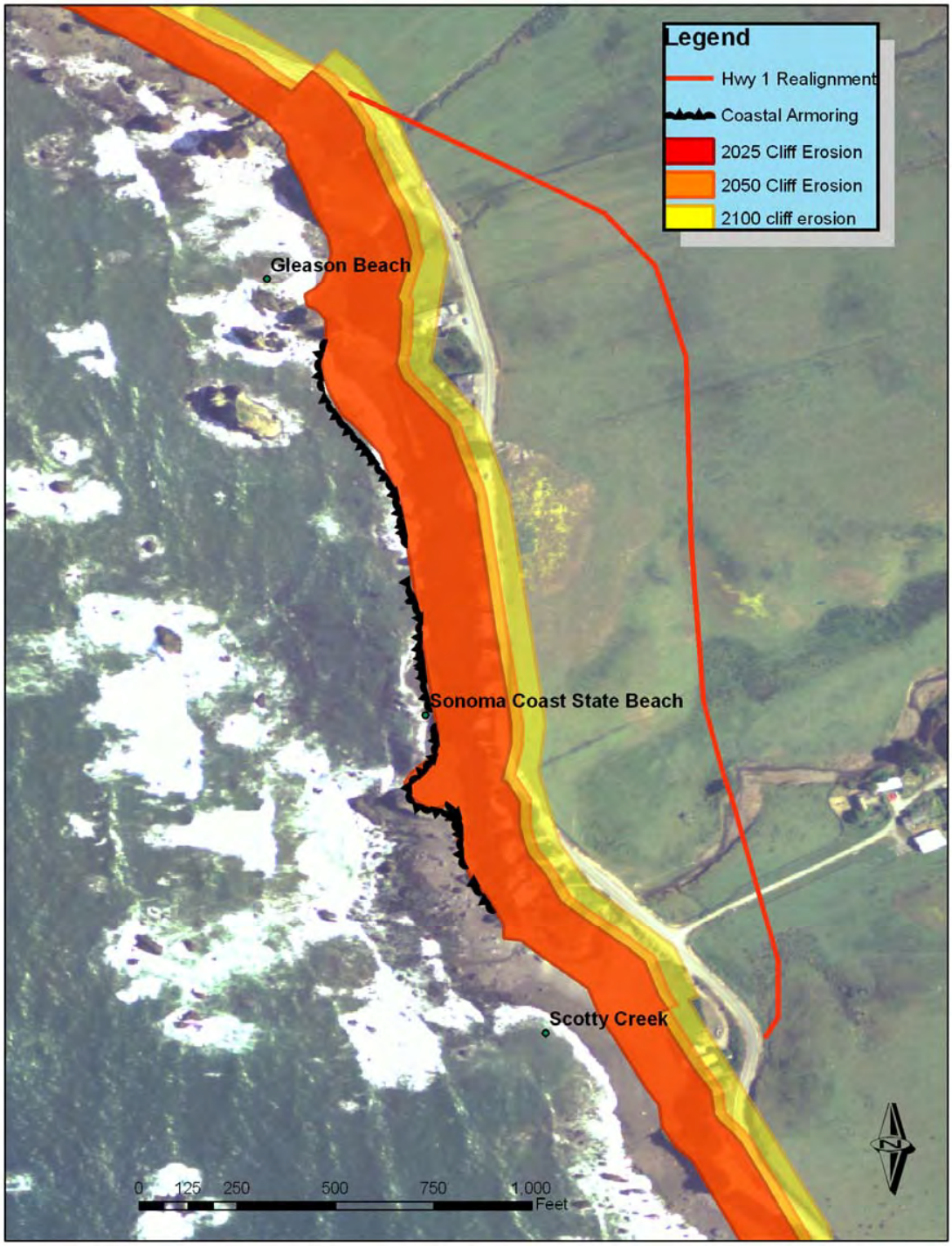


figure 4
Gleason Beach Coastal Hazard Assessment

Future Coastal Erosion Hazard Zones

PWA Ref# 2032.00

PWA

Source: Caltrans/WRECO (2020)

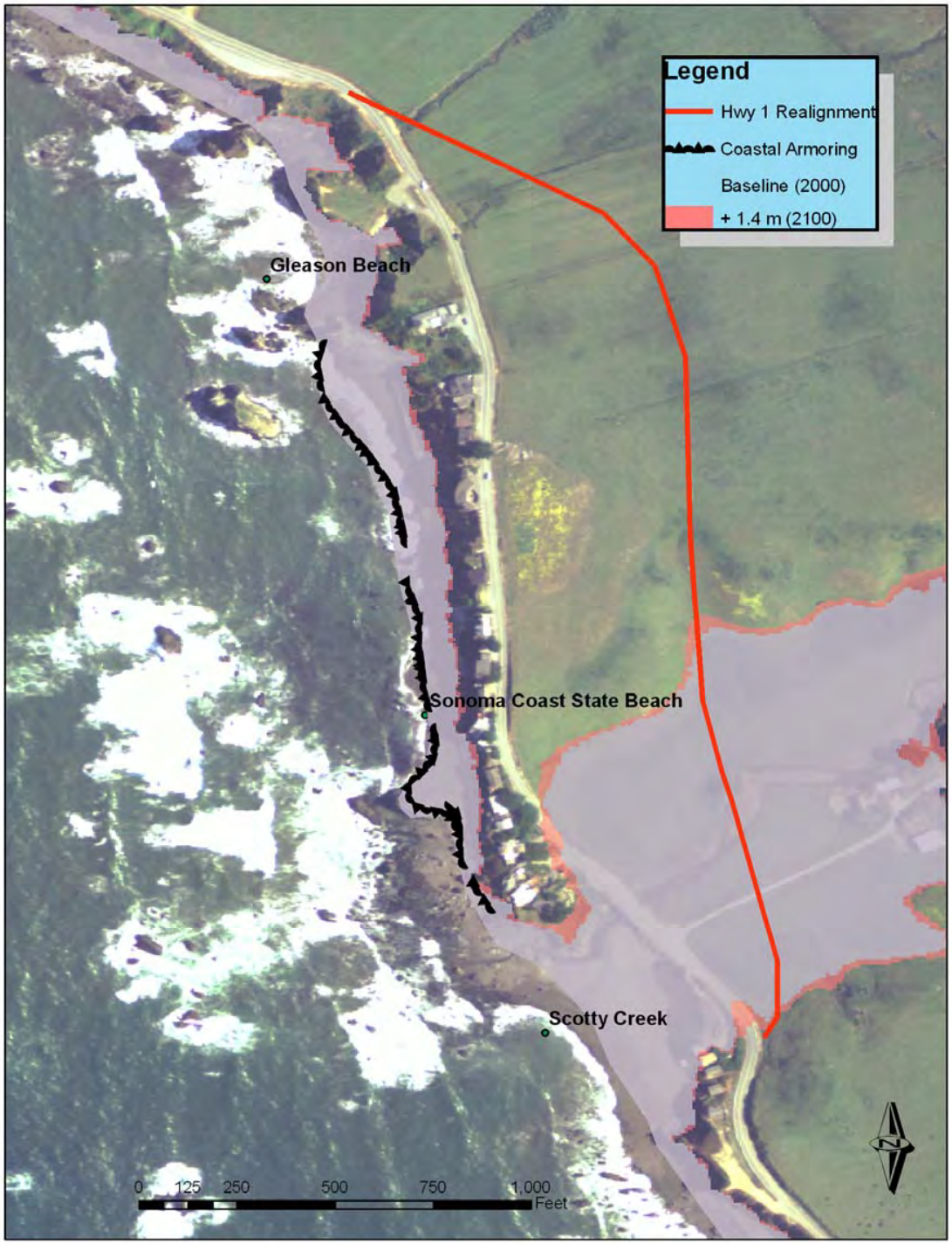


figure 5
Gleason Beach Coastal Hazard Assessment

Future Coastal Flood Hazards by 2100

PWA Ref# 2032.00

PWA

Source: Caltrans/WRECO (2020)

Conceptual Public Access Plan
9-30-2020

The proposed Gleason Beach Roadway Realignment Project (Project) is an inland realignment of a section of State Route (SR) 1 to address coastal erosion. The Project proposes to realign an approximately 4,000-foot segment of SR 1 with a two-lane highway facility, including an approximately 850-foot-long bridge over the Scotty Creek floodplain. The entirety of the Project falls within the Coastal Zone. The Project will provide substantial public access and recreation enhancements that will be a resource for Sonoma Coast residents and visitors as envisioned by the Sonoma County Local Coastal Plan (LCP). This will take the form of property acquisitions/transfers, a contribution of Caltrans' funding to Sonoma County, specific actions under Caltrans' Project construction contract and participation in the Coastal Public Access Taskforce planning and implementation efforts to be led by Sonoma County.

1. Existing Public Access

Existing opportunities for public access within the Project limits include through travel by bicyclists and pedestrians on the shoulders of SR 1 in very limited areas (the travel lane must be used in many locations because there is no usable shoulder), unofficial parking adjacent to the beach at Scotty Creek, and a gravel parking/turnaround at the vista point in the northern portion of the Project area, along the southbound lane. No other access amenities currently exist in the Project area.

The California Coastal Trail (CCT) is defined by the Coastal Commission as "…a continuous passage alone the entire length of the State's shoreline. It is intended not only to provide a trail system for a variety of coastal users (i.e. pedestrians, bicyclists, and the mobility impaired), but also to connect to other existing coastal and inland trail networks." (California Coastal Commission Coastal Trail Action Plan, Locklin & Grove, 1999 page ii). Sonoma County's LCP State Coastal Plan Policy 145 accordingly calls for establishment of a coastal trail system. The LCP also states that "(t)he Sonoma coastal trail will provide opportunities for both hikers and bicyclists. Bicyclists will generally use Highway 1, with wider paved shoulders, except on Bodega Bay where other routes will be available…"

The CCT is also recognized in Caltrans' Active Transportation Plans as a trail of statewide significance. Currently, the CCT alignment throughout the Project limits unofficially exists coincident with existing SR 1. Near Gleason Beach, pedestrians and bicyclists share the highway with vehicles or use the minimal highway shoulders, as access along existing SR 1 is limited by the narrow highway geometrics, including approximately 10-foot lane widths, the lack of shoulders, and the winding highway configuration (resulting in poor sight-distance). In addition, during low tide there is limited beach connectivity to the north and south of Scotty Creek for pedestrians, however this is very seasonal and is not safe in all conditions, particularly given the structural debris that has fallen onto the shoreline from collapsed houses and attempts to protect them.

2. Proposed Public Access Improvements

The proposed Project would provide multifaceted public access improvements that enhance bicycle and pedestrian access along the realigned highway, as well as increase passive recreation opportunities and access to coastal resources (see Figure 1).

This public access package includes acquisition of land that allows public beach access south of Scotty Creek, a continuous CCT network within the Project area that has adequate room for managed retreat as necessary due to sea level rise advances, a CCT bridge across the restored Scotty Creek (once the culverts and fill of the existing highway are removed), public access parking replacements for existing informal parking areas lost due to the realignment of SR 1, a new scenic overlook and other ancillary public access amenities.

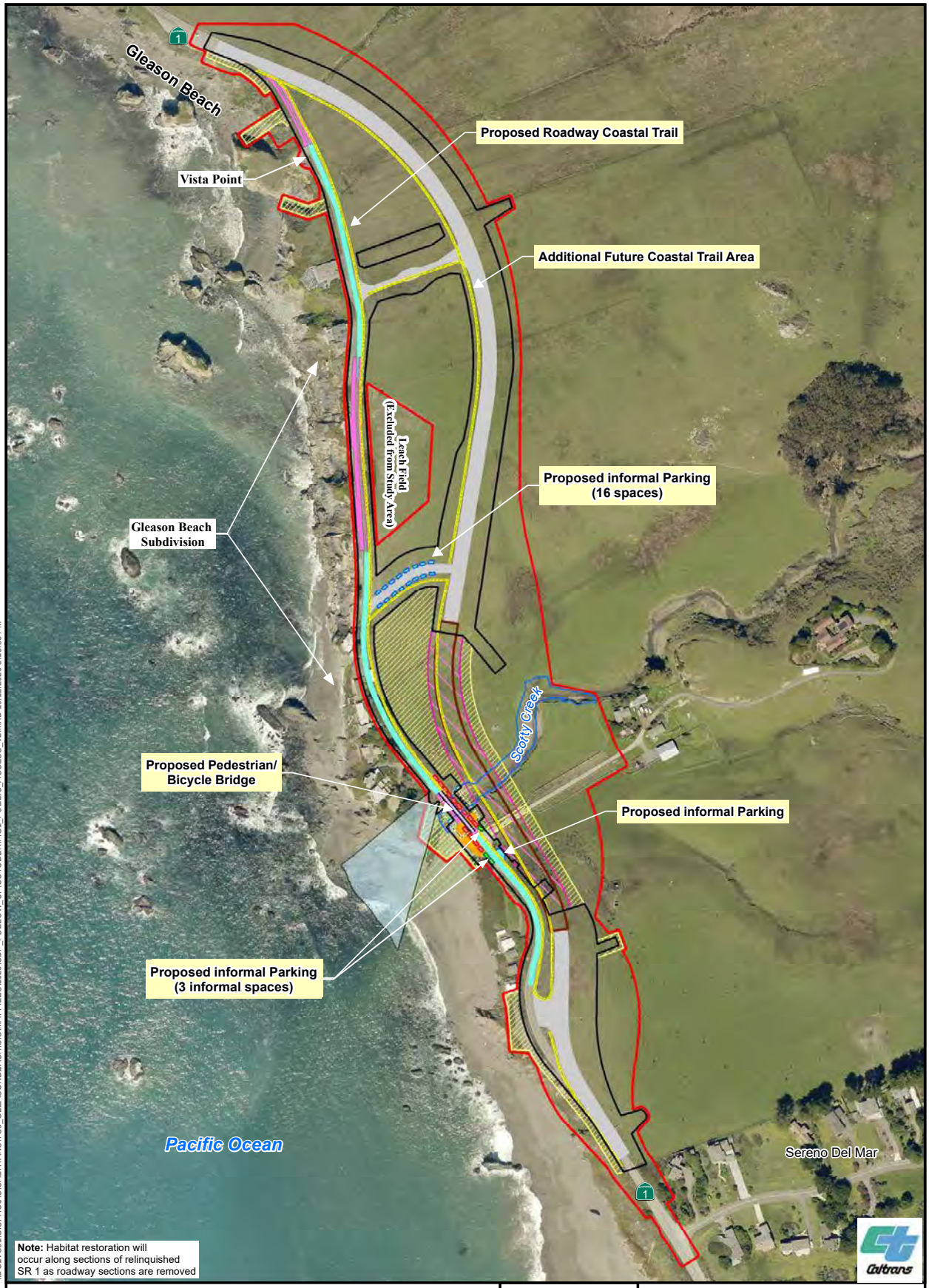
Features of these various public access improvements are described in conceptual form in this plan.

Bicycle and Pedestrian Access.

The Project will cause temporary delays attributed to construction-related traffic control, creating both non-automotive and vehicular traffic impacts. There will be construction-related accommodations for bicyclists, including a push button that will allow bicyclists to trigger a traffic light change. There is limited pedestrian use of the Project area, but temporary impacts to existing public access may be affected by the overall Project construction.

In the long term, the Project will improve bicycle and pedestrian access throughout the Project area in part by providing safer access associated with the highway, through wider shoulders along the realigned highway (4 feet paved and 4 feet unpaved, compared to the existing highway's 0- to 2-foot-wide shoulders), a separated pedestrian walkway on the new realignment bridge, and access along the existing SR 1 route that will be redeveloped for pedestrian and bicycle travel once it is repurposed after through traffic is moved to the realigned highway, as discussed more below.

Source: Caltrans/Sonoma County



Source: Caltrans/Sonoma County

Source: Caltrans/Sonoma County

California Coastal Trail.

Project implementation will provide enhanced recreational access in part because the abandoned SR 1 will be repurposed to serve as a new off highway strand of the CCT, with the ability to migrate the trail inland along other properties to be transferred from Caltrans to Sonoma County and within Caltrans right of way when there is no other feasible option. In addition, the realigned SR 1 western right of way can serve as a future north-south non-automotive connection if needed to link to the vehicular Scotty Creek Bridge which includes a separated sidewalk on its western edge to accommodate bicyclists and pedestrians traveling through the Project area.

By repurposing the existing SR 1, the proposed initial CCT alignment will be safely sited to be close to the sight, sound and smell of the ocean and designed and managed to accommodate the inland migration of the trail alignment as needed to adapt to erosion and other natural forces, thereby continuously maintaining the connectivity of the trail system in this area. Through a planning process led by Sonoma County, final siting decisions regarding the CCT and other public access features also will protect against any significant disruption of the habitat values of any adjacent environmentally sensitive habitat areas, maintain public scenic values and account for cultural and archaeological protections required by the Sonoma County LCP.

Caltrans has been working cooperatively with Sonoma County to enter into an agreement to relinquish the existing SR 1 (and new access roads to the new SR 1 realignment and other property interests) to Sonoma County for use as a CCT braid and for servicing residential and public access vehicular needs to the north and south of Scotty Creek. Caltrans is also committing funding to Sonoma County to provide for a CCT bridge over Scotty Creek after the stream channel within the Project limits is restored, to be owned and managed by Sonoma County Regional Parks, along with the connecting strands of the CCT, protective rock slope protection and other access amenities in the project area, as further discussed in this Conceptual Public Access Plan below.

Existing SR 1.

The relinquishment, repurposing and restoration of the existing SR 1 abandoned segments will make the area more available and appealing to recreational users and help conform the old highway to the rural character and natural resources of the Project area. Based on an initial access management plan to be developed jointly with Sonoma County, Caltrans will repurpose sections of the existing alignment of SR 1 for the development of the initial off-highway CCT alignment, including removal of asphalt, drainage infrastructure, signage, roadway prism and other ancillary highway infrastructure in areas no longer needed for vehicular access. New and reconstructed smaller access road areas (consistent with Sonoma County standards at the narrowest widths possible) be surfaced with pervious materials as appropriate. The planned repurposing of the existing SR 1 segments includes removing and re-grading the highway prism to place the CCT generally at the same level of adjacent lands and replanting (with locally appropriate native vegetation) those areas not being repurposed for the CCT and ancillary public access purposes. The proposed repurposing work also includes incorporating erosion control and drainage features, along with naturally appearing surfacing of the CCT segments.

Final design details and locations for vehicle access, safety buffers, parking and the CCT segments to be implemented by Caltrans will be based on coordination discussions with the Gleason Beach Coastal Access Task Force to be convened by Sonoma County and incorporated into the Phase I and II Final Initial Coastal Access Plans (see related discussion below). Caltrans and Sonoma County have committed to producing those Plans for review and approval by the Coastal Commission Executive Director in consultation with Permit Sonoma.

3. Design and Operation Principles:

To achieve approval of the Phase I and Phase II Final Coastal Access Plans, Caltrans will ensure that their construction activities and cooperative funding agreement with Sonoma County demonstrate conformance with the following guiding principles:

Off-highway California Coastal Trail:

As noted above, Caltrans is funding the purchase of lands for project requirements, including areas that can accommodate an off-highway coastal trail, along with providing funding to Sonoma County for their Regional Parks to design, install and manage the trail and other public access areas and amenities.

Through cooperative funding agreements, Caltrans will be able to work with Sonoma County to guide the design of the CCT and connected overlooks, picnic areas, etc. to reflect the rural character of the setting and to support efficient operations and maintenance, including a generally durable trail surface with a natural appearance.

The initial trail braid will be constructed through Caltrans' repurposing of the abandoned SR 1 and will meet Sonoma County LCP standards. The work will include building techniques to avoid erosion, particularly from the concentration of drainage flows. Where concentrated flows cannot be avoided, appropriate energy dissipation will be used that favors bio-engineering over hard solutions. If any safety fencing is determined to be needed by Sonoma County, it will be designed to be low lying, see-through and appropriate for the rural context of the area.

Future managed retreat of the CCT from predicted erosion will be expressly provided through the ability to make use of public land connections, including the new access roads to the SR 1 realignment and the western right of way of that realignment so as to connect to the new bike and pedestrian facility proposed on the western edge of the new SR 1 Scotty Creek vehicular bridge and to CCT connections to the north and south of the Project area. Caltrans will allow trail encroachments onto the new and existing SR 1 right of ways (including the existing SR 1 right of way to the north and the south of the Project limits).

Signs and Interpretive Panels:

Caltrans will coordinate with Sonoma County to place signs as appropriate in coordination with other elements of the signage plan for the Project area. Signage for the public coastal access areas that will be installed by Caltrans includes a minimum of two way-finding signs for SR 1 and the CCT, appropriate signs to guide parking to public areas and away from private

Source: Caltrans/Sonoma County

property, and signage for any ADA compliant access spaces. Additionally, Sonoma County will develop and install at least two interpretive educational panels about the site's natural geology/ecology, describing the Project as an adaptive management response to sea level rise and reviewing the Native American history and the area's transition to agricultural and ranching. As appropriate, the signage will acknowledge Caltrans, Sonoma County, Coastal Conservancy and Coastal Commission contributions to promoting public access and adaptive management through this Project.

Access to the Beach at Scotty Creek:

Caltrans has contributed funding and facilitated the purchase of formal public access to the sandy beach generally southwest of Scotty Creek at SR 1 so that the County now holds fee title to APN 101-120-058 (1), guaranteeing the public's right to access the mean high tide line and other public beach areas at this location. Caltrans will also design and construct the rock slope protection along existing SR 1 south of Scotty Creek in a manner to facilitate the public's ability to navigate over specifically designed rock placements. This improvement will be made in collaboration with Sonoma County Regional Parks to optimize user accessibility while minimizing impacts to coastal resources. These details will be further developed in consultation with the Gleason Beach Coastal Access Task Force and will consider weather, tides, and storm impacts when determining access options.

Parking:

Parking will be provided in reasonable proximity to the beach and the CCT network. Approximately 4 informal parking spaces will be available south of Scotty Creek, and 16 informal spaces along the central access road for a total of 20 parking spaces; a minimum of 1 ADA parking space will be evaluated for potential inclusion in that total.

CCT Bridge:

Siting and design for a CCT bridge over Scotty Creek will include (1) estimating the bridge length necessary to span the restored Scotty Creek and to avoid potential conflicts with the habitat restoration occurring at the site, (2) determining minimum widths necessary to accommodate potential users, (3) providing any necessary approaches to the bridge, and (4) identifying measures to facilitate the potential modifications and/or relocation of the Scotty Creek crossing in order to maintain a continuous connection of the CCT over time. Bridge materials will be selected to reflect the rural character of the area; bridge design and construction will also reflect LCP standards as well as the ease of potential future bridge relocation or reconstruction.

Landscaping:

Any landscaping/replanting proposed for the new public coastal access areas will consist of low-lying, locally native, coastal prairie habitat species. Limited native shrub or tree species may be sited for visual screening purposes. All plantings will be regularly maintained until they are established.

Use Provisions.

The CCT and all other public access components associated with the realignment Project, including the public sandy beach areas at Scotty Creek, will be planned and managed to remain available to the public free of charge 24 hours a day, 365 days a year, except that Sonoma County may set up temporary maintenance and hazards closings or direct users away from any hazardous conditions that may be encountered on the CCT or within other areas open to the public. Sonoma County may charge for its Commemorative Furniture Program (such as for dedicated benches, picnic tables, and interpretive panels). Additional management measures needed by Sonoma County may be proposed within the Phase I and II Final Coastal Access Plan.

4. Public Access Funding, Development and Implementation Process

Caltrans has sought to support public access improvements consistent with the Sonoma County LCP and the California Coastal Act and has developed this Conceptual Access Plan through a partnership approach with Sonoma County and with input from Coastal Commission Staff in order to meet the requirements for the coastal development permit needed for the Project. This has included a variety of actions, including incorporating direct actions into the Project construction plans and through the development of right-of-way acquisition strategies as described above. Additionally. Caltrans is supporting the overall planned public access improvements through contributing funds to Sonoma Count as further described below. These commitments were reconfirmed in Caltrans' April 2020 letter of assurance to Sonoma County.

Contribution of Funds.

Caltrans proposed to enter into a cooperative funding agreement(s) with Sonoma County to provide for a two-phased disbursement of funds totaling $1.2 million to underwrite the County's participation in the planning, design and engineering, construction and management of the features of this Conceptual Access Plan. Anticipating coastal development permitting requirements, Caltrans will execute the proposed cooperative agreement(s) prior to commencement of construction and will clearly identify the responsibilities of Caltrans and Sonoma County for implementing this Conceptual Access Plan as part of the agreement(s). At a minimum, Caltrans will ensure that the following roles and responsibilities are included in the funding agreements(s):

Gleason Beach Coastal Access Taskforce.

Prior to commencement of construction, Caltrans will make an initial disbursement of funds in the amount of $200,000 into an account specifically established for public access purposes to enable Sonoma County to form a Gleason Beach Coastal Access Taskforce (Taskforce) and to complete public access planning and design decisions for preparation of a Phase I Final Coastal Access Plan for Gleason Beach. Within three months of the disbursement of funds, Sonoma County will convene the Taskforce, consisting of Sonoma County, Coastal Commission, State Parks, State Coastal Conservancy and Caltrans representatives as well as other appropriate stakeholders. The Taskforce is expected to be convened by Sonoma County as needed to provide input and guidance on Sonoma County's and Caltrans' timely completion of Phase I

Source: Caltrans/Sonoma County

and II of the Final Coastal Access Plan for Gleason Beach in accordance with this Conceptual Public Access Plan proposal.

Final Coastal Access Plan for Gleason Beach.

This Plan will be cooperatively developed by Sonoma County and Caltrans in two phases to coordinate necessary decisions, plans and activities with the overall realignment project.

Phase I Coastal Access Plan.

The Phase I Coastal Access Plan will essentially cover planning and design activities that are necessary to inform further detailing of design, construction and operation activities in Phase II. Within one year of convening the Taskforce, Caltrans and Sonoma County will produce a Phase I Public Access Improvement Plan to be submitted to the Executive Director of the Coastal Commission for review and approval (in consultation with Permit Sonoma) with the following minimum contents:

A. A general narrative description of the public access components along with a schematic map identifying their proposed locations, including the general CCT alignment within the existing SR 1 corridor, the sandy beach access through the rock slope protection proposed on Gleason Beach, an adaptable CCT bridge over Scotty Creek, vista overlooks, parking spaces, unloading zone(s), possible restroom facilities and any other identified public access areas and amenities.

B. An overview of the sequencing, timing, and coordination needed to be undertaken with other concurrent project construction activities being conducted by Caltrans and Sonoma County, including (1) Caltrans' removal of the existing Scotty Creek box culverts and restoration of the floodplain, (2) Caltrans' replacement and planting of rock slope protection at the edge of the existing SR 1 on the sandy beach south of Scotty Creek, and (3) Sonoma County's cleanup and disposal of debris along the bluff and shoreline within the Coastal Hazards Cleanup Area (See Figure 1).

C. An outline, schedule and scope of work for the completion of the Phase II Public Access Plan.

D. The planned **Roles and Responsibilities** of Caltrans and Sonoma County, under the cooperative funding agreement(s) during Phase I activities are as follows:

    (1.) **Sonoma County** will be responsible for planning, in consultation with Caltrans:

        a. repurposing goals and location of the CCT between the northern and southern termini of the realigned SR 1 (including the approximate placement of the CCT within the existing SR 1 alignment as well as possible connections to, or through, other adjacent public lands, including SR 1 right of way lands when there is no feasible alternative, to the next closest existing CCT network segments at Duncan's Landing to the north and Marshall Gulch to the south);

b. providing Caltrans desired specifications for the CCT in adequate detail for Caltrans to initiate final designs for the repurposing of the existing SR 1 for the CCT;

c. preliminary plans for a CCT bridge over Scotty Creek, within the existing SR 1 corridor;

d. location and type of at least 20 public parking spaces to be distributed to the north and the south of Scotty Creek, along the Project's access roads;

e. conceptual type of vertical public access to the beach to be established over (or as part of) the rock slope protection at Scotty Creek;

f. location of at least one overlook viewing area that will be sited on the blufftop to the north of Scotty Creek in addition to any other desired and appropriate overlook/resting sites identified by the Taskforce;

g. feasibility of ADA compliant parking, viewing and/or other access features within, or connected to, the CCT network or other public coastal access areas;

h. needs and potential locations for other public access amenities such as trash/recycling bins, benches, bike racks, restroom facilities, etc.;

i. anticipated activities needed for the basic operation and maintenance of the public coastal access area;

j. convening the Taskforce as needed on a regular basis to ensure timely completion of the Phase I Coastal Access Plan; and,

k. leading the co-production of the Phase I Coastal Access Plan for Gleason Beach with Caltrans for submittal to the Coastal Commission Executive Director review and approval.

(2.) **Caltrans'** responsibilities will include:

a. participating in Sonoma County's Taskforce activities;

b. ensuring that the new residential driveways from the new SR 1 alignment onto the old SR 1 (Figure 1) are designed to be the narrowest widths possible to be consistent with Sonoma County standards and coastal development permit requirements;

c. providing geotechnical assistance to determine how the existing SR 1 can feasibly be repurposed for CCT uses in conjunction with the County's Final Bluff and Beach Hazards Clean Up Plans, with appropriate drainage and erosion control features, and developing the repurposing plans for inclusion in the Phase II Final Access Plan;

d. completing plans for the repurposing of the existing SR 1 footprint and new vehicular access construction to: accommodate the initial alignment of the CCT (including provisions for future CCT connections to the north and the south of the Project limits); incorporate one vehicular drop off/loading area to the north of

Source: Caltrans/Sonoma County

Scotty Creek; provide vehicular driveways and public access parking as described above, allow for any other identified public access amenities related to the trail and access road network—all to be guided by Sonoma County and to be initiated by Caltrans as soon as traffic is diverted to the realigned SR 1;

e. developing the program to establish native plantings throughout the unused portions of the restored existing SR 1 roadway prism, consistent with the design principals for an approvable replanting plan;

f. providing consultation support with Native American tribes during the public access planning process as part of the overall cultural resource mitigation strategies; and,

g. participating in the co-production of the Phase I Coastal Access Plan for Gleason Beach with Sonoma County for submittal to the Coastal Commission Executive Director for review and approval.

Phase II Coastal Access Plan.

Following the approval of the Phase I Coastal Access Plan, Caltrans will deposit the remaining balance of funds in the amount of $935,000 into the previously established public access account dedicated to Sonoma County to complete designing, construction, operation and maintenance of the access components within the approved Phase I and Phase II Final Coastal Access Plans. The $935,000 is the balance of funds committed by Caltrans, which is a total of $1.2 million, minus $200,000 from the initial fund transfer as well as the subtraction of $65,000 under Sonoma County's previous agreement to contribute toward the executed acquisition of public beach access at Scotty Creek.

Within one year of the approval of the Phase I Plan, the Phase II Coastal Access Plan will be jointly prepared by Sonoma County and Caltrans to submit to the Executive Director of the Coastal Commission for review and approval with the following minimum contents:

Overview.

A narrative description and site plan that clearly identifies the final location and general dimensions of each public access improvement, including the CCT segments, parking spaces, viewing area(s) and other recommended access amenities (such as trash cans, benches, bike racks, restrooms, etc.).

(1.) **Signs**. Final plan for signs and interpretive panel for the coastal public access area, including a minimum of (1) two way-finding signs located on the realigned SR 1; (2) two educational/interpretive signs about the site's natural geology/ecology/cultural resources/agricultural history and/or adaptive management responses to sea level rise; (3) signs to guide users to public areas, away from private property; and (4) signage for any ADA-compliant parking. The signage plan will provide a description of the location and materials of the signs and the proposed message texts, including acknowledgement of Caltrans, Sonoma County, State Coastal Conservancy, and California Coastal Commission contributions to promoting public access and adaptive

management. The plan also will ensure that any unnecessary signs in the project are removed and that signage installations avoid blocking public coastal views.

(2.) **Final Construction Plans**. Complete the final plans for the construction and installation of (a) all elements of the CCT, including methods and locations for removing and re-grading the existing SR 1 prism generally level with adjacent lands as well as installation of erosion control features and surfacing methods; (b) at least one viewing area on the bluff north of Scotty Creek (c) any ADA compliant public access features identified and approved in the Phase I Coastal Public Access Plan; and (d) any other public access facilities approved in the Phase I Coastal Public Access Plan or added upon further evaluation in the Phase II Coastal Public Access Plan.

(3.) **Planting Plan.** A final native species replanting plan and non-native/invasive species control proposed for areas of the abandoned SR 1 determined to not serve public access purposes and next to and over the rock slope protection south of Scotty Creek to soften the visual impact of the installed rock structure. To the greatest extent practicable, trailing native species appropriate to the area will be installed on the western edge of the restored road prism and rock slope protection so as to promote plantings that will naturally cascade down the bluff and rock faces to lessen visual impacts. The planting plan will include a species list, propagation and planting methods and maintenance and weed abatement until native species have established.

(4.) **Implementation**. This component will include a proposed schedule of the Final Phase I and II Public Access Plan implementation actions for all identified public access features. The Plan will describe how public access construction will be carried out in coordination with other concurrent Project activities, including: removal of the existing Scotty Creek box culverts and restoration of the lower floodplain, the replacement of rock slope protection at the edge of the existing SR 1 on the sandy beach area, the repurposing of the existing SR 1 roadway/road prism (with drainage features and native plantings) and the activities associated with the cleanup and disposal of debris to be conducted by Sonoma County along the bluff and shoreline within the Coastal Hazards Clean Up Area. The Implementation section will also include provisions for submitting, upon completion of the Scotty Creek mouth restoration, to the Coastal Commission Executive Director final construction plans for the CCT Bridge that will include location, approaches, length, width, materials and features to facilitate potential modifications and/or relocation of the bridge connection over time to maintain CCT connectivity.

(5.) **Management**. A general description of the operations and maintenance activities that Sonoma County Regional Parks will undertake to oversee the long-term management of the CCT, beach access and other public access lands and amenities.

(6.) **Reporting**. Will include specifications for the submission of annual written reports to the Executive Director of the Coastal Commission on the progress made toward the completion of the overall coastal access improvements until such time that all improvements approved in the Final Phase I and II Coastal Access Plan have been

completed and the coastal access area is fully opened for public use.

The planned roles and responsibilities of Caltrans and Sonoma County that will be specified in the cooperative funding agreement(s) for Phase II activities are as follows:

A. **Sonoma County.** The County will be responsible for**:**

(1.) making final determinations of all needs and locations for public access amenities to be included within the Phase II Final Coastal Access Plan consistent with this Conceptual Plan and guiding principles;

(2.) designing and implementing at least one overlook viewing areas on the blufftop north of Scotty Creek in addition to any other access amenity areas or facilities (except for the CCT network, vehicular turnaround and parking spaces) proposed within the Phase II Final Coastal Access Plan;

(3.) determining the final type of vertical public access to be provided over the rock slope protection at Scotty Creek to the beach and preparing and implementing any necessary additional plans for that access;

(4.) preparing the Management Plan section of the Phase II report for the long-term maintenance of the coastal access area;

(5.) convening the Taskforce as needed on a regular basis to ensure timely completion of the Phase II Coastal Access Plan and

(6.) Leading the co-production of the Phase II Coastal Access Plan for Gleason Beach with Caltrans for submittal to the Coastal Commission Executive Director for review and approval.

B. **Caltrans** responsibilities will include:

(1.) continued participation in Sonoma County's Coastal Access Taskforce activities;

(2.) continuing to provide geotechnical assistance to guide repurposing activities of the existing SR 1 in conjunction with Sonoma County's Final Bluff and Beach Hazards Clean Up Plans and activities, and

(3.) providing consultation support with Native American tribes during the public access implementation process as part of their overall cultural resource mitigation strategies; and,

(4.) participating in the co-production of the Phase II Coastal Access Plan for Gleason Beach with Sonoma County within one year of the approval of the Phase I Coastal Access Plan for submittal to the Coastal Commission Executive Director for review and approval.

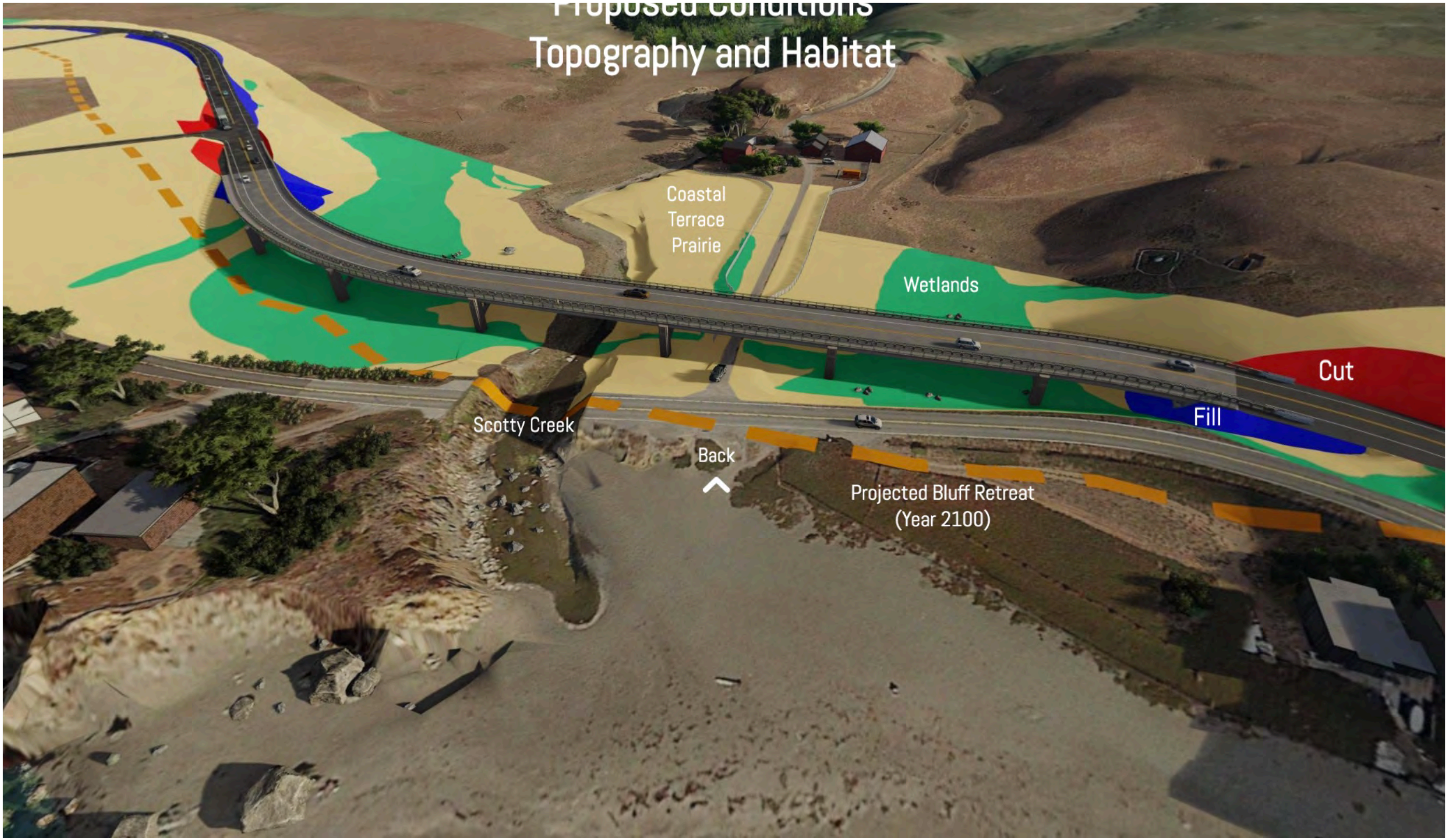
Relinquishment of Lands.

Upon the completion of Caltrans' commitments under the approved Phase I and II Coastal Access Plan for Gleason Beach, Caltrans will transfer fee-interest title, easements and any other property interests of all lands that have public access utility and that Caltrans owns or

has a property right to between the western edge of the right of way of the new SR 1 alignment and the western edge of the existing SR 1 ROW approximately from post mile (PM) 15.1 to PM 15.7 to Sonoma County to operate and maintain the CCT and other public access improvements for the public according to the commitments and use provisions of the approved Final Phase I and II Coastal Access Plan.

Source: Caltrans/Sonoma County

Wetland and ESHA Overview



Source: Caltrans (2020)

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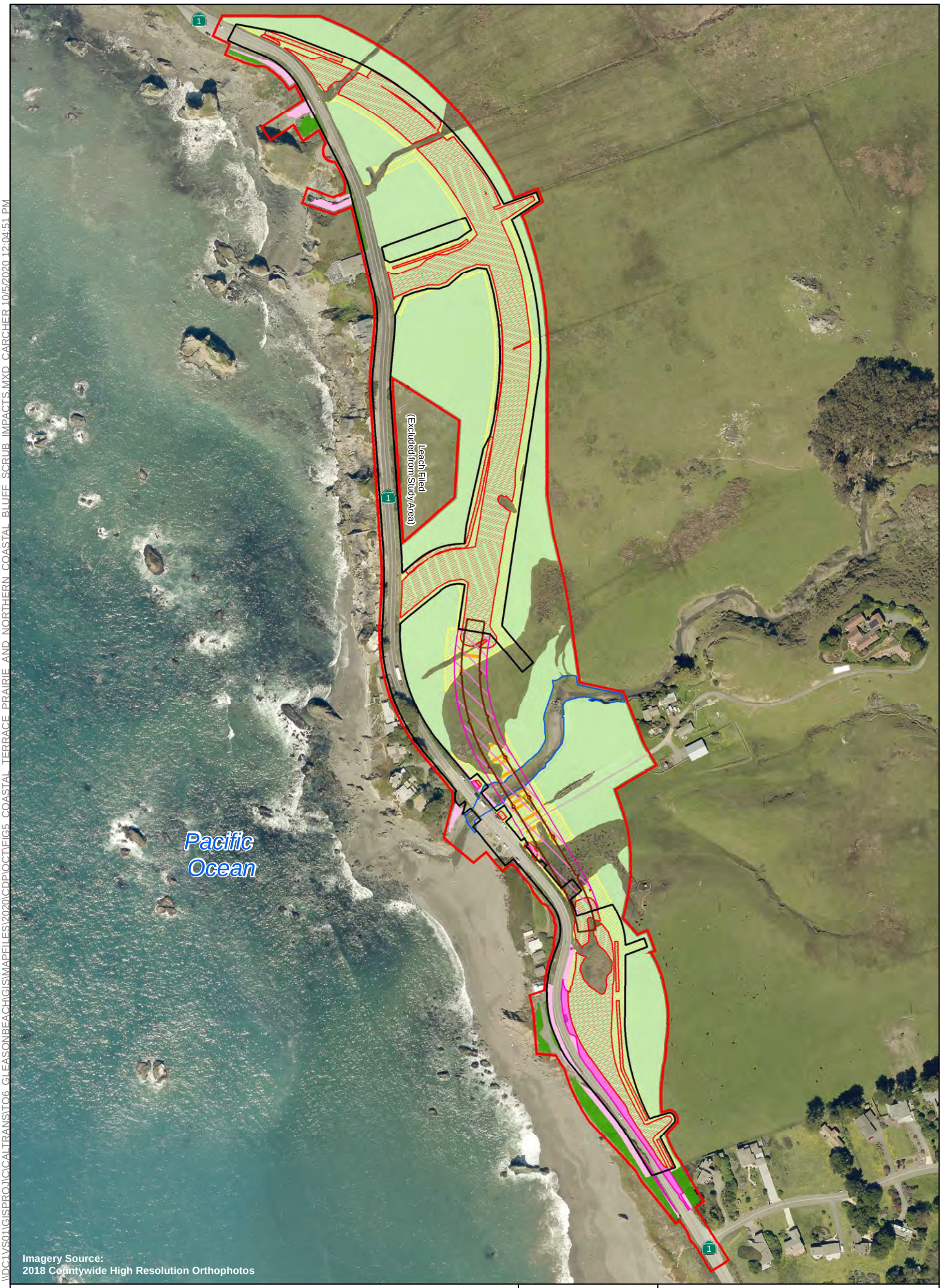

Legend

- Biological Study Area (BSA)
- Caltrans Right of Way
- Caltrans Aerial Easement
- Bridge
- Scotty Creek
- Coastal Terrace Prairie
- Northern Coastal Bluff Scrub

Impacts to Coastal Terrace Prairie

- Permanent (5.824 acres)
- Temporary - Longer-term (0.057 acre)
- Temporary Short-term (3.367 acres)

Impacts to Northern Coastal Bluff Scrub

- Permanent (0.289 acre)
- Temporary Short-term (0.537 acre)

N

0 260

Feet

Caltrans

FIGURE 5
PROJECT IMPACTS TO COASTAL TERRACE PRAIRIE AND NORTHERN COASTAL BLUFF SCRUB
Gleason Beach Roadway Realignment Project
Coastal Development Permit Application
State Route 1
Post Mile 15.1-15.7, EA 0A0200
Sonoma County, California

Source: Caltrans (2020)

FIGURE 6
PROJECT IMPACTS TO MYRTLE'S SILVERSPOT BUTTERFLY
Gleason Beach Roadway Realignment Project
Coastal Development Permit Application
State Route 1
Post Mile 15.1-15.7, EA 0A0200
Sonoma County, California

Source: Caltrans (2020)

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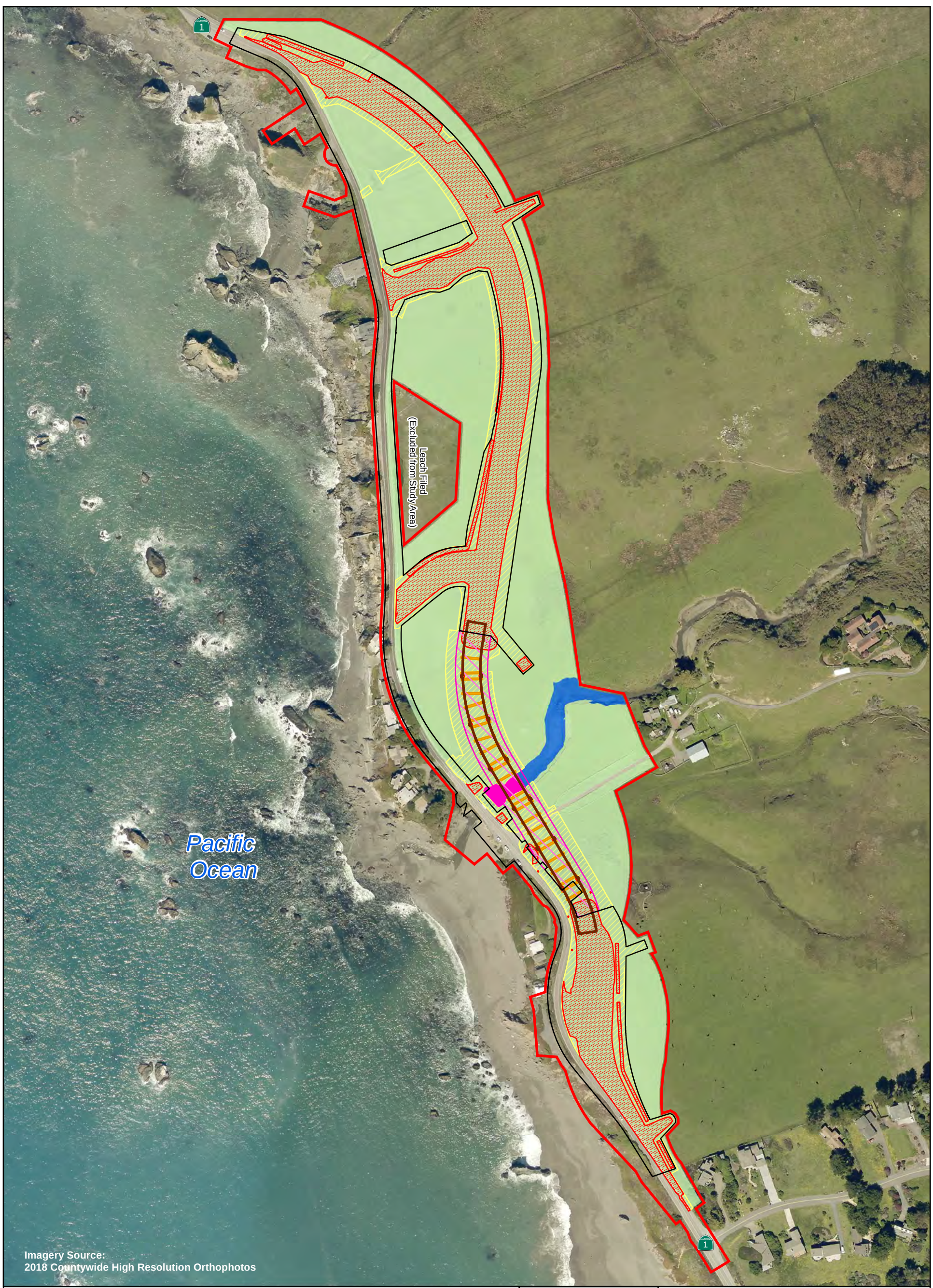

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Legend

- Biological Study Area (BSA)
- Caltrans Right of Way
- Caltrans Aerial Easement
- Bridge

California Red-Legged Frog (CRLF) Habitat

- Dispersal Habitat
- Breeding Habitat

Impacts to CRLF Dispersal Habitat

- Permanent (6.682 acres)
- Temporary Longer-term (0.176 acre)
- Temporary Short-term (5.072 acres)

Impacts to CRLF Breeding Habitat

- Temporary Short-term (0.117 acre)

N

0 260

Feet

Caltrans

FIGURE 7
PROJECT IMPACTS TO CALIFORNIA RED-LEGGED FROG
Gleason Beach Roadway Realignment Project
Coastal Development Permit Application
State Route 1
Post Mile 15.1-15.7, EA 0A0200
Sonoma County, California

Source: Caltrans (2020)

Exhibit 23
CDP 2-20-0282
Page 1 of 1

M E M O R A N D U M

FROM: Lauren Garske-Garcia, Ph.D. – Senior Ecologist

TO: Peter Allen, Ph.D. – Transportation Program Analyst
Tami Grove – Transportation Program Manager
Dan Carl – North Central Coast Deputy Director

SUBJECT: Impact Definitions and Mitigation Framework for Gleason's Beach Highway 1 Realignment

DATE: October 8, 2020

Since May 2018[1], Commission staff have continued to work closely with Caltrans towards a refined ecological mitigation approach that accounts for uncertainties concerning mitigation site availability. We have aimed to develop a framework that would provide flexibility in terms of specific locations, their attributes, and condition, while ensuring that required compensation for the realignment Project's impacts will be both meaningful and robust under the Coastal Act. In this memorandum, I intend to: 1) refine and clearly **articulate impact definitions**; 2) describe the **mitigation framework** that should be applied regardless of final mitigation site selection; and, 3) **update previous recommendations** provided to Caltrans in 2018[2], to reflect the guidance provided since. The updated Conceptual Mitigation Plan (CMP) submitted as part of the current application (**Exhibit 28**) already reflects much of this but given ecological complexities and nuances associated with the Project, I will address key points to ensure clarity.

Impact Definitions

In the past, the Commission has generally considered two categories of impacts: temporary and permanent. "Temporary" has typically referred to those impacts where there is no significant ground disturbance or killing of native vegetation[3] and the vegetation recovers to its pre-disturbance state within one year[4]; everything else has been

[1] In 2018, Commission staff published a recommendation for the Gleason's Highway 1 Realignment project (CDP 2-18-0078) prior to the item having been postponed by the applicant. At that time, Caltrans' proposed mitigation approach was based on a specific site, which may still ultimately serve this purpose but at this time, remains uncertain.

[2] *Draft Biology Mitigation Matrix* from CCC staff, dated July 12, 2018; *Draft Memorandum: Compensatory Mitigation Recommendations for Gleason's Beach Hwy 1 Realignment* from CCC Ecology Group, dated September 22, 2018.

[3] Ground disturbance is important to consider from an ecological perspective because it can affect resources and environmental properties such as seed banks, microtopography and superficial microhabitat, animal burrows, soil horizons, root zones, mycorrhizal and bacterial assemblages, and hydrology or drainage patterns. Similarly, it is important for native vegetation to persist rather than be replaced by non-native species or bare ground that then becomes available to competitive non-native species.

[4] Vegetation recovery to a pre-disturbance state, generally recognized by age classes and/or size structure distribution, is important because that condition is what establishes the foundation for the existing ecosystem. For example, perennial and woody species provide habitat structure serving as shelter, food sources, wind breaks, etc. Larger, more mature plants with established roots help stabilize substrate and reduce erosion, can allow the space for successional processes, and contribute to habitat mosaics, which in turn foster resilience and biodiversity. Heterogeneous

Source: CCC Staff

considered "permanent". Temporary impacts are generally brief and small, occurring on the order of a few weeks and over an area less than a quarter acre. On occasion, the Commission has recognized a third category, which acknowledges cumulative functional loss due to impacts sustained over longer construction periods and/or larger areas, even when they can recover quickly once construction ends.[5]

Given that the Project would have a construction phase extending over two years, including over areas where the vegetation is likely capable of recovering quickly, I recommend that **three impact categories be applied**, as follows:

- All temporary impacts require that 1) there be no significant ground disturbance and 2) that vegetation recovers to comparable age classes and/or size structure distributions by the end of the designated period, where:
    - Short-term temporary impacts are those where vegetation recovery occurs within 12 months of the *initial* point of disturbance;
    - Long-term temporary impacts are those that may be intermittent or sustained for up to a 24-month period such that vegetation recovery may require more than 12 months from the *initial* point of disturbance but no more than 12 months from the *conclusion* point of disturbance, thus effectively allowing for as much as 36 months to fully recover.
- Permanent impacts include areas or key ecological functions that would be lost to development, frequently disturbed in order to maintain development, involve significant ground disturbance, or necessitate more than 12 months for recovery following the conclusion of disturbance.

The definitions recognize that **ecology is more than a function of space** and allows for accounting of temporal losses to ecological functions. Successional processes, plant maturity, seed banks, and soil development are all examples of functions that may require years to recover, even from temporary disturbances. Other functions, like drainage patterns, may be permanently altered or lost in the course of nearby development.

Mitigation Framework

Caltrans' current best estimates of impacts are presented in Table 1 of the updated CMP (reproduced in part below); however, without an approved mitigation site, it is impossible to identify the opportunities that will be available for replacing each resource impacted. By instead providing a framework specifying geographic requirements and compensatory mitigation strategies, ratios, and phasing, we are **establishing clear expectations for resource replacement while allowing flexibility to adapt to the site(s) eventually secured**.

Resource Type	Temporary Short-term (≤ 12 mo) Impacts (acres)	Temporary Long-term (> 12 mo) Impacts (acres)	Permanent (acres)
Waters of the US and State	0.126	-	-
Wetlands	1.299	0.118	0.433
Coastal terrace prairie	3.267[6]	0.057	5.824
Northern coastal bluff scrub	0.523[6]	-	0.289
Myrtle's Silverspot Butterfly (*foraging*)	5.422	0.176	6.663

distributions can provide diverse habitat opportunities and in turn, support more diverse and resilient ecosystems than their homogenous counterparts.

[5] For example: North Coast Corridor Public Works Plan/Transportation and Resource Enhancement Program 2016 (CDP 6-15-2092); Toro Creek Bridge Replacement 2020 (CDP 3-19-1199)

[6] Note that there are some minor inconsistencies in estimates presented in the updated CMP and Figure 5 (Exhibit 28). Temporary short-term impacts for coastal terrace prairie are stated as 3.267 acres and 3.367 acres, respectively, and for northern coastal bluff scrub are stated as 0.523 acres and 0.537 acres, respectively. However, the error is not ultimately consequential since all impact estimates will be validated through post-construction surveys.

Source: CCC Staff

Myrtle's Silverspot Butterfly (*larval*)	0.085	-	0.061
CA Red-Legged Frog (*upland/dispersal*)	5.072	0.176	6.682
CA Red-Legged Frog (*aquatic*) Steelhead	0.117	-	-
Coho	0.152	-	-

Geography

Generally, the Commission requires compensatory mitigation efforts to occur within the coastal zone and within the same watershed or region where coastal resources were impacted. A key factor in this rationale is the maintenance of habitat availability within the local landscape, ensuring opportunities for species and genetic populations to persist nearby and along the coast. In this case, **any mitigation sites proposed should be limited to the Bodega Harbor-Frontal Pacific Ocean watershed (preferably) or those immediately adjacent (alternatively), within the coastal zone**.

Strategies

Compensatory mitigation can be achieved through a number of approaches; however, not all are equal and it is important to recognize the trade-offs between these from an ecological perspective. Generally, we recognize four strategies: creation, substantial restoration, enhancement, and preservation. In any mitigation, the net area and level of improvements (or "functional lift") of the intended compensation package are critical in terms of recovering ecological functions, values, and services. Mitigation may also vary as provided in-kind or out-of-kind, and on-site or off-site.

Creation is where habitat is developed at locations it has not historically existed, thus contributing to a new or expanded footprint relative to existing habitat. Important aspects of this strategy include consideration of habitat conversion and suitability. Replacement through habitat creation is often difficult to achieve because an ecosystem is not only defined by its physical footprint but also the many environmental processes that shape past and future conditions, including connectivity to other populations and habitat types within the broader landscape.

Substantial restoration focuses on areas where habitat exists in a degraded state. By virtue of its presence, it's understood that the necessary conditions to support the ecosystem are or have been historically present but that stress has been imposed by any assortment of drivers. These might include physical or chemical alterations to the landscape, unchecked invasions by non-native species, or unauthorized and/or insensitive land uses among other things. Restoration at this level **generally involves alleviating the system from any such stressors and actively facilitating the return of a full suite of self-sustaining ecological functions**. This may involve techniques such as manipulating landforms to return natural processes, or eradicating non-native species and then revegetating with a robust palette of natives.

Enhancement involves improvement of some limited ecological functions rather than recovery of a full suite. This strategy may be appropriate where a habitat's starting condition requires only limited intervention to achieve a "high quality" state. It can also be used where more robust restoration efforts may not be feasible due to equipment access challenges, restrictions due to the presence of sensitive species or cultural resources, or labor is less limiting than financial means. Examples of what may qualify as enhancement include weeding out invasive vegetation, installation of smaller landscape features to benefit a particular species (e.g., basking rocks for pond turtles or large woody debris in streams), or limited planting (e.g., to augment what may already be present rather than replace existing vegetation).

Preservation represents a passive management approach where no active effort is made to improve the existing condition of the habitat, it is simply placed under some form of permanent protection. While this strategy undoubtedly offers benefits as explicit protection from development threats and buffering resources from adjacent activities, these benefits are also limited by the quality of the existing habitat. It is possible that the area would already be otherwise protected by virtue of the resources present. And in the absence of active restoration efforts, there is no

Source: CCC Staff

assurance of habitat improvement or even maintenance in the face of climate change, species invasions, etc.

The terms in-kind and out-of-kind refer to resource replacement relative to the resource impacted. **Typically, in-kind replacement is strongly preferred** so as to ensure continuity of that resource's existence and role within the greater ecosystem and landscape. Occasionally, this may not be feasible and so out-of-kind alternatives may be considered. When this is the case, it's **important to identify a nexus of any proposed out-of-kind mitigation with the observed habitat impacts**. In the realignment Project, I recognize two particular situations where out-of-kind mitigation may be necessary and appropriate. First, it may be difficult to locate an appropriate site for northern coastal bluff scrub mitigation and while this should remain the priority, I note that Myrtle's Silverspot Butterfly impacted within the prairie habitat likely uses nectar plant species occurring among bluff scrub as well; if suitable bluff scrub opportunities cannot be secured, out-of-kind mitigation as additional acreage for prairie including the butterfly's native nectar plants should be considered. Second, the loss of California red-legged frog dispersal habitat within the prairie cannot likely be replaced in-kind; an out-of-kind option to benefit the frog would be improvements to its aquatic habitat along Scotty Creek.

Mitigation may occur on-site or off-site though **on-site replacement is strongly preferred**. Few habitats can be meaningfully sustained as islands because they require a flow of resources in and out of an area (e.g., genetic material, hydrology, habitat corridors, etc.). In a landscape mosaic, a healthy patchwork of metapopulations and habitat types helps ensure resilience and persistence over the long-term; fragmentation deteriorates this opportunity and compromises overall resource integrity. On-site mitigation allows this integrity to be sustained. **When compensation is instead moved off-site, it is critical to provide a strong ecological rationale to support the selection**.

Finally, I note that **there may be components of a project that involve revegetation but should not qualify as mitigation**. For example, landscaping using local native species is commonly a project requirement but is not considered mitigation for ecological impacts.[7] Similarly, vegetation is often used to screen development and/or improve visual continuity with the surrounding landscape. In these situations, plant palettes may require ecological sensitivity but since they are not considered ecological mitigation, ratios, associated success criteria, and monitoring would not apply.

Ratios

The different **mitigation strategies vary in their degrees of ecological uplift and benefits to the landscape and thus, should not be considered equivalent**. While the Commission has generally used mitigation ratios of 3:1 (acres mitigated: acres impacted) for permanent ESHA impacts and 4:1 for permanent wetland impacts, these ratios assume that resources are being compensated for through either habitat creation or substantial restoration. **With wetlands, there is an added expectation of no net loss of acreage**[8], and the underlying principle remains good practice for all habitat types. These ratios are intended to account for the spatial losses of habitat due to development, temporal losses of ecological function due to lags in mitigation implementation and final achievement of success criteria, assumptions made through reliance on limited post-implementation monitoring, and the improbability of truly or fully replacing ecosystem functions, values, and services at a rate of 100% per acre mitigated. In other words, the ratios include an acceptance of uncertainty that is balanced by the robust spatial replacement of key ecological components.

While these typical ratios and strategies are aimed at ensuring full suites of ecological functions are replaced, there are situations where less involved approaches may be acceptable; however, to compensate adequately for the level of

[7] For example, at the Fort Ord Dunes State Park Campground (CDP 3-14-1613), approximately 83 acres of restoration were required as compensatory mitigation for the campground development. In addition, approximately 6 acres immediately surrounding the development was required to be planted with native dune species to help separate and screen the campground from the surrounding habitat, while providing some limited habitat value enhancement, but this acreage did not count towards fulfillment of compensatory mitigation requirements.

[8] State of California Executive Order W-59-93

ecological functions, values, and services lost, ratios should be increased. **I recommend that mitigation ratios be doubled when enhancement is used and tripled when preservation is used.** In addition, mitigation packages should never rely on preservation strategies alone.

It is feasible that multiple mitigation strategies may be used within a single package. The realignment Project is an example of where this makes sense because of its scale and complexity. **Using the ratios above, I am recommending a framework that allows for the flexibility of employing multiple mitigation strategies and establishes a mathematical discount approach[9] to ensure that the impacted habitats are fairly compensated for**. Caltrans has incorporated this approach to their CMP, including the no net loss of wetlands. In addition to doubling or tripling ratios for enhancement and preservation fractions, respectively, they will also complete any necessary **out-of-kind enhancement at triple the typical ratios**. This framework then reflects the differences in ecological benefits provided by various mitigation strategies while ensuring robust compensation for the realignment Project's impacts.

Example

To illustrate how the compensatory mitigation framework would be applied, the following example uses wetlands and the typical 4:1 mitigation ratio. In each of the five scenarios (A-E), the impact area is 3 acres and there is a minimum 1:1 requirement for habitat creation in order to ensure there is no net loss of wetlands; however, the remaining 3:1 of the requirement (the discounted ratio) could be met in various ways.

- **Scenario A** represents the Commission's typical expectation that wetlands will be mitigated at 4:1 via creation and substantial restoration, so 3 acres of impacts requires 12 acres of mitigation with at least three of those being newly created.
- **Scenario B** fulfils the required 1:1 minimum of creation but the remaining 3:1 is achieved through on-site enhancement at double the discounted ratio (4:1 – 1:1 = 3:1, 3:1 x 2 = 6:1, 3 ac x 6:1 = 18 ac); 3 acres of impacts requires 3 acres creation and 18 acres of enhancement.
- **Scenario C** also fulfills the required 1:1 minimum of creation but instead addresses the remaining 3:1 is through preservation at triple the discounted ratio (4:1 – 1:1 = 3:1, 3:1 x 3 = 9:1, 3 ac x 9:1 = 27 ac), so 3 acres of impacts requires 3 acres creation and 27 acres of preservation.

Scenario	Requirement	Impact (ac)	Ratios Applied	Mitigation Approach	Mitigation (ac)
A	4:1	3	1:1	creation	3
			3:1	creation or substantial restoration	9
B	4:1	3	1:1	creation	3
			6:1	enhancement	18
C	4:1	3	1:1	creation	3
			9:1	preservation	27
D	4:1	3	1.5:1	creation*	4.5
			5:1	enhancement	15
E	4:1	3	1.5:1	creation*	4.5
			7.5:1	preservation	22.5

* including up to 0.5 ac as substantial restoration

[9] The discount approach begins with the typical mitigation ratio that would be expected by the Commission, 3:1 for ESHA or 4:1 for wetlands, and subtracts the fraction that is completed via primary mitigation strategies (i.e. creation or substantial restoration). The remainder is the discounted ratio, which is then either doubled or tripled per the secondary strategy employed (i.e. enhancement or preservation), and then applied to the impact acreage to determine the remaining acreage required via the secondary strategy.

Source: CCC Staff

- **Scenario D** represents having achieved more than the minimum creation needed to ensure no net loss of wetlands at 1.5:1, leaving a discounted ratio of 2.5:1 (4:1 – 1.5:1 = 2.5:1), which would be doubled for on-site enhancement (2.5:1 x 2 = 5:1, 3 ac x 5:1 = 15 ac) and result in 3 acres creation with 15 acres of enhancement.
- **Scenario E** alternatively addresses the remainder via preservation at triple the rate (4:1 – 1.5:1 = 2.5:1, 2.5:1 x 3 = 7.5:1, 7.5:1 x 3 ac = 22.5 ac), resulting in 3 acres creation and 22.5 acres of preservation.

Phasing

Since it is unclear whether all of the realignment Project's compensatory mitigation will occur at a single site or will be necessarily spread across multiple sites, or whether all components will begin and end on the same schedule, it is foreseeable that there may be spatial and/or temporal offsets in mitigation implementation. While we recognize and emphasize that it would be generally preferable to focus efforts geographically and keep them in sync, I have suggested that Caltrans **consider how they could structure mitigation plans should such a situation become necessary**. For large projects elsewhere, the Commission has approved phased efforts and recent models are available.[10] Regardless, any proposed mitigation phasing would need to clearly detail how monitoring, performance evaluation, and any remedial action that may become necessary would occur in the context of the overall mitigation package.

Updated Guidance

Provided the outstanding uncertainties regarding mitigation plans and updates to the CMP, the following refines some previously articulated recommendations. While the **CMP already reflects some of this as a product of the ongoing coordination between our agencies**, I will provide details not fully captured.

Clarifications and Revisions

1. In Table 2 of the updated CMP, Caltrans identifies preservation as being an appropriate method for mitigating a fraction of the long-term temporary impacts. If preservation is used instead of creation or substantial restoration strategies, **the ratios will need to be tripled as in all other instances under the framework** (i.e. the discounted ratio would be 1.5:1 – 1:1 = 0.5:1 and at triple the rate (x 3), this becomes 1.5:1 for preservation, to be multiplied by the total acreage characterized as long-term temporary impacts).
2. For Myrtle's Silverspot Butterfly's **larval and nectaring species, plants should be replaced at a 3:1 ratio over an area from at least one but no more than three times as large the total area occupied prior to construction impacts**. This will ensure that the minimum spatial distribution and plant densities are maintained, if not improved, and are capable of continuing to support butterflies with limited home ranges.
3. For Myrtle's Silverspot Butterfly's nectaring, there are roughly a dozen plant species, including both natives and non-natives, which occur in the coastal terrace prairie and adjacent northern coastal bluff scrub habitats. The realignment Project will impact roughly six acres of these, which makes it challenging to census all plants; instead, and unlike the situation for the singular larval host species, **I recommend that all nectaring species be sampled across the area and that the average density per acre be used to set the 3:1 plant replacement ratio**.
4. The current CMP submission is based upon refined technical insight concerning archaeological constraints that will necessarily limit the extent of riparian corridor revegetation efforts within the on-site mitigation at Scotty Creek. **I recommend that this should be 50 feet wherever possible and acknowledge there may be areas where this is necessarily adjusted, but under no circumstances should the riparian swath be less than 25 feet**

[10] For example, see Fort Ord Dunes State Park Campground (CDP 3-14-1613)

on either bank of Scotty Creek.

Outstanding Items

5. While we have received updated estimates of impacts within the current CMP, the realignment Project will occur in an area rich with sensitive ecological resources and the actual impacts will likely vary to some degree in terms of their extent and characterization. **Pre-construction and post-construction surveys will be necessary to finalize impact calculations and fully determine compensatory mitigation requirements** based upon the mitigation framework above. Additionally, mitigation for temporary impacts will need to be confirmed as successful by the end of the designated period or alternatively recharacterized as permanent, with mitigation requirements then being adjusted upward to duly compensate for the losses.

6. Although our understanding is that a **preferred mitigation site is presently being negotiated for acquisition**, the details of that site will remain confidential until it is finalized. Given the uncertainties, we have repeatedly encouraged Caltrans to plan for contingency sites. The updated CMP identifies potential off-site habitat mitigation opportunities on properties owned by CA Department of Parks and Recreation (State Parks), The Wildlands Conservancy, Sonoma Agricultural Preservation and Open Space District, or potentially on private land that would be purchased by Caltrans for the purposes of mitigation. Additionally, I have urged Caltrans to begin identifying and sampling appropriate reference sites in the region; a letter provided by Nomad Ecology[11] offers some preliminary options for coastal terrace prairie sites, and Caltrans has conveyed that they have also reached out to State Parks to discuss potential locations on their local properties. While it is unusual for such a large project to come before the Commission **without a secured mitigation site, in this case, the permit conditions, progress to-date, inclusion of a robust mitigation framework, and the assurance letter from Caltrans provide us with confidence and assurance that the mitigation will be implemented appropriately**. Importantly, Special Conditions to this CDP require that Caltrans acquires a final mitigation site and submits final mitigation plans for Executive Director review and approval prior to beginning construction. Effectively, this means the mitigation site should be finalized by the end of the year.

[11] Attached to the end of the updated CMP in Exhibit 28

Biological Technical Memorandum

Making Conservation a California Way of Life.

To: PETER ALLEN
Environmental Planner
California Coastal Commission

Date: October 5, 2020

From: CRISTIN HALLISSY
Office Chief
Office of Biological Sciences and Permits
State of California
Department of Transportation

Caltrans EA: 04-0A020

Subject: **Gleason Roadway Realignment Project: Conceptual Mitigation Plan**

The California Department of Transportation (Caltrans) is proposing the Gleason Beach Roadway Realignment Project (Project) to realign and relocate a section of State Route (SR) 1 to a more inland location.

The purpose of the Project is to protect SR 1 from coastal erosion while maintaining SR 1's long-term regional and local connectivity for the surrounding communities in the unincorporated area of Sonoma County, California. Along the Gleason Beach section of SR 1, coastal bluff erosion continues to threaten the stability of the highway, with the historical coastal bluff eroding at the proposed Project location at a rate of about 1 foot per year. Previous efforts to preserve the highway included installing soldier pile retaining walls placed within the southbound lane of SR 1. These efforts have temporarily stabilized small sections of SR 1 but will not prevent further erosion along the coastline.

The Project is located in a rural coastal area between post miles (PMs) 15.1 and 15.7, immediately southeast of Gleason Beach and approximately 5 miles north of Bodega Bay within the Duncans Mills U.S. Geological Survey 7.5-minute topographic quadrangle.

The Project would involve relocating SR 1 several hundred feet inland, with the new alignment consisting of one 12-foot-wide lane with 4-foot paved and 4-foot unpaved shoulders in each direction. An approximately 850-foot-long bridge, spanning the Scotty Creek channel and its floodplain is also included.

Project actions include removing a section of the existing highway, a reinforced concrete double-box culvert over Scotty Creek and a grade control structure. Removal of these structures will "daylight" (i.e., restore the creek to an open channel system) approximately 52 linear feet of Scotty Creek.

This Conceptual Mitigation Plan (CMP) summarizes the proposal to offset unavoidable Project impacts to environmentally sensitive habitat areas. This includes mitigation for impacts to Myrtle's silverspot butterfly (*Speyeria zerene myrtleae*; MSB), California red-

Source: Caltrans (2020)

legged frog (*Rana draytonii;* CRLF), Central California Coast coho salmon (*Oncorhynchus kisutch*), and Central California Coast steelhead (*O. mykiss*) and their habitats, as well as coastal terrace prairie (CTP) and wetlands.

This CMP has been prepared in conjunction with the Project's Coastal Development Permit (CDP) application. A Project impact analysis is also provided to the updated CDP application package. Mitigation details, including performance criteria and reference sites, will be included in a Final Mitigation Plan prior to the beginning of Project construction. A preliminary review of potential reference sites is attached.

Summary of Project Impacts

The proposed Project would result in both permanent and temporary impacts. Construction impacts from the bridge, highway, rock slope protection (RSP), fill, and alterations to topography will result in permanent impacts to wetlands, CTP, MSB, Northern Coastal Bluff Scrub, and CRLF habitats (Table 1). Other Project activities related to roadway construction, are limited in time and scope, and will only result in temporary impacts. The Project will have temporary effects on Scotty Creek due to a stream diversion during culvert removal operations, which may affect coho and steelhead. However, removal of the concrete box culverts will daylight the mouth of the creek, thereby improving fish and wildlife passage at the road crossing. Overall, the removal of the culverts will have a net beneficial effect for salmonids and no significant effect to CRLF aquatic habitat.

Table 1 Summary of Impacts to Environmentally Sensitive Habitat Areas

Resource Type	Temporary Short-term (≤12 months) Impacts (acres)	Temporary Long-term (>12 months) Impacts (acres)	Permanent (acres)	Relevant Regulatory Agency
Waters of the U.S. and State	0.126	-	-	CDFW, RWQCB, USACE
Wetlands	1.299	0.118	0.433	CCC, USACE, and RWQCB
Coastal Terrace Prairie	3.267	0.057	5.824	CCC and USFWS
Northern Coastal Bluff Scrub	0.523	-	0.289	CCC
MSB Foraging	5.422	0.176	6.663	CCC and USFWS
MSB Larval	0.085	-	0.061	CCC and USFWS
CRLF Upland Dispersal	5.072	0.176	6.682	CCC and USFWS
CRLF Aquatic and Steelhead Habitat	0.117	-	-	CCC, NMFS, and USFWS
Coho Habitat	0.152	-	-	CCC, CDFW, and NMFS

Source: Caltrans (2020)

Resource Type	Temporary Short-term (≤12 months) Impacts (acres)	Temporary Long-term (>12 months) Impacts (acres)	Permanent (acres)	Relevant Regulatory Agency

CCC = California Coastal Commission; CDFW = California Department of Fish and Wildlife; NMFS = National Marine Fisheries Service; RWQCB = Regional Water Quality Control Board; USACE = U.S. Army Corps of Engineers; USFWS = U.S. Fish and Wildlife Service

Proposed Mitigation

Permanent impacts will be mitigated at a 3:1 ratio for all resources except wetlands. Wetlands will be mitigated at a minimum ratio of 4:1. This will include at least 1:1 wetlands creation, to accomplish no net loss of wetlands. The remaining amount may include a combination of preservation and enhancement of wetlands, and out-of-kind enhancement of riparian habitat. This proposal will meet or exceed regulatory guidance [1] for preservation and out-of-kind mitigation. Short-term temporary impacts, where habitat recovery occurs within 12 months of the initial disturbance, will be restored onsite at a 1:1 ratio. Short-term temporary impacts will not involve significant ground disturbance and will require vegetation recover to comparable age class/size structure by the end of the designated period. Long-term temporary impacts, where habitat may be disturbed intermittently or continually for up to 24-months, with habitat recovery occurring within 12 months from the conclusion of disturbance, will be mitigated at a 1.5:1 ratio.

The proposed mitigation would fully compensate for Project impacts through preservation, enhancement, and creation, with strategy-based mitigation ratios identified in Table 3. Mitigation will be located within the Coastal Zone, preferably proximate to the Project and within the same watershed, Bodega Harbor- Frontal Pacific Ocean , and within the Sonoma County. Mitigation in northern Marin County Coastal Zone may be considered if needed. Potential off-site mitigation includes habitat restoration on property owned by Department of Parks and Recreation, The Wildlands Conservancy, and Sonoma Agricultural Preservation and Open Space District, or on land purchased by Caltrans for the purposes of mitigation.

Table 2 California Coastal Commission Compensation Framework

Resource Type	Impact Type	Mitigation Method	Mitigation Ratio[a]
All Resource Types	Temporary Short-term	Restored within Project footprint	1:1
All Resource Types	Temporary Long-term	Creation, substantial restoration, or preservation	1.5:1

[1] CCC Draft Mitigation Matrix. July 12, 2018 and CCC Draft Memorandum. Compensatory Mitigation Recommendations for Gleason's Beach Hwy 1 Realignment. September 22, 2018

Source: Caltrans (2020)

Resource Type	Impact Type	Mitigation Method	Mitigation Ratio[a]
		(1:1 restored within Project footprint, 0.5:1 as part of proposed mitigation)	
Wetland	Permanent	Creation or substantial restoration; or	4:1
Wetland	Permanent	Preservation or Out-of-Kind Restoration/Enhancement	9:1
Coastal Terrace Prairie	Permanent	Substantial restoration; or	3:1
Coastal Terrace Prairie	Permanent	Preservation	9:1
MSB Larval and Foraging	Permanent	Substantial restoration; or	3:1[b]
Larval and Foraging	Permanent	Preservation	9:1
Northern Coastal Bluff Scrub	Permanent	Substantial restoration; or	3:1
Northern Coastal Bluff Scrub	Permanent	Preservation or Out-of-Kind Restoration/Enhancement	9:1
CRLF Upland Dispersal	Permanent	Substantial restoration; or	3:1
CRLF Upland Dispersal	Permanent	Preservation	9:1
Coho	Permanent[c]	Substantial restoration	1:1

Notes:

[a] CCC guidance on mitigation ratios was provided in draft memorandums dated 7/12/18 and 9/22/2018.

[b] Viola adunca will be planted at a 3:1 ratio based on pre-construction surveys. Nectar species will be planted to establish three times the area affected by the project. The larval and foraging habitat planting will occur over an area no greater than three times the area affected by the project to maintain habitat density and value to MSB.

[c] Potential effects associated with the temporary water diversion and other Project activities.

The following is a summary of mitigation by impact type and activity.

Restoration of Temporarily Impacted Areas

Temporarily disturbed areas will be restored by grading to match pre-Project topography, removing invasive species to the maximum extent practicable, and applying a locally appropriate native seed mix.

Caltrans will conduct a post-construction vegetation survey within 30 days of restoring temporarily impacted areas and provide a report to the resource agencies that demonstrates revegetation has occurred in areas of short-term temporary impacts.

Source: Caltrans (2020)

Final on-site vegetation monitoring will occur 1 year following completion of the highway construction activities. temporary disturbed area Additional on-site vegetation monitoring will occur until full restoration is achieved.

Culvert Removal and Associated Riparian Restoration

The double-box culvert at SR 1 has been identified as a partial fish barrier; accordingly, removal of the culverts and adjacent fill is included as part of the Project to improve salmonid habitat, enhance the riparian corridor, and improve conditions for wildlife connectivity.

Restoration and enhancement work will proceed in two phases. During phase one, the banks of Scotty Creek will be regraded, and existing fill material will be removed to allow conformity of the natural creek banks upstream and downstream of the removed double-box culvert. RSP will be installed along a portion of the southern bank of Scotty Creek to protect the remnant SR 1 embankment providing access to the parcels south of Scotty Creek. The RSP will be covered with a combination of topsoil, compost and jute, and planted with appropriate species to minimize its appearance and to establish a riparian corridor and species habitat (Table 3). Species will be selected based on consistency with the local vegetation community, use of locally appropriate species, coordination with local nurseries, and viability for inclusion as part of local seed collection and propagation efforts. Reference sites include State Parks, private lands, and The Wildlands Conservancy lands within the Sonoma and northern Marin County Coastal Zone. Habitat restoration in these areas will consist of a mix of seasonal/coastal wetland creation, northern coastal bluff scrub, and coast strand habitats based on the elevation and location. Phase two of the riparian restoration will occur a year after the initial removal and restoration efforts, to allow potential movement of the Scotty Creek channel. The specific vegetation community and planting palette will be determined based on a re-evaluation of site conditions.

Table 3 Preliminary List of Plant Species Considered for the Scotty Creek Revegetation Site

Vegetation Types	Native Target Species	
Coastal Strand	*Artemisia pycnocephala* *Abronia* spp. *Lupinus arboreus*	*Atriplex* spp. *Eriophyllum staechadifolium* *Ericameria ericoides*
Northern Coastal Bluff Scrub	*Artemisia californica* *Baccharis pilularis* *Ceanothus thyrsiflorus* *Erigeron glaucus*	*Eriogonum fasciculatum* *Eriogonum Latifolium* *Eriophyllum staechadifolium* *Mimulus aurantiacus*
Coastal Marsh/Riparian	*Juncus* spp. *Carex* spp. *Sisyrinchium bellum*	*Iris douglasiana* *Eriophyllum staechadifolium* *Salix* spp.

Source: Caltrans (2020)

Wetlands

Wetlands Creation. Wetlands permanently impacted by the Project will be replaced with newly created wetlands at a 1:1 ratio so that there is no net loss of wetlands. Wetland creation would be achieved by converting areas adjacent to existing freshwater wetlands with less than 10 percent ground cover of native plants, where hydrology and wetland vegetation can be established through grading, wetland plantings, and other restoration management tools.

Wetland enhancement. Existing freshwater wetlands will be preserved and enhanced by managing invasive species to promote native species growth.

Out-of-kind enhancement. The remainder of the wetland mitigation will consist of out-of-kind enhancement and riparian habitat restoration to benefit salmonids and CRLF.

Enhancement and restoration of the Scotty Creek riparian corridor within the Project area will include fencing to exclude cattle and planting with a palette of local native riparian species in an approximately 50-foot-wide riparian buffer to the north of the creek and 25-foot wide riparian buffer to the south of the creek (e.g., cultural resources and topography may be restrictive in some locations).

Plant selection and design will be based on existing high-quality coastal wetlands within the Sonoma County or northern Marin County Coastal Zone. This would include existing wetlands onsite, if relevant.

Restoration of Coastal Terrace Prairie and Myrtle's Silverspot Butterfly Habitat

Coastal terrace prairie and northern coastal bluff scrub will be mitigated by increasing native cover and reducing cover of invasive plant species. Increasing cover of native CTP grasses will be primarily achieved by appropriate invasive species control, and by planting locally appropriate native species. The principal function of the appropriate invasive species control is to reduce the biomass of exotic herbaceous plants and to increase the cover of native CTP species, including *Viola adunca* (the larval host plant required by MSB) and nectar plants for the MSB. Impacts to MSB larval and nectaring habitat would be mitigated by successfully establishing three times the number of *Viola adunca* and three times the cover of nectar plants that are removed by construction activities (based on pre-construction surveys). *Viola* and nectar planting will occur within an area no greater than three times the area impacted by the Project, to maintain its value to MSB. Substantial restoration of CTP will improve CRLF upland dispersal habitat and provide an overall benefit to the species. Well timed cattle grazing, adaptively managed by rotational grazing, will also be a key restoration strategy to reduce cover of invasive species and promote growth of native grasses.

Restoration of Northern Coastal Bluff Scrub Habitat

A small area of northern coastal bluff scrub habitat would be permanently impacted by the Project. This will be mitigated through the removal of portions of existing SR 1 (over Scotty Creek west of the leachfield, and near the northern conform; see Figure 1 at the end of this memorandum), regrading to original ground, and revegetating with coastal

Source: Caltrans (2020)

bluff scrub species. Areas will be planted with locally appropriate native coastal bluff scrub species based on high quality reference areas present on-site. The plantings will be maintained during the plant establishment period.

Remaining northern coastal bluff scrub mitigation will be provided through onsite out-of-kind mitigation to benefit MSB, planting native and locally appropriate CTP/MSB nectar species, and/or offsite northern coastal bluff scrub restoration.

Conservation Easement

A conservation easement or similar instrument will be acquired to protect mitigation areas in perpetuity if located on privately held land.

Final Mitigation Plan

Prior to commencement of construction, Caltrans will submit two copies of the Final Mitigation Plan to the Coastal Commission Executive Director for review and written approval. The plan will address wetland, MSB, coastal terrace prairie, northern coastal bluff scrub, and other relevant habitat mitigation. Wetland creation will occur near existing wetlands in areas of non-native plants, if feasible. Coastal terrace prairie, defined as grassland with at least ten percent cover of native grasses and forbs, will not be converted to wetland. Myrtle's silverspot butterfly habitat enhancement will include planting *Viola adunca* in association with other natives, such as *Iris douglasiana*, with which it typically occurs and planting in appropriate areas native species used for nectaring. Where feasible, planting will be concentrated in areas where some shelter from wind is available. Coastal terrace prairie restoration will include reducing the abundance of non-native grasses and planting native grasses and forbs within an area at least three times larger than the area impacted by development. The plan will include:

a. Introduction. Proposed on-site mitigation for the Project's environmental impacts, including final figures, maps and related information depicting existing biological resources, areas of impact, and mitigation areas for each affected habitat or sensitive species.

b. Mitigation Goals. A statement of restoration goals, including the desired habitat type, major vegetation components, sensitive species presence, wildlife support, and hydrological regime for wetlands. A description of the desired habitat should be provided based on a high functioning reference site where feasible, or from literature describing either the site's historic conditions or "typical" regional habitat conditions.

c. Methods. Specification of the final design and construction methods to be used to ensure the restoration sites achieve the defined goals, objectives, timeline, best management practices to avoid impacts to species and habitats, detailed performance standards, and contingency plan for adaptive management to be implemented during restoration activities to ensure success. Specific triggers for adaptive management measures will be identified where appropriate.

d. Site Preparation. Methodology for restoration, including (1) grading or other site preparation; (2) topsoil stock piling and re-use; (3) plant and seed salvaging (including seed collection from impact areas and adjacent habitat, storage, relocation, and establishment); (4) planting design (including plant palette, source of material, installation methods, and location of species); (5) any proposed irrigation (including method and frequency); (6) removal of all temporary infrastructure after plant establishment; and (7) erosion control measures.

e. Control of Non-native Species. Monthly intensive weeding where native revegetation occurs until the native vegetation is sufficiently established, and quarterly thereafter, when native vegetation is sufficiently established to resist colonization by non-native species.

f. Reporting. An annual monitoring report will include maintenance and remediation activities, assessment methods, interim success criteria, and schedule. Monitoring and remediation of the restoration site will occur until it has been determined that success criteria have been met or have failed to be met, at the end of the designated monitoring period. In general, visual monitoring will be monthly until plants are established and then quarterly thereafter. Photographs of representative planting areas will be taken at least annually at the same time of year from fixed points. Quantitative monitoring will take place at least once a year during the period of rapid plant growth and flowering, generally in spring or early summer. Annual monitoring will be subject to annual reports that will describe cumulative summaries of monitoring results and include a determination of whether the interim or final success criteria have been met. Monitoring reports will correspond with the phasing of restoration. Raw data and associated metadata will be provided with the reports (in digital format) and recommended changes identified in the approved annual monitoring reports will be implemented (i.e. adaptive management becomes prescriptive upon approval). Annual reports will be submitted to the CCC Executive Director for review and approval for the duration of the 5-year monitoring period.

g. Success Criteria. Final success criteria will be supported by interim criteria, the latter of which are intended to serve as benchmarks and guide adaptive management. Criteria generally include: targets for revegetation cover and type; vegetation species composition, diversity, and distribution; physical parameters such as hydrology; and, target wildlife support functions or usage. Success criteria should insure that the major structure-producing and habitat-defining species (from the Manual of California Vegetation 2) are present and that there is appropriate species diversity and vegetative cover within each vegetation layer of each habitat type. Success criteria may be fixed values where there is a strong empirical basis, but, where feasible, should be relative to high-functioning reference sites in order to account for environmental variability, such as annual rainfall. Reference sites will be similar to the restoration site with regard to soil type, aspect, slope, and other relevant abiotic characteristics. Reference sites will be identified, sampled and a quantitative description included in the plan.

Source: Caltrans (2020)

h. Evaluation. The method by which success will be judged, including: (1) type of comparison, including to fixed criteria or relative to reference sites; (2) identification and description of any reference sites that will be used; (3) test of similarity, which could simply be determining whether the result of a census was above a predetermined threshold, but generally will entail a one- or two-sample t-test; (4) the field sampling design to be employed, including a description of the randomized placement of sampling units, sampling unit size, and the planned number of samples; (5) specification of the maximum allowable difference or effect size between the restoration value and the reference value for each success criterion; and (6) where statistical tests will be employed, statistical power analyses to document that the planned sample sizes will provide adequate statistical power to detect maximum allowable differences. For such a test alpha must equal beta; these values are typically 0.10 or 0.20, depending on the expected natural variability of the variables of interest.

i. Format Sampling Design. The field sampling program will be designed in conjunction with the performance criteria and chosen methods of comparison. The sampling design and sampling methods will provide sufficient detail to enable an independent scientist to duplicate them.

Source: Caltrans (2020)

Source: Caltrans (2020)

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LEGEND

- Biological Study Area (BSA)
- Caltrans Right of Way
- Caltrans Aerial Easement
- Caltrans Temporary Construction Easement/Rights
- Scotty Creek
- Existing Culverted Waters

Mitigation Sequence

- Phase 1 (0.32 acre)
- Phase 2 (0.41 acre)

Creation/Substantial Restoration

- Northern Coastal Bluff Scrub (0.410 acre)
- Coastal Strand (0.004 acre)
- Coastal Marsh/Riparian (0.095 acre)
- Streambed Enhancement (0.094 acre)
- Riparian Restoration (0.41 acre)

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FIGURE 1
PROPOSED ON-SITE MITIGATION

Gleason Beach Roadway Realignment Project
Conceptual Biological Mitigation Plan
State Route 1
Post Mile 15.1-15.7, EA 0A0200
Sonoma County, California

Source: Caltrans (2020)

Source: Caltrans (2020)

Attachment 1 Preliminary Reference Site Review

Source: Caltrans (2020)

Source: Caltrans (2020)

September 30, 2020

Caitlin De La Torre
Branch Chief – Construction East
Caltrans, District 4
510-622-1745
caitlin.delatorre@dot.ca.gov

Technical Memorandum: Results of Potential Reference Site Surveys, Gleason Beach Roadway Realignment Project, Sonoma County, California.

Dear Ms. De La Torre:

California Department of Transportation (Caltrans) is proposing the Gleason Beach Roadway Realignment Project (Project) to realign a section of State Route 1 in Sonoma County to an inland location, replacing the current alignment. Realignment of the existing roadway will permanently affect wetlands as well as habitat that supports Myrtle's silverspot butterfly (*Speyeria zerene myrtleae*; MSB) and its host plant western dog violet (*Viola adunca* subsp. *adunca*). The habitat that supports MSB is Coastal Terrace Prairie (CTP), which is an Environmentally Sensitive Habitat Area (ESHA) as defined by the California Coastal Act. The California Coastal Commission defines CTP as grassland with at least 10 percent absolute cover of native grasses and forbs. The Project area also supports the federally listed California red-legged frog (*Rana draytonii*).

Caltrans is proposing to mitigate Project impacts to these species and habitats. As part of the restoration planning, reference sites will be used to inform final restoration design (such as final plant palettes and planting density). Reference sites may also be used to inform evaluation of restoration performance by comparing annual monitoring data collected in the restoration areas with annual monitoring data collected in the reference site.

Two properties were visited in September 2020, to assess them for suitability as reference sites. This memo provides a brief summary of the results of the site visit.

SITE VISIT METHODOLOGY

Nomad Ecology senior restoration ecologist Erin McDermott visited Sonoma Land Trust's Estero Americano Preserve and the Wildlands Conservancy's Jenner Headlands Preserve on September 24, 2020. Grasslands on sites were walked and observations recorded about species composition. Ms. McDermott looked for areas containing CTP that would serve as an appropriate reference site. Late September is not an ideal time to survey grasslands as spring blooming forbs are not detectable, and most grasses are senescent, however perennial bunchgrasses, perennial forbs, and late blooming forbs were detectable.

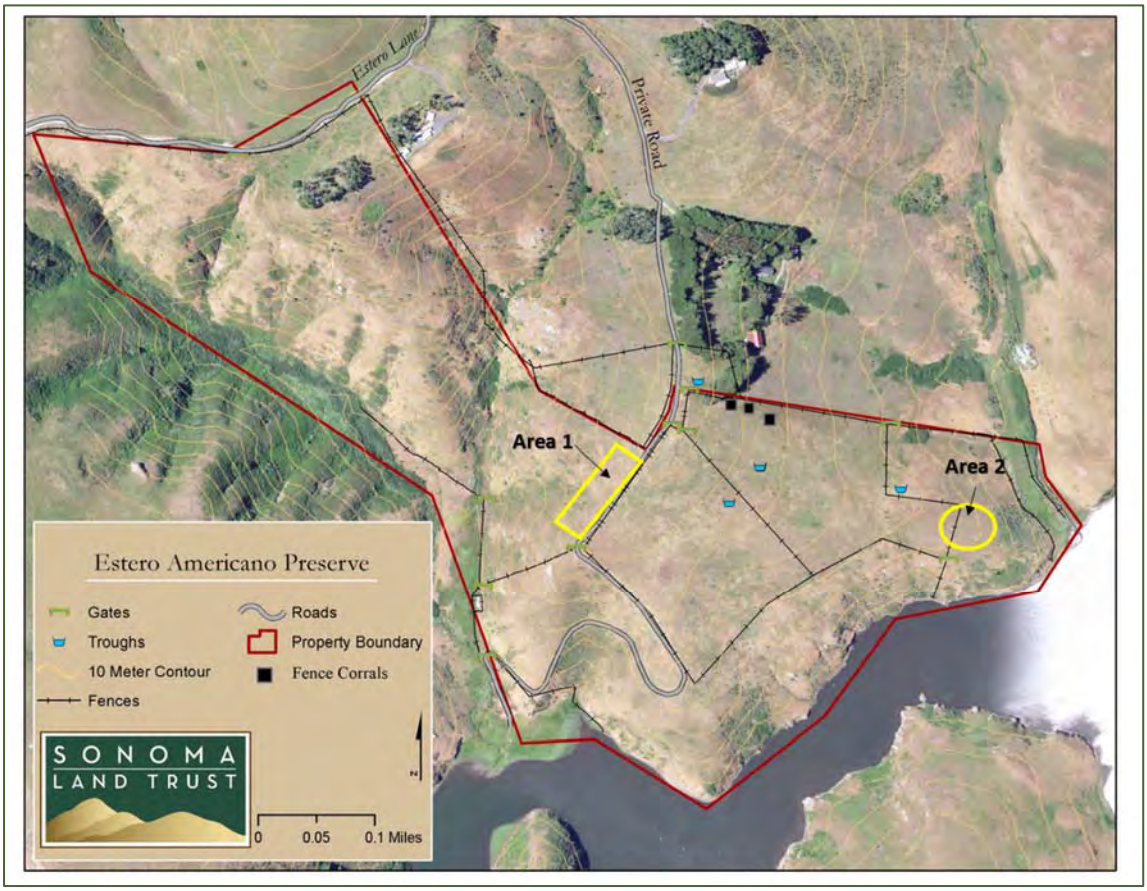
RESULTS

Estero Americano Preserve

Estero Americano Preserve is located in southern Sonoma County, just south of Bodega and Bodega Bay. The GPS coordinates are 38.310156, -122.991749. It is on the north side of Estero Americano. It consists of grasslands on a bluff just north of the Estero, as well as steep slopes containing grasslands

Source: Caltrans (2020)

and coyote brush scrub. Overall, the site did not appear to have been recently grazed. Grasslands on site contained dense thatch and tall standing vegetation. Many of the grasslands were dominated by non-native species including hedgehog dogtail (*Cynosurus echinatus**) and purple awned wallaby grass *(Rytidosperma penicillatum**), which is considered an invasive species. Stands of purple needlegrass (*Stipa pulchra*) were present but these areas had dense thatch and were on slopes, that is not similar to Gleason which does not contain thatch and slopes are gentle. Although the majority of the site was not suitable as a reference site, two areas (labeled Area 1 and Area 2) were identified that may be suitable.



Aerial view and map of Estero Americano Preserve showing 2 areas that may be suitable as reference sites.

Area 1

A grassland area was identified to the north of the unpaved access road on a north facing slope that contained species characteristic of CTP. Maps provided by the Preserve show hairy star tulip (*Calochortus tolmiei*) and goldfields (*Lasthenia* sp.) have been mapped here. This area contained low stature grassland, with areas of open soil and low cover of thatch. Species observed include yarrow (*Achillea millefolium*), nude buckwheat (*Eriogonum nudum* var. *oblongifolium*), bracken fern (*Pteridium aquilinum* var. *pubescens*), English plantain (*Plantago lanceolata**), brownie thistle (*Cirsium quercetorum*), California acaena (*Acaena pinnatifida* var. *californica*), lupine (*Lupinus* cf. *variicolor*), hedgehog dogtail*, and velvetgrass (*Holcus lanatus**). The only native grass observed was blue wildrye (*Elymus glaucus* subsp. *glaucus*).

* Denotes a nonnative species that has an origin other than California

Source: Caltrans (2020)

Area 1 of Estero Americano Preserve on north facing slope north of access road.

Area 2

An area on the bluffs above the Estero was identified as a potential reference site. This area had low vegetation cover compared to the high thatch grasslands present on the rest of the bluff. It contained a few individuals of California oatgrass (*Danthonia californica*) and California acaena. It was dominated by non-natives including English plantain*, hedgehog dogtail*, and rattlesnake grass (*Briza maxima**), but native forbs may be present in spring.

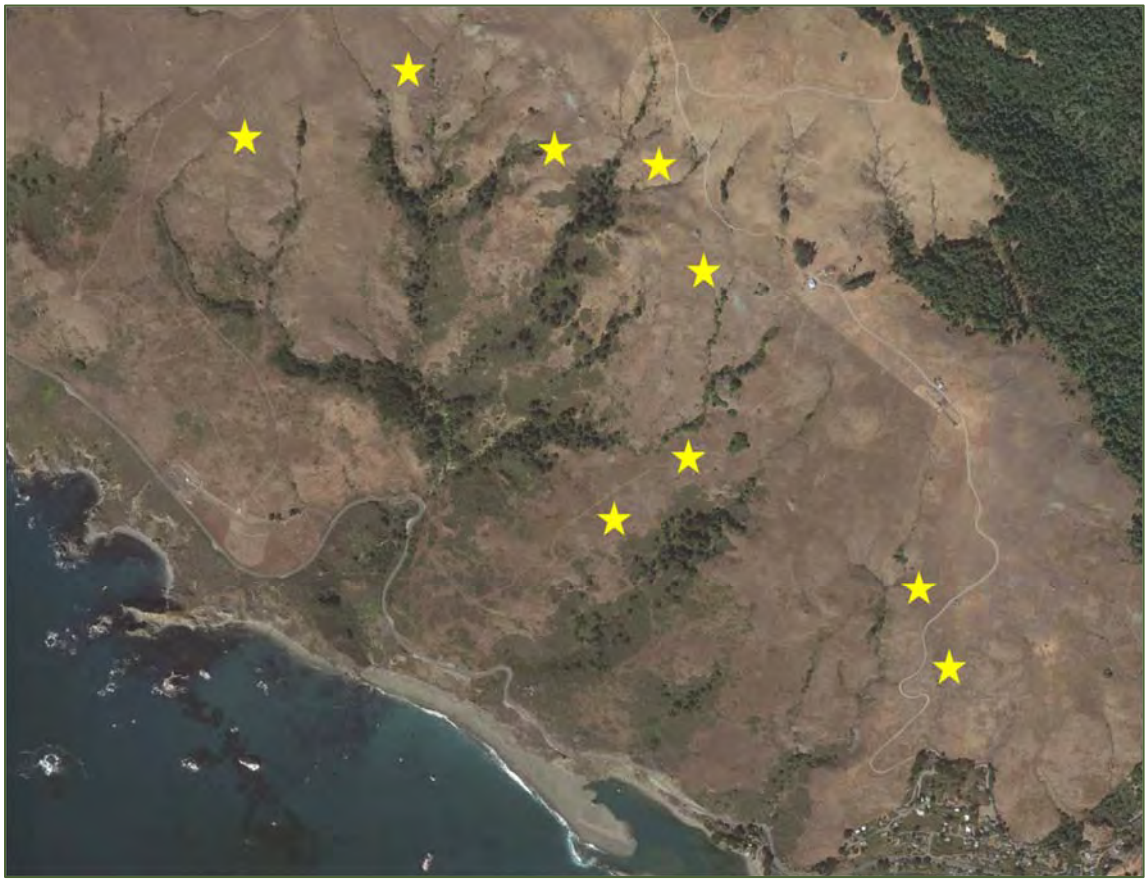
Area 2 of Estero Americano Preserve on bluff just north of the Estero.

Jenner Headlands Preserve

Jenner Headlands Preserve is located just north of Jenner and the Russian River, and just east of Highway 1. The GPS coordinates are 38.462980, -123.133155. The western portion of the Preserve consists of west facing slopes above the Pacific Ocean containing grasslands and scrub communities.

Source: Caltrans (2020)

Trees are located in canyons. The east side of the Preserve (on the right edge in the aerial below) contains woodland and forests.



Aerial view of Jenner Headlands Preserve. Yellow stars indicate grassland containing native species that may be suitable as reference sites.

The majority of the grassland on site is regularly grazed and cattle were observed during the site visit. Grasslands on site were divided into a series of paddocks. Numerous stands of purple needlegrass grassland were observed and were marked with a yellow star on the photo above. Other native species in these areas included hayfield tarweed (*Hemizonia congesta* subsp. *lutescens*), bracken fern, Douglas iris (*Iris douglasiana*), yarrow, blue-eyed grass (*Sisyrinchium bellum*), California blackberry (*Rubus ursinus*), perennial lupine (*Lupinus* sp.) and common rush (*Juncus patens*). California oatgrass was not observed but it is likely present on site. Photos of some of these areas are shown below. Because the site is regularly grazed and stands of native grassland were observed during the site visit, Jenner Headlands Preserve is suitable for establishment of reference sites.

Source: Caltrans (2020)

Purple needlegrass stands in grazed grassland at Jenner Headlands Preserve.

Purple needlegrass stands in grazed grassland at Jenner Headlands Preserve. Native forbs were also present.

Source: Caltrans (2020)

Purple needlegrass stands in grazed grassland at Jenner Headlands Preserve.

PLANT PALETTE ADDITIONS

One late blooming species was observed on site that may be suitable to include in the plant palette for restoration: Pacific aster (*Symphyotrichum chilense*).

SUMMARY AND RECOMMENDATIONS

Two potential reference sites were identified at Estero Americano Preserve and several potential reference sites were identified at Jenner Headlands Preserve. Due to the timing of the site visits, reference sites could not be definitively established. It also was not suitable timing to collect data on plant density or composition during this site visit. We recommend site visits be conducted in early spring at these locations to confirm the suitability of these reference sites and collect data on plant density and composition.

Please contact me at (925) 228-1019 if you have any questions.

Sincerely,

Erin L. McDermott
Principal
Senior Vegetation and Restoration Ecologist
Certified Consulting Botanist – CCB #0028
ISA Certified Arborist – WE7318A
Nomad Ecology LLC

Source: Caltrans (2020)

DEPARTMENT OF TRANSPORTATION
DISTRICT 4
P.O. BOX 23660, MS 1A
OAKLAND, CA 94623-0660
PHONE (510) 286-5907
FAX (510) 286-6301
TTY 711
www.dot.ca.gov

Making Conservation a California Way of Life.

October 7, 2020

Jeannine Manna, North Central Coast District Manager
California Coastal Commission
45 Fremont Street, Suite 2000
San Francisco, CA 94105

Attention: Peter Allen

Dear Ms. Manna:

The California Department of Transportation (Caltrans) is providing this funding assurance for the Gleason Beach Roadway Realignment Project (EA: 04-0A020; PID: 04-0000-0129) to demonstrate its commitment to meeting the Coastal Development mitigation requirements pursuant to the California Coastal Act.

More specifically for purposes of this letter, Caltrans is committed to fund the full cost of all measures to minimize and fully mitigate project impacts to all species and their habitats including Myrtle's silverspot butterfly, California red-legged frog, coho salmon, wetland, coastal terrace prairie, coastal bluff scrub, and riparian habitats at the designated mitigation ratios approved by the commission and consistent with any other terms of special conditions related to mitigation requirements. The mitigation will include compensation for the temporary and permanent loss of species and their habitat, potential take of individuals, and affects to natural resources incidental to the construction of the Gleason Beach Roadway Realignment Project. Habitat mitigation ratios are as follows: 3:1 for permanent Environmentally Sensitive Habitat Area (Coastal Terrace Prairie, coastal bluff scrub, and riparian habitats) impacts, 4:1 for permanent wetland impacts, 1:1 for temporary impacts and 1:1.5 for long-term temporary impacts. Caltrans shall provide funding from the State Highways Operation and Protection Program.

All minimization and avoidance measures shall be covered in the Project budget. This includes approximately $800,000 to restore stream and terrestrial habitat in the project footprint, approximately $2 million to restore or create wetlands, approximately $200,000 to restore riparian habitat, $600,000 to restore or enhance Coastal Terrace Prairie and coastal bluff scrub habitats (Myrtle's silverspot butterfly – larval and foraging habitat and California red-legged frog – upland habitat), and $175,000 to purchase Coho mitigation bank credits to satisfy the requirement to minimize and fully mitigate the impacts of take resulting from this Project.

Caltrans will provide additional funds for a follow up mitigation project to be undertaken by the Gold Ridge Resource Conservation District or another similar entity as approved by the Commission's Executive Director. The mitigation project proposes to enhance and protect

existing wetlands, species habitat, and other natural resources through a conservation easement. This will be accomplished through wetland restoration/creation, riparian plantings, grazing management, creek bank stabilization, coastal terrace prairie plantings, and coastal bluff scrub plantings where appropriate. The mitigation project will be deemed successful once success criteria have been met and will be managed according to the long-term management plan. The objective of this mitigation is to increase habitat resiliency.

Caltrans looks forward to working with the CCC to further plan, design and implement the measures necessary to satisfy Caltrans' mitigation obligations and thereby mitigate impacts to sensitive resources that may be associated with the construction of the project. This letter intends to formally acknowledge our legal obligation with the proposed mitigation described above.

Please contact Caitlin De La Torre, Branch Chief for the Office of Biological Science and Permits, at (510) 715-6247 or Lilian Acorda, Project Manager, at (510) 286-4927 should you have any questions.

Sincerely,

Melanie Brent

MELANIE BRENT
Deputy District Director
Environmental Planning and Engineering

DOANH NGUYEN
Deputy District Director
Program/Project Management

LEGEND

- Biological Study Area (BSA)
- Caltrans Right of Way
- Caltrans Aerial Easement
- Roadway Realignment
- Bridge
- Culvert Removal

Potential Waters of the U.S.

- Wetlands
- Other Waters of the US
- Below Ground Drainage
- Drainage Ditch

Impacts to Waters

- Temporary Short-term (0.126 acre)

Impacts to Wetlands

- Permanent (0.433 acre)
- Temporary Longer-term (0.118 acre)
- Temporary Short-term (1.299 acres)

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Caltrans

FIGURE 4
PROJECT IMPACTS TO WETLANDS AND WATERS

Gleason Beach Roadway Realignment Project
Coastal Development Permit Application
State Route 1
Post Mile 15.1-15.7, EA 0A0200
Sonoma County, California

Source: Caltrans (2020)

Exhibit 27
CDP 2-20-0282
Page 1 of 1

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Conceptual Gleason Beach and Bluff Cleanup In Lieu Fee Program

9-25-2020

The Gleason Beach and Bluff Cleanup In Lieu Fee Program (Program) is proposed to provide mitigation for visual impacts created by Caltrans' Gleason Beach Highway 1 Realignment Project (Project) in Sonoma County between Postmile 15.1 and 15.7. The mitigation program will clean up a significant bluff and shoreline debris field caused by decades of structural collapses from residential and highway development in the area. In addition, a variety of Caltrans emergency repairs installed between 2004 and 2019 will also be removed as required follow-up to Sonoma County emergency coastal development permits for those repairs. See "Coastal Hazards Mitigation Area" and "Caltrans Highway 1 Repairs" figures attached.

Accordingly, this in lieu fee Program proposal is being included with Caltrans' application package for the required consolidated Coastal Development Permit being processed by the California Coastal Commission (CCC). The Program will be funded by a $5 million in lieu fee that Caltrans will deposit into a special account established by Sonoma County and the Program will be implemented through a Gleason Beach and Bluff Cleanup In Lieu Fee Program Memorandum of Understanding (MOU) between Sonoma County and the CCC. The in lieu fee amount was jointly developed based on projected costs prepared by experienced Caltrans engineers; the mitigation proposal was developed in partnership between Caltrans and Sonoma County and memorialized in the County's April 17, 2018 Board Resolution Number CPH17-0003, Caltrans District Director 4 Tony Tavares' April 18, 2020 letter to Sonoma County Supervisor Lynda Hopkins and Caltrans Project Manager Lilian Acorda's September 14, 2020 letters to CCC Staff Peter Allen and to Sonoma County Staff Gary Helfrich.

The Program entails removing debris and hazards from the "Coastal Hazards Mitigation Area" identified in Figure(attached), returning the bluff to natural conditions that resemble the undeveloped, similarly-situated bluff areas to the north of the realignment Project, and monitoring of the bluff and shoreline during and after cleanup is complete. Per Caltrans and Sonoma's County's partnership agreement and special conditions to the coastal development permit, the Gleason Beach and Bluff Cleanup In Lieu Fee Program will be guided by a Final Gleason Beach and Bluff Hazards Cleanup Plan (Plan) to be prepared by Sonoma County within eighteen months of receiving the in lieu fee funds and finalizing the MOU with the CCC. The Plan will include:

1. Describing how the entire fee and accrued interest will be used, including overall scope of work, milestones and timelines, to fund administrative, planning, acquisition (if

Source: Caltrans/Sonoma County (2020)

needed), hazard abatement, code compliance, construction, oversight, restoration, maintenance and monitoring costs associated with the cleanup and disposal of manmade materials from the debris field along the bluff and shoreline within the identified Coastal Hazard Mitigation Area;

2. Abating existing violations of the Coastal Act, Sonoma County Local Coastal Plan, and Sonoma County Building Code (Chapter 7) created by structures such as foundations, septic tanks, and seawalls left in place by private property owners after demolition of homes damaged by landslides, giving priority to phased removal of debris that is toxic or hazardous, that causes visual blight, that blocks public access and/or that creates dangerous conditions on the public beach.
3. Phasing removal and disposal of repair structures installed by Caltrans, per requirements from emergency permits issued to stabilize the existing alignment of Highway 1. This phased removal will be designed to extend the life of the California Coastal Trail for as long as possible, while allowing natural forces to contribute toward returning the bluff to a natural condition.
4. Creating a monitoring plan that compares the baseline of existing conditions against changes caused by erosion and sea level rise to ensure that appropriate debris removal and cleanup activities are timed and triggered in response to the changing conditions.
5. Providing for the submittal of annual status reports to the CCC's Executive Director on the progress made toward the completion of the Plan's goals, milestones timelines and monitoring.

Working with their staff experts as appropriate and a team of qualified consultants and contractors, Sonoma County will scope the completion of the tasks to accomplish the Program's objectives and the County's commitments within the $5 million budget. With Sonoma County's oversight, construction firms will be hired for the debris collection and disposal and experts experienced with returning coastal bluffs in high erosion zones to a more natural equilibrium (through native planting and other techniques) will be consulted for restoring the aesthetics and natural geology of the cleaned bluffs and beach . The annual monitoring and reporting of changed conditions will allow Sonoma County to facilitate the bluffs' to return to a natural condition while proactively keeping in pace with erosion and landslide events so that cleanup of manmade structures occurs in a timely fashion, along with the managed retreat of a continuous Coastal Trail over time. All of these Program components will be reflected in the Final Gleason Beach and Bluff Hazards Clean Up Plan to be prepared by Sonoma County and submitted to the CCC's Executive Director for review and approval.

Source: Caltrans/Sonoma County (2020)

LEGEND

- Coastal Hazards Clean-up
- Caltrans Right of Way
- Caltrans Aerial Easement
- County Parcels
- Scotty Creek
- Roadway
- Proposed Bridge
- Rock Slope Protection (2017)
- Retaining Wall (2004)
- Micropiles (2017)
- New Pavement Section (2019)
- CIDH Piles (2019)

Imagery Source:
Sonoma County Spring 2018

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Caltrans

COASTAL HAZARDS MITIGATION AREA

State Route 1
Post Mile 15.1-15.7, EA 0A0200
Sonoma County, California

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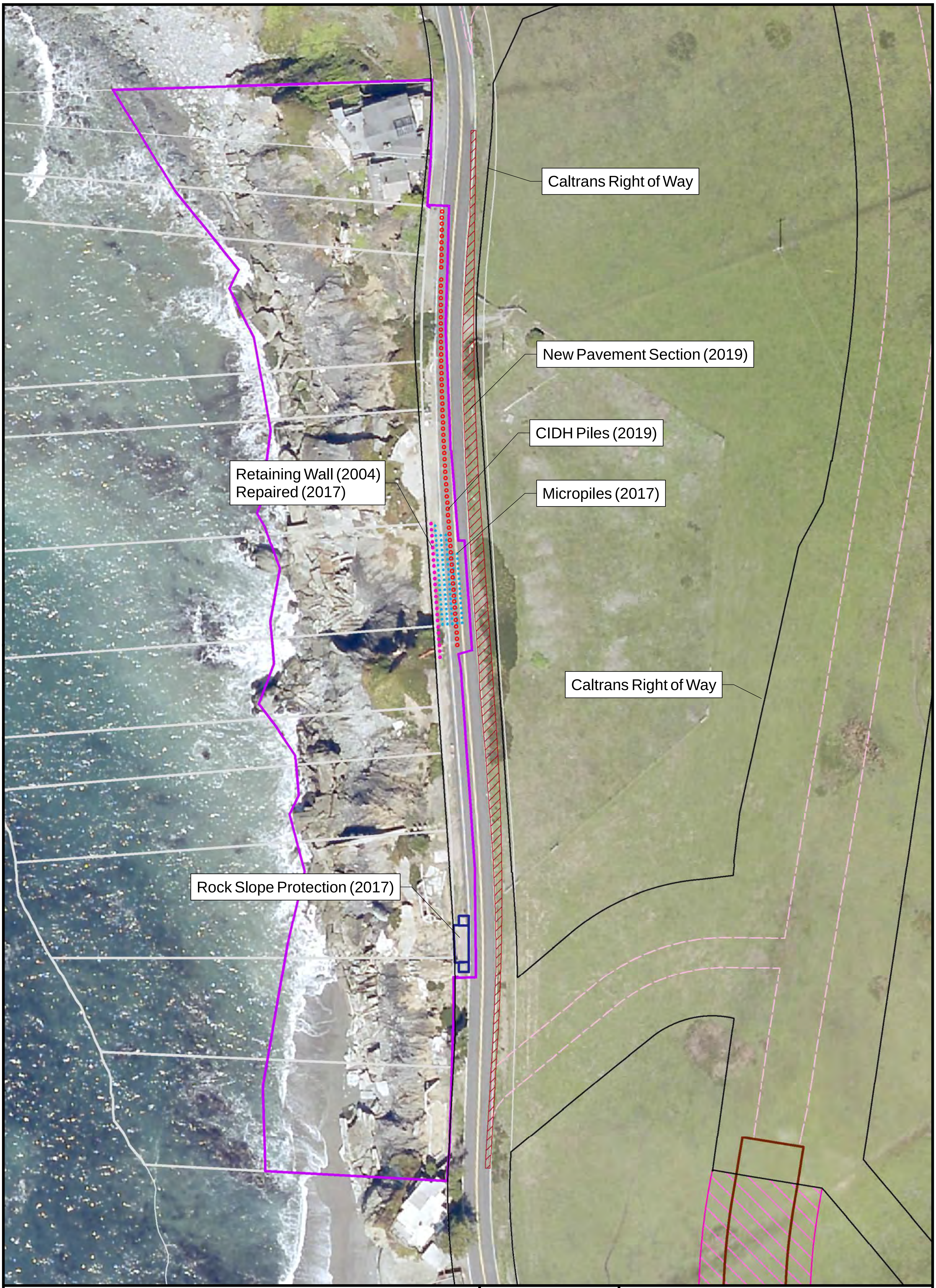
Source: Caltrans/Sonoma County (2020)



LEGEND

- Coastal Hazards Clean-up
- Caltrans Right of Way
- Caltrans Aerial Easement
- County Parcels
- Roadway
- Proposed Bridge
- Rock Slope Protection (2017)
- Retaining Wall (2004)
- Micropiles (2017)
- New Pavement Section (2019)
- CIDH Piles (2019)

Imagery Source:
Sonoma County Spring 2018

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CALTRANS HIGHWAY REPAIRS

State Route 1
Post Mile 15.1-15.7, EA 0A0200
Sonoma County, California

Source: Caltrans/Sonoma County (2020)

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