

INFORMATION HANDOUT

For Contract No. 05-492804
At SLO-1-64.0/R66.9

Identified by
Project ID 05 0000 0576

WATER SOURCE INFORMATION

San Simeon Community Services District Water Availability Information letter

PERMITS

California Coastal Development Permit dated November 24, 2014

California Coastal Development Consistency Determination October 28, 2014

California Dept. of Fish and Wildlife Streambed Alteration 1600 dated November 19, 2014

U.S. Army Corps of Engineers 404 Individual dated November 12, 2014

Regional Water Quality Control Board 401 dated October 29, 2014

U. S. Fish and Wildlife Service Biological Opinion for the Piedras Blancas Realignment Project dated February 26, 2010

National Marine Fisheries Service Biological Opinion dated April 19, 2010

California Coastal Development Permit for placement and removal of RSP dated October 12, 2007

MATERIALS INFORMATION

Revised Foundation Reports dated December 1, 2014

Geotechnical Design Report dated November 24, 2014

Bridge Foundation Review dated February 28, 2013

Final Hydraulic Report for Arroyo Del Osos, Arroyo Del Corral, Arroyo De Los Playanos dated May 24, 2012

MANUFACTUROR DRAWINGS

Alternative In Line Terminal Systems

SKT-MGS, ET 31 and 31" X-Tension

Alternative Flared Terminal Systems

FLEAT-MGS, SRT-31 and 31" X-Tension

DETAIL FOR X-TENSION TERMINAL SYSTEM TRANSITION TO MGS

Transition detail for 31" terminal system end treatment with rail splicing at posts to Midwest guardrail system

PHOTOS

Existing Rock Slope Protection to be removed

San Simeon Community Services District



111 Pico Avenue, San Simeon, California 93452
(805) 927-4778 Fax (805) 927-0399

November 25, 2014

Kyle Birch, P.E.
Caltrans District 5 Design

Dear Mr. Birch:

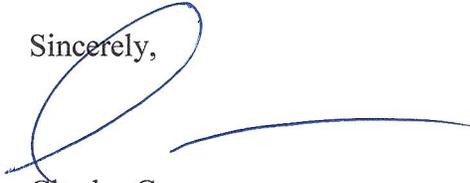
The San Simeon Community Services District (SSCSD) received your request of the SSCSD to potentially supply recycled water to the Piedras Blancas Highway 1 Realignment Project.

The San Simeon CSD Recycled Water Facility produces Title 22 Unrestricted use quality water that is also approved by the Division of Drinking Water (DDW) for use in construction projects. We produce approximately 30,000 gallons a day at a rate of 22 gallons per minute (GPM) with limited storage capacity:

- We distribute recycled water Tuesday through Thursday upon appointment.
- Any request over 1000 gallons requires at least one (1) day notice by calling 805-927-0365 to make sure there is enough recycled water in storage.
- Given a 22GPM production rate substantial time is necessary prior to re-loading trucks.

The Recycled Water is 2 cents per gallon. Prior to picking up water the SSCSD will need Cal Trans' billing information mailed to **111 Pico Avenue, San Simeon CA. 93452** or emailed to sansimeoncommunityservices@yahoo.com If you need additional information please contact me at 805-431-6253. Please call 805-927-0365 to coordinate loading water trucks.

Sincerely,


Charles Grace
General Manager
San Simeon CSD



California Coastal Commission

COASTAL DEVELOPMENT PERMIT

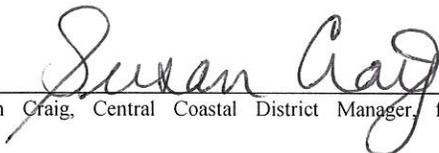
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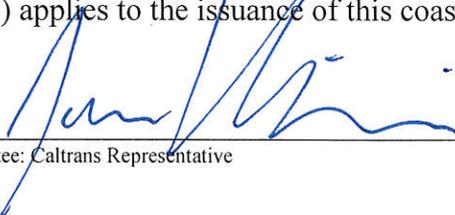
Coastal development permit (CDP) number 3-13-012 was approved by the California Coastal Commission on July 11, 2014. CDP 3-13-012 provides for the realignment of 2.8 miles of Highway One up to 475 feet inland, including removal of the existing Highway One in this area, demolition of two existing single-family houses, construction of a new inland alignment of Highway One, development of an off-road California Coastal Trail west of the Highway, and resource restoration and enhancement (along the alignment and at Arroyo de la Cruz) between mile markers 64.0 and 66.9 of State Highway Route 1, north of the Piedras Blancas Light Station in northern San Luis Obispo County. (all as more specifically described in the Commission's CDP file). CDP 3-13-012 is subject to certain terms and conditions, including the standard and special conditions beginning on page 2 of this CDP.

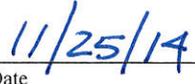
As of November 20, 2014, all of the CDP's prior to issuance requirements have been met, and the CDP can now be issued. Thus, by my signature below, the CDP is issued on behalf of the California Coastal Commission:


Susan Craig, Central Coastal District Manager, for Charles Lester, Executive Director

Acknowledgement

The undersigned Permittees acknowledge receipt of this coastal development permit and agree to abide by all terms and conditions thereof. The undersigned Permittees acknowledge that Government Code Section 818.4 (that states in pertinent part that "a public entity is not liable for injury caused by the issuance of any permit") applies to the issuance of this coastal development permit.


Permittee: Caltrans Representative


Date

Please note that this coastal development permit is not valid unless and until a copy of it with the signed acknowledgement has been returned to the California Coastal Commission's Central Coast District Office (14 Cal. Admin. Code Section 13158(a)).

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bridges, boardwalks, benches, etc.).

- f. **EIR Avoidance, Minimization and Mitigation Measures.** Implementation of the avoidance, minimization and mitigation measures of the project EIR (SCH# 2008031059) that are consistent with the terms and conditions of this CDP.
2. **Revised Final Plans.** PRIOR TO ISSUANCE OF THE CDP, the Permittee shall submit two sets of Revised Final Plans for Executive Director review and approval showing all development authorized by this CDP, except for the new California Coastal Trail portion of the project covered by Special Condition 5. The Revised Final Plans shall be in substantial conformance with the submitted project plans (consisting primarily of plan sheets showing layout, construction details, erosion control, grading, drainage, utilities and planting) and narratives received in the Coastal Commission's Central Coast District Office on August 21, 2013 except that they shall be revised as follows:
- a. **Highway 1 Shoulder Widths.** Shoulders shall be paved and 8 feet wide, with no additional area of shoulder backing.
 - b. **Northern Alignment Modifications.** The northernmost part of the new roadway (approximately from stations 420 to 449) shall be modified to provide safe ingress and egress to the Northern Trailhead Parking Access area (as generally illustrated in Exhibit 5) for both directions of travel from the realigned highway, including any necessary connector lanes. A left turn lane should be considered for such access unless it can be demonstrated that equivalent, safe ingress and egress from/to the highway may be achieved given expected traffic and parking lot use patterns at this location through the existing or an alternate design. As part of this evaluation, opportunities for reducing landform alteration and grading to the maximum extent feasible (e.g., through a possible combination of modified cut slopes, narrower cross sections, steeper longitudinal profiles, more road curvature, etc.) should be considered for incorporation into the design.
 - c. **Southern Trailhead (Piedras Blancas/Surfer Beach) Parking Access.** Safe ingress and egress to the Southern Trailhead Parking Access area (as generally illustrated in Exhibit 5) for both directions of travel from the realigned highway, including any necessary connector lanes, shall be included in the final plans. A left turn lane should be considered for such access unless it can be demonstrated that equivalent, safe ingress and egress from/to the highway may be achieved given expected traffic and parking lot use patterns at this location through the existing or an alternate design.
 - d. **Fencing.** The inland fence separating the grazing use from the roadway use shall be located no more than 30 feet from the edge of the roadway shoulder, except where additional distance is necessary to allow for maintenance or to protect wetlands, and shall be of a rustic ranch design that meets the specifications and requirements of a commercial grazing operation to prevent cattle from entering the highway. The seaward fence adjacent to State Parks property shall be of a similar rustic ranch design. Caltrans and State Parks shall work cooperatively with the Hearst Corporation to pursue changes to the underlying scenic and conservation easement that applies west of the Highway that will allow for fencing that does not include barbed wire on at least the seaward side of the highway. Caltrans shall submit the Revised Final Plans with evidence of a modified easement agreement or, in the alternative, evidence of their good faith efforts to pursue

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such changes with the Hearst Corporation. If the easement cannot be modified in this way at this time, then barbed wire may be allowed until the time when the easement is changed. All fences shall be sited and designed so that they integrate seamlessly with the surrounding landscape, and so that they minimize impacts on public views, both to the maximum extent feasible. A photo simulation of the fencing, as well as product brochures and specifications, shall be included as part of the Revised Final Plans.

- e. **Well Access.** The separate well access entrances for Sani Parcel 3 and the Welsh Parcel (APNs 011-231-015 and 011-231-017) seaward of the new Highway alignment shall be eliminated and shall be replaced by a single consolidated well access entry route from the new roadway sited and designed to serve intermittent well access. Such well access route shall be sited and designed to minimize impacts on public views to the maximum extent feasible, including that: it shall be limited to one, informal rangeland farm road (e.g., jeep trail); it shall be unpaved; and it shall not extend seaward of the remaining wells.
- f. **Driveway Access.** Driveway access for Sani Parcel 3 and the Welsh Parcel (APNs 011-231-015 and 011-231-017) inland of the new Highway alignment shall be sited and designed to minimize impacts on public views to the maximum extent feasible, including that such access shall be as narrow as possible and shall not include large pedestals or identifiers (other than required address). Only those driveway and related elements that cannot feasibly be removed shall be allowed in this area. All other driveways and related development, both seaward and inland of the new Highway alignment shall be removed and the area restored to match the surrounding landscape.
- g. **Residential Demolition.** Demolition and removal of the two existing houses and all related development (including associated structural components, landscaping, gates, and all utilities, except for the remaining wells providing water to the home located on APN 011-231-015 and necessary well infrastructure) on Sani Parcels 1 and 2 (APNs 011-231-013 and 011-231-014) shall be shown on the Revised Final Plans. Except for (1) the remaining wells, (2) access to the wells (described above), (3) the California Coastal Trail (see Special Condition 5 below), and (4) any associated public access improvements, the portions of these parcels seaward of the new highway shall be restored to wetland habitat to the greatest extent feasible, utilizing natural soil profiles wherever possible and importing clay soils where an impermeable layer is needed for wetland hydrology. The remainder of the undeveloped portions of these parcels not restored to wetland, both seaward and landward of the new highway, other than vegetation screening inland of the Highway if required in this area per the approved Landscape Screening Plans (see Special Condition 3) shall be restored to native coastal prairie. (See also Special Condition 14 (Mitigation and Monitoring Plan)).
- h. **Trail and Parking Accommodation.** The Revised Final Plans shall identify how removal of the existing Highway 1 roadway prism and associated grading and planting shall be carried out in a manner that will not impede or conflict with the location, highway re-use or dimensions of the California Coastal Trail alignment identified in Special Condition 5, including providing evidence that State Parks agrees.

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- i. **Parking Facilities.** The Revised Final Plans shall show all vehicle parking facilities, which shall include, at a minimum, preservation of the existing Piedras Blancas Motel Parking Access, establishment of the Southern Trailhead Parking Access at the Piedras Blancas Lighthouse/Surfer's Beach trailhead/lighthouse vista point with no less than 20 spaces, and the Northern Trailhead Parking Access at the existing Arroyo de la Cruz pullout with no less than 30 spaces. The Southern Trailhead Parking Access and the Northern Trailhead Parking Access shall be surfaced with class 2 road base or similar permeable aggregate material. These two parking areas shall be safely accessible from Highway 1 and shall be constructed by Caltrans. Upon their completion, State Parks shall be responsible for continuous maintenance of these parking areas for the life of the project. The Revised Final Plans shall indicate how safe entry and egress to the highway will be provided for automobiles and bicycles at each parking access. The remainder of the informal pullout area near Arroyo de la Cruz, which contains space for approximately 60 cars adjacent to the Northern Trailhead Parking Access, shall not be modified in any manner that prevents potential future parking improvements at this location. Parking areas shall be sited and designed to minimize impairment of public views from the realigned Highway 1 and the CCT, and shall utilize existing topography, sensitively-designed berms, and/or mottled landscaping to minimize visual impacts while ensuring public views are not significantly impaired. At the Piedras Blancas Motel, all parking and roadway pavement shall be retained as shown on Exhibit 5 to allow for continued public access.
- j. **Water Quality Features.** The Revised Final Plans shall be modified to show the following:
1. Vegetated Buffer Strips (VBS) shall be replaced with Biofiltration Strips (BFS) at locations where runoff is directed to wetlands (e.g., from Stations 296+25 to 311+50).
 2. All runoff from bridge decks shall be directed to vegetated slopes or swales (e.g., VBS or BFS).
 3. VBS and BFS near Sani parcels 1 and 2 (APNs 011-231-013 and 011-231-014) shall be modified to conform to the residential demolition and restoration components of the Revised Final Plans.
 4. The permeable filter blanket in the road prism between stations 379+33 and 382+23 shall be increased in height to the extent feasible, in order to maximize the amount of surface water draining to the ephemeral wetland feature, as opposed to directly into Arroyo del Oso.

All requirements above and all requirements of the approved Revised Final Plans shall be enforceable components of this CDP. The Permittee shall undertake all development in accordance with this condition and the approved Revised Final Plans.

3. **Landscape Screening Plan.** PRIOR TO ISSUANCE OF THE CDP, the Permittee shall submit two sets of a Preliminary Landscape Screening Plan to the Executive Director for review and approval. Within two years of commencement of construction, the Final Landscape Screening Plan shall be submitted to the Executive Director for review and approval. The Preliminary and Final plans shall indicate the timing of landscaping completion and shall provide for landscaping (at maturity) that is the minimum necessary to fully screen any remaining residences and associated residentially-related

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development on Sani Parcels 1, 2 and 3 and the Welsh parcel (APNs 011-231-013, 011-231-014, 011-231-015 and 011-231-017), as well as any approved aboveground utility infrastructure along the realigned highway, as seen from the Highway and the California Coastal Trail for the life of the project. Landscape screening shall be designed to blend with the surrounding environment and shall minimize impacts on public views, including of the hillsides to the east. The final plan shall identify all plant materials (i.e., size, species, quantity, etc.), all irrigation systems, and all proposed maintenance measures, including providing for modification and adaptation as necessary to achieve required screening. All plant materials shall be native and non-invasive species selected to be complimentary with the mix of native species in the project vicinity, to prevent the spread of exotic invasive plant species, and to avoid contamination of the local native plant community gene pool. All landscaped areas shall be continuously maintained in a litter-free, weed-free, and healthy growing condition by the Permittee, and shall be replaced as necessary to maintain compliance with this CDP. No plant species listed as problematic and/or invasive by the California Native Plant Society, the California Invasive Plant Council, or as may be so identified from time to time by the State of California, and no plant species listed as a 'noxious weed' by the State of California or the U.S. Federal Government shall be planted or allowed to naturalize or persist. All requirements above and all requirements of the approved Landscape Screening Plan shall be enforceable components of this CDP. All requirements above and all requirements of the approved Preliminary and Final Landscape Screening Plans shall be enforceable components of this CDP. The Permittee shall undertake development in accordance with this condition and the approved Preliminary and Final Landscape Screening Plans.

4. **Maximum Number of Lanes.** The approved highway shall be limited to a two-lane highway in perpetuity as required by Coastal Act Section 30254.
5. **California Coastal Trail.** PRIOR TO CONSTRUCTION OF THE REALIGNED HIGHWAY APPROVED PURSUANT TO THIS CDP, the Permittee shall submit written documentation that demonstrates that the Permittee and State Parks have entered into a Memorandum of Agreement (MOA) that is consistent with the requirements of this CDP and its terms and conditions. Prior to State Parks and the Permittee executing this MOA, it shall be submitted for review and approval by the Executive Director. The roles and responsibilities of State Parks and Caltrans under the MOA shall be clearly identified.

Within six months of the Executive Director's approval of the MOA, the Permittee shall submit to the Executive Director evidence that a nonrefundable public access mitigation fee of \$1.4 million has been transferred to State Parks and deposited into a separate, interest-bearing account created solely to implement the MOA described herein. The sole purpose of the funds shall be to construct a segment of the California Coastal Trail (CCT) and directly related public access improvements over the length of the project limits (as described in subsection (a) below). After Caltrans has transferred the \$1.4 million mitigation fee to State Parks, constructed the northern and southern trailhead parking areas and entered into the Executive Director-approved MOA, their obligation toward all aspects of trail construction is finalized except to the extent that the MOA identifies some continuing obligation. Caltrans will not be held responsible thereafter for any aspect of the development, construction, maintenance, environmental compliance (including NEPA/CEQA review, permitting,

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and mitigation) and any other components toward the completion of the CCT except to the extent that the MOA identifies some continuing obligation. The MOA between Caltrans and State Parks shall comply with the following minimum provisions, which are a requirement of this CDP:

- a. **CCT Scope.** The MOA shall cover all aspects of ensuring that a continuous CCT (an off-highway public trail) and associated public parking is built and opened as soon as possible, but in no case more than 2 years after the realigned Highway 1 is opened. The CCT shall extend from the public parking area nearest the point where the paved surface of the realigned highway segment departs from the existing paved highway surface, to the corresponding point at which it rejoins the existing highway. As identified on submitted plans, these limits are approximately demarcated as Station 303+75, north of Post Mile (PM) 64.0 and the gated entrance to Piedras Blancas Light Station, to Station 432+10 on the existing alignment, south of the existing Arroyo de la Cruz bridge.
- b. **CCT Plans.** The MOA shall provide for Final CCT Plans in compliance with the terms and conditions of this CDP to be submitted by State Parks to the Executive Director for review and approval within one year of the transfer of funds from Caltrans to State Parks for the construction of the trail. The Final CCT Plans shall be in substantial conformance with the draft CCT conceptual plans received in the Coastal Commission's Central Coast District Office on August 21, 2013, as modified to conform to this CDP and its terms and conditions.

The Final CCT Plans shall clearly describe the manner by which public CCT access is to be provided and managed, with the objective of maximizing public access and recreational use and enjoyment of the CCT, including all associated and related elements and amenities (i.e., parking areas, picnic tables, benches, etc.) as described in this special condition. These Final CCT plans shall at a minimum include:

1. **Alignment.** The CCT alignment and the location of the public parking areas shall generally be as shown on the schematic map entitled "California Coastal Trail & State Highway Realignment—Piedras Blancas," prepared by State Parks and dated June 25, 2014 (attached as pages 3-6 of Exhibit 4) and identified as the "Proposed California Coastal Trail". The CCT system includes reuse of certain segments of the existing Highway 1 as generally identified by State Parks in Exhibit 4. The CCT must be continuous, completing the connection between the southern public parking area to the northern public parking area, and connecting to existing blufftop trails. Between the swale north of the Piedras Blancas Motel and Arroyo del Oso, the alignment of the CCT shall be continuous, well-separated from the new highway alignment and generally following the seaward margin of the second-level coastal terrace (at approximately the 36-foot contour on submitted plans where it crosses Sani Parcels 1 and 2 and then clearly connecting across the Welsh Parcel in manner that allows for easy continuity for trail users). State Parks shall specify which culverts north of Arroyo del Oso must be retained for CCT crossings and shall commit to being fully responsible for their maintenance.

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2. **Overall Coastal Trail Character.** The CCT shall be designed and aligned so as to provide the impression of a natural surface path in a rural environment with curvilinear features, a compacted but unpaved surface, and widths generally not exceeding 6 feet.
3. **Parking.** The Final CCT Plans shall show all vehicle parking facilities, which shall include, at a minimum, all of the parking facilities described in Special Condition 2 and shown on the approved Revised Final Plans (see Special Condition 2). Upon completion of the parking facilities per the approved Revised Final Plans, State Parks shall be responsible for continuous maintenance of these facilities and related development (e.g., vegetation screening, public use amenities, etc.) for the life of the project. The remainder of the informal pullout area near Arroyo de la Cruz, which contains space for approximately 60 cars adjacent to the Northern Trailhead Parking Access, shall not be modified in any manner that prevents potential future parking improvements at this location. Parking areas shall be sited and designed to minimize impairment of public views from the realigned Highway 1 and the CCT, and shall be at least partially screened with mottled landscaping to minimize visual impacts while ensuring public views are not significantly impaired. At the Piedras Blancas Motel, all parking and roadway pavement shall be retained as shown on Exhibit 5 to allow for continued public access; final trail management plans shall depict how the entire pavement area will be used for current parking and circulation needs, or reserved for future access uses.
4. **Operations and Maintenance Plans.** Operation and maintenance components of the trail plans shall specify that the CCT is available for bicyclist and pedestrian use; that it is open for free public access 365 days a year, except for temporary hazards closings; that it provides for elephant seal protection as necessary; and that it directs users against any hazardous conditions that may be encountered on the trail. Caltrans and State Parks shall work cooperatively with the Hearst Corporation to pursue changes to the underlying scenic and conservation easement that applies west of the Highway that will allow for use of the CCT at night for passive recreational use, but not camping. State Parks shall submit the Final CCT Plans with evidence of a modified easement agreement or, in the alternative, evidence of their good faith efforts to pursue such changes with the Hearst Corporation. If the easement cannot be modified in this way at this time, then the CCT shall be open daylight hours (i.e., one hour after sunset to one hour before sunrise) until the time when the easement is changed to allow passive recreational use at night. State Parks overall management of the CCT system and parking areas, including use of any areas for lighthouse tour staging and the opening of any public uses at the Piedras Blancas Motel Site, shall also be described in these plans. Improvements to support the trail uses such as benches, picnic tables or other developments shall be indicated on the plan.
5. **Signage.** The Final CCT Plans shall identify all signs and any other project elements that will be used to facilitate, manage, and provide public access to the CCT, including identification of all public education/interpretation features that will be provided on the site (educational displays, interpretive signage, etc.). Sign details showing the location, materials, design, and text of all public access signs shall be provided. The signs shall be sited and designed so as to

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provide clear information without impacting public views and site character. The location of CCT signage and other interpretive signs, including: a description of the CCT connections to the north and the south of the project site; education of visitors about the natural ecology and safe viewing and protection of potential elephant seal haul out areas; and, a discussion of the realignment project as an example of the State's adaptive management response to changing conditions from sea level rise, shall be identified on the Final CCT Plans. The proposed content of the signs shall be included in the submitted plans. CCT signage shall include the California Coastal Trail, California Coastal Conservancy, and California Coastal Commission emblems and recognition of Caltrans, State Parks, California Coastal Conservancy, and the Coastal Commission's role in providing public access at this location.

- 6. Elephant Seal Fencing.** Elephant seal-resistant fencing that does not obstruct views shall be provided where needed to avoid conflicts from elephant seals potentially entering public use areas and to protect the marine mammals from harassment and accidents with motor vehicles. The design and placement of such fencing shall be determined in collaboration with the California Department of Fish and Wildlife, the National Marine Fisheries Service and the Monterey Bay National Marine Sanctuary. Due consideration shall be given to maintaining beach access, minimizing visual impacts, and preventing obstruction of wildlife movement of other species. Potential locations include Arroyo del Oso, the wet swale north of the Piedras Blancas Motel, Arroyo del Corral, and Arroyo de los Playanos.
- 7. Water Quality Protection.** Bridges shall be constructed to extend a minimum of 10 feet beyond delineated wetland boundaries. The trail shall be constructed using standard building techniques that grade the surface to avoid concentration of drainage flows. Where concentrated flows cannot be avoided, appropriate energy dissipation shall be used that favors bio-engineering over hard solutions.
- 8. Archaeological Resources.** The Final CCT Plans shall provide for archaeological protection via submittal of the same type of plan required for the realignment project pursuant to Special Condition 16.
- c. Additional State Parks Responsibilities.** The MOA shall describe the roles and responsibilities of State Parks as the administrator of the CCT funds. State Parks shall be responsible for complying with any additional permitting requirements from other agencies for the construction of the CCT.
- d. Reporting.** The MOA shall provide for annual written reports to be submitted by State Parks to the Executive Director of the Coastal Commission on the progress made toward the completion of the overall CCT and parking access improvements until such time that all improvements have been completed and opened to the public as required by this CDP.
- e. Contingency.** The MOA shall include provisions to address any failure by the Permittee and State Parks to implement the MOA consistent with the requirements of this CDP, including but

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not limited to transfer of the funds to an alternate Executive Director-approved entity able to construct the CCT as described in the MOA.

- f. **Utilities Undergrounded.** The MOA shall specify that all utility poles at the Piedras Blancas motel, café, and the South Ranger House shall be removed and utilities placed underground. No overhead utility lines shall remain seaward of the realigned Highway 1.
- g. **Plan Coordination.** The MOA shall ensure that the Final CCT plans are coordinated with Caltrans final habitat mitigation plans (see Special Condition 14).
- h. **Interpretation.** Unless resolved by the Executive Director, any dispute concerning compliance with or interpretation of any provision of the MOA shall be resolved by the Coastal Commission.

Minor adjustments to the MOA and the Final CCT Plans that are in substantial conformance with the terms and conditions of this CDP may be allowed by the Executive Director if such adjustments: (1) are deemed reasonable and necessary; and (2) do not adversely impact coastal resources. All requirements above and all requirements of the approved MOA and the approved Final CCT Plans shall be enforceable components of this CDP. The Permittee and State Parks shall undertake all development in accordance with this condition and the approved MOA and approved Final CCT Plans.

- 6. **Construction Plan.** PRIOR TO COMMENCEMENT OF CONSTRUCTION, the Permittee shall submit two sets of a Construction Plan to the Executive Director for review and approval. The Construction Plan shall, at a minimum, include the following:
 - a. **Construction Areas.** The Construction Plan shall identify the specific location of all construction areas, all staging areas, all storage areas, all construction access corridors (to the construction site and staging areas), and all public pedestrian access corridors. All such areas within which construction activities and/or staging are to take place shall be minimized in order to minimize construction encroachment on all publicly available pathways and beach access points, to have the least impact on public access. In addition, staging and storage areas shall be screened to the extent feasible (through berming, vegetation, or other natural features), shall be located outside important public viewshed areas, and shall be kept neat and orderly at all times.
 - b. **Construction Methods and Timing.** The Construction Plan shall specify the construction methods to be used, including all methods to be used to keep the construction areas separated from public recreational use areas, including using unobtrusive fencing (or equivalent measures) to delineate construction areas, and including all methods to be used to protect coastal waters. In addition, the Construction Plan shall specify a construction phasing schedule that minimizes the area of disturbance in a given timeframe, with a description and timeline of significant land disturbance activities.
 - c. **Detour Plan.** The Construction Plan shall include a detour plan that provides for continuous safe pedestrian and bicycle access through the project site for the duration of construction.
 - d. **Construction-Phase BMPs.** The Construction Plan shall include a BMP plan (which may be in the form of a NPDES-compliant Storm Water Pollution Prevention Plan (SWPPP)) wherein all

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erosion control/water quality best management practices to be implemented during construction and their location shall be noted, including the location of all temporary construction-phase BMPs (such as silt fences, inlet protection, and sediment basins), and a schedule for the inspection and maintenance of construction-phase BMPs, including temporary erosion and sediment control BMPs. At a minimum, the following BMPs that will be implemented to minimize erosion and sedimentation during construction activities shall be identified:

1. BMPs deployed to stabilize soil during construction.
 2. BMPs deployed to control erosion and sedimentation during construction. Plastic netting shall be prohibited in all erosion and sediment control products.
 3. A schedule for installation and removal of temporary erosion and sediment control BMPs, and identification of temporary BMPs that will be converted to permanent post-development BMPs will be provided. At a minimum, all erosion and sediment controls shall be ready for implementation prior to the commencement of construction and deployed as specified in the BMP Plan.
 4. BMPs will be deployed to minimize land disturbance, avoid inadvertent soil compaction in temporary impact areas, and protect vegetation.
 5. BMPs will be implemented to protect stockpiled soil and other materials.
- e. **Construction Requirements.** The Construction Plan shall include the following construction requirements specified by written notes on the Construction Plan. Minor adjustments to the following construction requirements may be allowed by the Executive Director if such adjustments: (1) are deemed reasonable and necessary; and (2) do not adversely impact coastal resources.
1. All work shall take place during daylight hours, with the exception of traffic shifts from the old to new alignment. Lighting of the beach area is prohibited.
 2. Grading shall be minimized during the rainy season (from October 15 through March 15) as much as feasible.
 3. Construction (including but not limited to construction activities, and materials and/or equipment storage) is prohibited outside of the defined construction, staging, and storage areas.
 4. Equipment washing and servicing shall only be allowed at a designated inland location as noted on the Plan. Vehicle refueling, staging and storage areas for equipment, materials, fuels, lubricants, and solvents shall be located a minimum of 100-feet outside of coastal waters and wetlands, and to the extent possible, on previously disturbed ground. Stationary equipment such as cranes, motors, pumps, generators, compressors, and welders located within or adjacent to coastal waters or wetlands, shall be positioned over drip pans. Vehicles shall be moved away from the coastal waters and wetlands prior to refueling and lubrication. Appropriate best management practices shall be used to ensure that no spills of petroleum

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products or other chemicals take place during these activities.

5. The construction site shall maintain good construction site housekeeping controls and procedures (e.g., clean up all leaks, drips, and other spills immediately; keep materials covered and out of the rain, including covering exposed piles of soil and wastes; dispose of all wastes properly, place trash receptacles on site for that purpose, and cover open trash receptacles during wet weather; remove all construction debris from the beach; etc.).
6. Removal of road crossing fills and culverts from drainages on the old highway shall be overseen in the field by a qualified geologist or other expert that specializes in wetland and hydrology alterations, subject to the approval of the Executive Director. The appointed expert shall be authorized to direct and modify excavation activities to ensure natural drainage channels are preserved to the maximum extent feasible. As fill is excavated, original bed and bank elements buried under the fill during construction of the original highway shall be used to identify appropriate excavation limits. To the extent feasible, excavation shall leave the original bed and bank elements (such as cobble, woody debris and substrate) in place, and shall match the original gradient and planform.
7. The Permittee shall include all applicable CDP terms and conditions within bid solicitations and final contracts for the project work. Contractors shall insure that work crews are carefully briefed on the importance of observing all appropriate precautions to ensure that work is done consistent with the terms and conditions of this CDP. Construction contracts shall contain appropriate penalty provisions sufficient to offset the cost of remediating violations of this CDP.
8. The Permittee shall notify planning staff of the Coastal Commission's Central Coast District Office at least three working days in advance of commencement of construction or maintenance activities, and immediately upon completion of construction or maintenance activities.

All requirements above and all requirements of the approved Construction Plan shall be enforceable components of this CDP. The Permittee shall undertake development in accordance with this condition and the approved Construction Plan.

7. **Construction Site Documents & Construction Coordinator. DURING ALL CONSTRUCTION:**
 - a. **Construction Site Documents.** Copies of the signed CDP and the approved Construction Plan shall be maintained in a conspicuous location at the construction job site at all times, and such copies shall be available for public review on request. All persons involved with the construction shall be briefed on the content and meaning of the CDP and the approved Construction Plan, and the public review requirements applicable to them, prior to commencement of construction.
 - b. **Construction Coordinator.** A construction coordinator shall be designated to be contacted during construction should questions arise regarding the construction (in case of both regular inquiries and emergencies), and the coordinator's contact information (i.e., address, phone numbers, etc.) including, at a minimum, a telephone number that will be made available 24 hours

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a day for the duration of construction, shall be conspicuously posted at the job site where such contact information is readily visible from public viewing areas, along with an indication that the construction coordinator should be contacted in the case of questions regarding the construction (in case of both regular inquiries and emergencies). The construction coordinator shall record the name, phone number, and nature of all complaints received regarding the construction, and shall investigate complaints and take remedial action, if necessary, within 24 hours of receipt of the complaint or inquiry.

- 8. Post-Construction Water Quality Management Plan.** PRIOR TO THE ISSUANCE OF THE CDP, the Permittee shall submit two sets of a Water Quality Management Plan (WQMP) for the post-construction project site to the Executive Director for review and approval. The WQMP shall integrate and supplement the information contained in the Storm Water Data Report Long Form (finalized by Marissa Nishikawa, Regional Design SW Coordinator, dated 5/21/2013) and the TBMP + VBS Mapping (Biofiltration Locations by station and Vegetated Buffer Strip Locations), 05 0000 0576-4, supplied by Pete Riegeluth, D-5 SW Coordinator, on June 6, 2014. The WQMP shall include documentation of the items specified in this special condition, including calculations for reduced impervious surfaces on road shoulders, increasing the number or lengths of Biofiltration Strips (BFS), providing BFS vegetated slopes or swales (e.g., VBS or BFS) where runoff leaves bridges, and revising the stormwater BMPs provided at APNs 011-231-013 and 011-231-014. The plans shall incorporate the final location and configuration of long-term post-construction Bio-Filtration Strips (BFS) and Vegetated Buffer Strips (VBS). Minor adjustments to the following requirements may be allowed by the Executive Director if such adjustments: (1) are deemed reasonable and necessary; and (2) do not adversely impact coastal resources. The plan shall be in substantial conformance with the following requirements:
- a. BMP Repair and Maintenance.** All BMPs, including Vegetated Buffer Strips (VBS) and Biofiltration Strips (BFS), and energy dissipaters shall be designed, installed, and maintained for the life of the project in accordance with accepted design principles and guidelines, such as those contained in the *Caltrans Stormwater Quality Handbook*. Should any of the project's BMPs fail to effectively arrest erosion, or result in accelerated erosion, the Permittee shall be responsible for any necessary repairs to the BMPs and restoration of the affected area. This requirement shall apply to all BMPs. Should repairs or restoration become necessary, prior to the commencement of such repair or restoration work, the Permittee shall submit a repair and restoration plan to the Executive Director to determine if an amendment or new CDP is required to authorize such work.
 - b. Minimum Maintenance Schedule.** At a minimum, all BMPs shall be inspected and cleaned/repared or otherwise maintained in accordance with the following schedule: (1) prior to the start of the winter storm season, no later than October 15th each year, (2) monthly thereafter for the duration of the rainy season (October 15th - April 30), and cleaned/maintained as necessary based on inspection and, (3) as needed throughout the dry season.
 - c. Proper Disposal.** Sediment and debris removed from treatment BMPs during clean out shall be disposed of in a proper manner.

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- d. **Irrigation/Fertilizers.** Irrigation and the use of fertilizers and other landscaping chemicals shall be minimized.
- e. **Biofiltration Strips.** Biofiltration strips (BFS) shall be sized to treat the amount of runoff produced by all storms up to and including the 85th percentile 24-hour storm event for volume-based BMPs, and/or the 85th percentile, 1-hour storm event (with an appropriate safety factor of two or greater) for flow-based BMPs.

All requirements above and all requirements of the approved WQMP shall be enforceable components of this CDP. The Permittee shall undertake development in accordance with this condition and the approved WQMP.

- 9. **CCT Access Dedication.** PRIOR TO COMMENCEMENT OF CONSTRUCTION, the Permittee shall submit to the Executive Director for review and approval evidence that a dedication to State Parks of a fee interest or easement(s) for lateral public access has been executed and recorded against Sani Parcels 1 and 2 (APNs 011-231-013 and 011-231-014) and the Welsh Parcel (APN 011-231-017) that provide a direct public access route from the CCT connections to the north and south, along the alignment approved pursuant to Special Condition 5 (California Coastal Trail). The CCT Access Dedication area shall be ambulatory, including that the trail shall move inland if relocation and/or reconstruction of access amenities in these areas is necessary to retain their continuity and/or utility. With respect to the Welsh Parcel, if the Permittee acquires the portion of the Welsh Parcel west of the new Highway right-of-way, then the access dedication shall apply to the acquired property. If the Permittee does not acquire the portion of the Welsh Parcel west of the new Highway right-of-way, then the existing Highway right-of-way area on the Welsh property shall continue to be used as the CCT until one of the following three things happens, whichever comes first: (1) the end of Caltrans' 5-year plant establishment, restoration and monitoring period; (2) the existing highway easement is terminated and the property reverts to the underlying owner of the property through operation of law; or (3) it is no longer suitable for a trail (e.g., it is in danger from erosion, etc.).

In addition, PRIOR TO COMMENCEMENT OF CONSTRUCTION the Permittee shall dedicate to State Parks a fee interest or easement for lateral public access over the westernmost portion of the new Highway right-of-way. The CCT Access Dedication area shall be of a sufficient width to allow for construction and maintenance of the CCT pursuant to the terms and conditions of this CDP. The CCT Access Dedication shall be recorded free of all prior liens and encumbrances that the Executive Director determines may affect the interest being conveyed. The CCT Access Dedication shall include a legal description and graphic depiction of the legal parcels subject to the CDP and a metes and bounds legal description and graphic depiction of the CCT Access Dedication area prepared by a licensed surveyor based on an on-site inspection, drawn to scale, and approved by the Executive Director.

10. Evidence of CDP Amendments.

- a. **Sani Parcels 1, 2 and 3:** PRIOR TO COMMENCEMENT OF CONSTRUCTION, the Permittee shall provide evidence that San Luis Obispo County has amended CDP COAL 90-137, as

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reconsidered and amended in D010029P and MUP D020333P to: allow for the highway to be constructed in the new alignment approved by this CDP; prohibit development on Sani Parcels 1 and 2 (APNs 011-231-013 and 011-231-014) other than demolition, restoration, well access, public access and recreation improvements, and CCT development approved by this CDP; reflect screening requirements of Special Condition 3; and retain all other development limitations included in existing deed restrictions/scenic easements/mitigation agreements as they currently pertain to the undeveloped areas outside of the existing development envelope, but modify the area to which they apply to be all areas on the properties outside of the new highway right-of-way. Any amendment approval shall be based on the future conditions of the site after the rock slope protection is removed, as required by CDPs 3-97-039 and 3-07-030, including future erosion rates associated with the unprotected shoreline.

- b. **Welsh Parcel:** PRIOR TO COMMENCEMENT OF CONSTRUCTION, the Permittee shall provide evidence that the Coastal Commission has amended CDP A-3-SLO-00-119 to allow for the highway to be constructed in the new alignment approved by this CDP; to prohibit development on that portion of the parcel seaward of the realigned Highway other than restoration, well access, and CCT development approved by this CDP; reflect screening requirements of Special Condition 3; and retain all other development limitations included in the existing scenic easement as it currently pertains to the undeveloped areas outside of the existing development envelope and extend these limitations to the remainder of the portion of the property seaward of the new highway right-of-way. The amendment approval shall be based on the future conditions of the site after the rock slope protection is removed, as required by CDPs 3-97-039 and 3-07-030, including future erosion rates associated with the unprotected shoreline.
- 11. Evidence of Amendments to Recorded Documents.** PRIOR TO THE COMMENCEMENT OF CONSTRUCTION, the Permittee shall submit evidence that that the landowner(s) has executed and recorded deed restrictions against Sani Parcels 1 and 2 (APNs 011-231-013 and 011-231-014, or as may be renumbered), and the Welsh Parcel (APN 011-231-017, including any roadway that reverts to the property, and as may be renumbered), in a form and content acceptable to the Executive Director, prohibiting all development, as defined in Section 30106 of the Coastal Act, outside of the new Highway 1 alignment right-of-way, as shown on the Revised Final Plans, except:
1. Construction of a CCT west of the new Highway 1 alignment right-of-way and associated infrastructure and improvements (e.g. trails, bridges, interpretive signage, restrooms, garbage cans, parking, fencing, etc.).
 2. Recreation and associated infrastructure (e.g., low-cost visitor-serving camping, restrooms, parking, signage, support services, etc.).
 3. Restoration (all types – wetland, coastal prairie, other).
 4. Vegetation screening. Vegetation screening shall provide for landscaping (at maturity) that is the minimum necessary to fully screen any remaining residences and associated residentially-related development (e.g., well heads and aboveground infrastructure) on Sani Parcels 1, 2 and 3 and the Welsh Parcel (APNs 011-231-013, 011-231-014, 011-231-015 and 011-231-017), as well as any

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approved aboveground utility infrastructure along the realigned highway, as seen from the Highway and the California Coastal Trail for the life of the project. Landscape screening shall be designed to blend with the surrounding environment and shall minimize impacts on public views, including of the hillsides to the east. Landscape screening shall be maintained for the life of the project, including replacement of dead or diseased trees and shrubs, irrigation, trimming and pruning and other such care as required to ensure that landscaping will fully screen development, such that no residential development will be visible in public views. The use of vegetation screening shall be limited to that which is necessary to provide the necessary screening.

5. Consolidated access to and maintenance of existing wells from Highway 1. The consolidated well access shall be sited and designed to minimize impacts on public views to the maximum extent feasible, including that: it shall be limited to one, narrow, informal rangeland farm road (e.g., jeep trail); it shall be unpaved; and it shall not extend seaward of the remaining wells.
6. Driveway access inland of the new Highway alignment that is to be sited and designed to minimize impacts on public views to the maximum extent feasible, including that such access shall be as narrow as possible and shall not include large pedestals or other identifiers (other than required address). Only those driveway and related elements that cannot feasibly be removed shall be allowed in this area. All other driveways and related development, both seaward and inland of the new Highway alignment are not allowed.
7. New wells or relocation of wells inland of existing wells, subject to CDP requirements.
8. A water storage tank, water well, septic system, underground utilities, drainage, landscaping, fire protection measures, and agricultural uses, all subject to obtaining necessary permits.
9. All utilities shall be placed underground.

The recorded documents shall include a legal descriptions of Sani Parcels 1 and 2, and the Welsh Parcel, and a metes and bounds legal description and graphic depiction, prepared by a licensed surveyor, of the areas restricted by the applicable deed restriction. The deed restrictions shall run with the land, binding all successors and assigns, and shall be recorded free of prior liens and encumbrances that the Executive Director determines may affect the enforceability of the restriction, including, but not limited to: (a) Deed Restriction number 2005-089950 recorded in the San Luis Obispo County Recorder's Office on October 25, 2005; (b) the Mitigation Agreements recorded as document numbers 1994-072466, 1997-019825, and 2008-025068 in the San Luis Obispo County Recorder's office on December 20, 1994, April 21, 1997 and May 14, 2008, respectively; (c) The Covenants, Conditions & Restrictions and Agreement for Pedestrian, Equestrian and Drainage Easements recorded as document number 2008-034839 in the San Luis Obispo County Recorder's office on July 8, 2008; (d) OTD and acceptance of lateral access; (e) Deed Restriction recorded as document number 2008-040425 in the San Luis Obispo County Recorder's office on August 5, 2008; (f) The "Agricultural, Scenic and Conservation Easement" and "Resolution # 2002-109" recorded as document numbers 2002020772 and 2002021797 in the San Luis Obispo County Recorder's office on March 14, 2002 and March 18, 2002 respectively, and; (g) Deed Restriction recorded as document number 2002020744 in the San Luis Obispo County Recorder's office on March 14, 2002.

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- 12. Other Agency Approvals.** PRIOR TO ISSUANCE OF THE CDP, the Permittee shall submit to the Executive Director written evidence that all necessary permits, permissions, approvals, and/or authorizations for the approved project have been granted, including by the U.S. Army Corps of Engineers, the Monterey Bay National Marine Sanctuary, Regional Water Quality Control Board, U.S. Fish and Wildlife Service, National Marine Fisheries Service and the California Department of Fish and Wildlife. Any changes to the approved project required by these agencies shall be reported to the Executive Director. No changes to the approved project shall occur without a Commission amendment to this CDP unless the Executive Director determines that no amendment is legally necessary.
- 13. Assumption of Risk, Waiver of Liability and Indemnity.** By acceptance of this permit, the Permittee acknowledges and agrees, on behalf of itself and all successors and assigns: (i) that the site is subject to hazards from episodic and long-term shoreline retreat and coastal erosion, high seas, ocean waves, storms, tsunamis, tidal scour, coastal flooding, and the interaction of same; (ii) to assume the risks to the Permittee and the property that is the subject of this permit of injury and damage from such hazards in connection with this permitted development; (iii) to unconditionally waive any claim of damage or liability against the Commission, its officers, agents, and employees for injury or damage from such hazards; and (iv) to indemnify and hold harmless the Commission, its officers, agents, and employees with respect to the Commission's approval of the project against any and all liability, claims, demands, damages, costs (including costs and fees incurred in defense of such claims), expenses, and amounts paid in settlement arising from any injury or damage due to such hazards.
- 14. Mitigation and Monitoring Plan.** PRIOR TO COMMENCEMENT OF CONSTRUCTION, the Permittee shall submit two copies of a revised Mitigation and Monitoring Plan (Habitat Restoration Plan) that covers on-site and off-site mitigation, including Sani Parcels 1 and 2 and the Welsh Parcel in the case it and/or an interest in it is acquired by the Permittee that requires and/or allows for mitigation work on it, to the Executive Director for review and approval. The plan shall at a minimum include:

 - a. Introduction.** Overview of proposed on-site and off-site mitigation, and figures and exhibits including location maps, proposed project site plans, maps of existing biological resources, and maps comparing existing vs. future site conditions.
 - b. Goals of on-site and off-site mitigation.** A clear statement of the goals of the mitigation, including the desired habitat (including provisions for central (Lucian) coastal sage scrub that will be impacted by the project), major vegetation components (emergent wetland, arrow willow riparian, coastal stream, coastal prairie, and central coastal sage scrub), hydrological regime for wetlands, and wildlife support functions. There shall be a clear narrative description of the characteristics of the habitat type that the on-site and off-site mitigation is intended to provide.
 - c. Characterization of the Desired Habitats.** Although the characteristics of the model habitat may be based on descriptions in the literature, the best approach is to identify an actual habitat that can act both as a model for the required mitigation and as a reference site for developing

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success criteria. Reference habitats should be sampled using the methods that will be applied to the mitigation sites. The resultant data shall be included in the Mitigation and Monitoring Plan.

- d. **Description of Existing Habitats.** The Mitigation and Monitoring Plan shall include descriptions of existing biological resource conditions.
- e. **Grading Plan.** If there is a component to the plan that requires topographic alterations, a formal grading plan covering each such area shall be included.
- f. **Erosion Control.** Methods to control erosion and maintain water quality shall be included for any activities where soil or other substrate will be significantly disturbed for any reason.
- g. **Weed Eradication Plan.** One of the greatest threats to the success of mitigation (enhancement, restoration, creation) projects and for management of natural habitats is invasion by exotic species. The Mitigation and Monitoring Plan shall include plans for weed eradication for both on-site and off-site mitigation. After the initial mitigation work has taken place, weeding should be very frequent (usually monthly and then quarterly as interim performance criteria are achieved) and intense until the native vegetation is sufficiently well-established to resist continued colonization by exotics.
- h. **Planting Plan.** The Mitigation and Monitoring Plan shall identify the natural habitat types that are the model for mitigation (and any planned enhancement, restoration, and/or creation) and describe the desired relative abundance of particular species in each habitat type that is to be enhanced, restored, or created. Based on these goals, the Mitigation and Monitoring Plan shall identify the species that are to be planted (i.e., the plant "palette"), and provide a rationale for and describe the size and number of container plants and the rate and method of seed application. Any plant propagules used shall come from local native stock. If plants, cuttings, or seed are obtained from a nursery, the nursery must certify that they are produced in California from the counties of San Luis Obispo, Santa Barbara, or Monterey, and are not cultivars, and the planting plan shall provide specifications for preparation of nursery stock (e.g., container size and shape to develop proper root form, hardening techniques, watering regime, etc.). Technical details of planting methods (e.g., spacing, micorrhyzal inoculation, etc.) shall also be included.
- i. **Irrigation Plan.** If supplemental watering is planned, the method and timing of watering should be described. All irrigation infrastructure must be removed by the end of the monitoring period.
- j. **Annual Monitoring Plan.** Annual monitoring shall cover maintenance and remediation activities, assessment methods, interim performance goals, and schedule. In general, visual monitoring shall be approximately monthly until plants are established and then quarterly thereafter. Weeding shall be frequent (at least monthly) until plants are established and then quarterly thereafter. Photographs shall be taken from fixed points on fixed azimuths during each monitoring period. Quantitative monitoring shall take place at least once a year.
- k. **Final Monitoring Plan.** Final monitoring is intended to determine whether the mitigation (enhancement, restoration, and/or creation) has been successful. In order to help insure that the

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habitats are self-sustaining, the Mitigation and Monitoring Plan shall provide that final monitoring for success shall take place after at least 5 years. The Final Monitoring Plan shall include specific ecological performance or "success" criteria that relate logically to the goals of the required mitigation (enhancement, restoration, and/or creation). Generally, these criteria must include standards for species diversity of both perennial and annual plants, and vegetative cover. Success criteria shall insure that the major structure-producing species that characterize the habitats are present and that there is an appropriate diversity of species in the vegetation layers of each habitat type. Habitat elements necessary for particular wildlife species shall be specified in such criteria. For wetlands, such criteria shall include hydrological criteria.

- i. Basis for Selection of Performance Criteria.** The basis for the selection of each performance criterion shall be explained. Commonly, performance criteria take the form of, for example, "85% vegetative cover at the end of 5 years" without explanation, and this is not satisfactory without appropriate justification. For some habitat types, this is too high, and for others it is too low. There must be some empirical basis for the selection of each performance criterion.
- m. Types of Performance Criteria.** Where there is sufficient information to provide a strong scientific rationale, the performance criteria may be absolute or fixed (e.g., a specified percentage ground cover or relative diversity of species, or a specified average height for a species). Alternatively, relative performance criteria may be specified. Relative criteria are those that require a comparison of the mitigation (enhanced, restored, and/or created) sites with appropriate reference sites to be compared at the same time each year. In the case of relative performance criteria, the rationale for the selection of reference sites shall be described. These sites must be selected and identified in the Mitigation and Monitoring Plan. In addition, a preliminary field sample shall be taken and the results included in the plan.
- n. Procedure for Judging Success.** Regardless of whether performance criteria are absolute or relative, the comparison procedure, and the basis for judging differences to be significant must be specified. If the comparison requires a statistical test (e.g., a one-sample or two-sample t-test), the test shall be described, including the desired magnitude of difference to be detected, the desired statistical power of the test, and the alpha level at which the test will be conducted.
- o. Formal Sampling Design.** The design of the field sampling program shall relate logically to the performance criteria and chosen methods of comparison. The sampling design and the sampling methods shall be described in sufficient detail to enable an independent scientist to duplicate it.
- p. Final Monitoring Report.** A final monitoring report shall be submitted for the review and approval of the Executive Director at the end of the monitoring period (i.e., at least 5 years with no remediation or maintenance activities other than weeding). The final report shall be prepared by a qualified ecologist. The report must evaluate whether the required management, enhancement and/or restoration has achieved the goals and success criteria set forth in the approved Mitigation and Monitoring Plan.
- q. Provision for Possible Further Action.** If the final monitoring report indicates that the project has been unsuccessful, in part or in whole, based on the approved success criteria, the Permittee

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shall submit within 90 days a revised or supplemental plan to compensate for those portions of the original plan which did not meet the approved success criteria. The revised plan shall be processed as an amendment to the coastal development permit unless the Executive Director determines that no permit amendment is required.

- r. **Public Access Improvements.** The final Mitigation and Monitoring Plan shall not include restoration planting in areas to be developed with the trail or parking, as required by Special Condition 5.

All requirements above and all requirements of the approved Mitigation and Monitoring Plan shall be enforceable components of this CDP. The Permittee shall undertake development in accordance with this condition and the approved Mitigation and Monitoring Plan.

- 15. **No Future Armoring.** By acceptance of this Permit, the Permittee agrees, on behalf of itself and all successors and assigns, that no shoreline armoring (including but not limited to seawalls, revetments, groins, etc.) shall be constructed to protect the development approved pursuant to this CDP (including but not limited to the realigned highway, CCT, and associated drainage features) in the event that such development is threatened with damage or destruction from episodic and/or long-term shoreline retreat and coastal erosion, high seas, ocean waves, storms, tsunamis, tidal scour, coastal flooding, other natural hazards, and the interaction of same in the future. By acceptance of this Permit, the Permittee hereby waives, on behalf of itself and all successors and assigns, any rights to construct such armoring that may exist under Public Resources Code Section 30235 or San Luis Obispo County LCP Hazards Policy 4. Notwithstanding the above, the Permittee retains all rights to conduct all necessary emergency work as allowed and required by law, and nothing in this condition or Permit precludes the Permittee from fulfilling and performing its statutory responsibility to seek necessary permits to construct, improve, maintain and provide for use of Highway 1 in the face of such emergency.
- 16. **Archaeological Resources.** PRIOR TO THE ISSUANCE OF THE CDP, the Permittee shall submit two copies of an archaeological mitigation and monitoring plan prepared by a qualified archaeologist for review and approval of the Executive Director. The Plan shall provide for an archaeological monitor to be present during all ground disturbing activities for the road realignment that will take place within areas of high archaeological sensitivity (i.e., location at and near the three site areas that were evaluated and found ineligible to the National Register of Historic Places (NRHP). Additionally, the Plan shall provide for weekly inspections of the overall project area by the archaeological monitor to identify additional areas where there may be high archaeological sensitivity and where the archaeological monitor must also be present during all ground disturbing activities. The Plan shall also include a description of monitoring methods, including provisions for a pre-project survey that includes consultation with qualified local Native Americans, frequency of monitoring, procedures for halting work on the site and a description of reporting procedures that will be implemented during ground disturbing activities to ensure that cultural resources are not disturbed. The Plan shall include a list of the personnel involved in the monitoring activities and their qualifications, and shall include qualified local Native Americans as project monitors as applicable. At a minimum, the Plan shall provide for the following:

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- a. **Training.** PRIOR TO COMMENCEMENT OF CONSTRUCTION, the archaeological monitor shall conduct a training session with construction personnel discussing the cultural sensitivity of the area and the protocol for discovery of cultural resources during construction. The archaeological monitor shall also inform all qualified local Native Americans of the timing of construction and their opportunity to participate in construction monitoring.
- b. **Halt Construction.** SHOULD ARCHAEOLOGICAL RESOURCES BE ENCOUNTERED DURING ANY CONSTRUCTION, all activity that could damage or destroy these resources shall be temporarily suspended until a qualified archaeologist has examined the site and mitigation measures have been developed, including in consultation with the Native American community as applicable, that address and proportionately offset the impacts of the project on archaeological resources.
- c. **Monitor.** DURING ALL GROUND DISTURBING ACTIVITIES, the Permittee shall retain a qualified archaeologist, approved by the Executive Director, to monitor all earth disturbing activities as described above. The Permittee shall also include qualified local Native Americans as project monitors as applicable. If an area of cultural deposits is discovered during the course of the project, all construction shall cease in the vicinity of the resource, and a new plan shall be submitted that avoids such resources that shall be submitted for the review and approval of the Executive Director.

All requirements above and all requirements of the approved Plan shall be enforceable components of this CDP. The Permittee shall undertake development in accordance with this condition and the approved Plan.

17. **Landowner Authorization.** PRIOR TO ISSUANCE OF THE CDP, the Permittee shall provide written evidence, for the review and approval of the Executive Director, that all other owners of property on which development authorized by this CDP will take place: (1) have provided the Permittee with the legal authority to undertake development on their property pursuant to the terms and conditions of this CDP; (2) have acknowledged that, as landowner of property on which a portion of the development covered by this permit will be undertaken, is bound by all terms and conditions of the CDP applicable to the portions of the project occurring on their property.

CALIFORNIA COASTAL COMMISSION

45 FREMONT STREET, SUITE 2000
SAN FRANCISCO, CA 94105-2219
VOICE AND TDD (415) 904-5200



October 28, 2014

Cecelia Boudreau
Caltrans District 5
50 Higuera Street
San Luis Obispo, CA 93401-5415

Applicant: **Caltrans**
Project: **Highway 1 Realignment (and associated improvements)**
Location: **Between mile markers 64.0 and 66.9 of Highway 1, north of Piedras Blancas Light Station, northern San Luis Obispo County**

Coastal Commission Permit/Appeal **CCC CDP No. 3-13-012**

The Coastal Commission staff has received your request to identify Commission jurisdiction for the purposes of processing an individual, nationwide, general or regional permit from the Army Corps of Engineers (Corps). Pursuant to the federal Coastal Zone Management Act (CZMA), the Corps cannot issue a permit for an activity, either in or out of the coastal zone, that affects land and water uses or natural resources of the coastal zone until the applicant has complied with the requirements of Section 307(c)(3)(A) of the CZMA. (16 USC Section 1456[c][3][A].) The applicant can meet these requirements by receiving a Commission concurrence with either (1) a consistency certification prepared by the applicant or (2) a showing that the activity does not affect the coastal zone. Alternatively, the applicant can satisfy these requirements by the issuance of a Commission approved coastal development permit. Since the Commission cannot delegate federal consistency authority to local governments, a coastal development permit issued by a local agency does not replace the requirement for a consistency certification. The Coastal Commission staff has reviewed the information submitted for the above-referenced project, and has made the following determination:

The Coastal Commission staff considers the Commission's federal consistency jurisdiction to be waived at this time, due to the fact that this project has received Coastal Commission approval with conditions of a coastal development permit, and once the conditions are satisfied and the permit granted, federal consistency will have been automatically satisfied. Thus, for the purposes of the Army Corps of Engineers granting its authorization, the Commission staff believes the Army Corps can also consider the project's federal consistency requirements to have been satisfied at this time.

Sincerely,

A handwritten signature in black ink, appearing to read "Mark Delaplane".

MARK DELAPLAINE
Manager, Energy, Ocean Resources, and
Federal Consistency Division

cc: CCC Caltrans Liaison (Tami Grove)
Santa Cruz District
Army Corps, S.F. District
Caltrans District 5

CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE
REGION 4 - CENTRAL REGION
1234 EAST SHAW AVENUE
FRESNO, CALIFORNIA 93710



STREAMBED ALTERATION AGREEMENT

NOTIFICATION NO. 1600-2013-0139-R4

ARROYO DE LOS PLAYANOS , ARROYO DEL CORRAL, ARROYO DEL OSO, AND
TWO UNNAMED DRAINAGES - SAN LUIS OBISPO COUNTY

JENNIFER MOONJIAN

CALIFORNIA DEPARTMENT OF TRANSPORTATION

CALTRANS DISTRICT 5

50 HIGUERA STREET

SAN LUIS OBISPO, CALIFORNIA 93401

SLO-1 PIEDRAS BLANCAS REALIGNMENT EA 05-492800 (PROJECT)

This Streambed Alteration Agreement (Agreement) is entered into between the California Department of Fish and Wildlife (CDFW) and the California Department of Transportation, Caltrans District 5 (referred to as Permittee), represented by Jennifer Moonjian.

RECITALS

WHEREAS, pursuant to Fish and Game Code (FGC) section 1602, Permittee notified CDFW on August 9, 2013 that Permittee intends to complete the Project described herein.

WHEREAS, pursuant to FGC section 1603, CDFW has determined that the Project could substantially adversely affect existing fish or wildlife resources and has included Protective Measures in this Agreement necessary to protect those resources.

WHEREAS, Permittee has reviewed this Agreement and accepts its terms and conditions, including the Protective Measures to protect fish and wildlife resources.

NOW THEREFORE, Permittee agrees to complete the Project in accordance with this Agreement.

PROJECT LOCATION

The Project will occur at five (5) locations along Highway 1 north of the Piedras Blancas Lighthouse and south of the Arroyo de la Cruz Bridge in San Luis Obispo County. Location 1 is the Arroyo de los Playanos crossing at Post Mile (PM) 64.6; Location 2 is the Arroyo del Corral crossing at PM 64.8; Location 3 is the unnamed drainage at PM 65.2; Location 4 is the Arroyo del Oso crossing at PM 65.4; and Location 5 is the un-named drainage crossing at PM 65.8. All locations are between Latitude 35.681729, Longitude -121.284024 at the south and Latitude 35.697136, Longitude -121.294517 at the north.

PROJECT DESCRIPTION

In order to protect State Highway 1 from continuing coastal bluff erosion, a 2.8-mile stretch of State Highway 1, starting approximately 0.3 miles north of the Piedras Blancas Lighthouse and ending just south of the Arroyo de la Cruz Bridge, will be relocated inland (east) for a distance ranging from 80 to 475 feet from its current location. An existing roadbed will be removed for the realignment activity and restoration of stream banks, wetlands, and coastal prairie will occur. The construction of the larger Project will entail work outside of CDFW jurisdiction, including a driveway that will be built to connect the new highway alignment with the old Piedras Blancas Motel; relocation of existing utilities inland parallel to the new alignment; and possible staging of equipment at locations that include private property and the large pull out area just south of Arroyo de la Cruz. The Project authorized by this Agreement includes work at the five (5) locations as described below.

For the purpose of this Project the following terms and definitions will be used to describe the installation of rock slope protection (RSP).

- “No.1” RSP will consist of rocks 0 to 5 percent larger than 200 pounds, 50 to 100 percent larger than 75 pounds, and 90 to 100 percent larger than 25 pounds.
- “Light” RSP will consist of rocks 0 to 5 percent larger than ¼ ton, 50 to 100 percent larger than 200 pounds, and 95 to 100 percent larger than 25 pounds.
- “1T” RSP will consist of rocks 0 to 5 percent larger than 2 ton, 50 to 100 percent larger than 1 ton, and 95 to 100 percent larger than ½ ton.
- Method A installation of RSP is a process that consists of excavation and backfilling the footing trench, laying down geotextile fabric, placement of larger rocks in the footing trench, placement of rocks on the slope so that their longitudinal axis is normal to the face of the embankment, placement of foundation course rocks so that they are in contact with the geotextile fabric, and placement of rocks above the foundation course so that each rock has a 3-point bearing on underlying rocks, but not on smaller rocks which may be used for chinking voids.
- Method B installation of RSP is a process that consists of excavation and backfilling the footing trench, laying down geotextile fabric, placement of smaller-sized rocks onto the geotextile fabric, and placement of larger rocks over the smaller rock. The thickness of each rock layer will be at least 1.5 times the diameter of the median-sized rock.

Location 1 - Arroyo de los Playanos:

A 2-span bridge will replace the downstream 90-inch concrete pipe culvert. The bridge will be 240 feet long, with 120 feet from Abutment 1 to Bent 2 and another 120 feet from Bent 2 to Abutment 3. Bent 2, the support for where the two (2) spans meet, will consist of two (2) 4-foot diameter columns made of cast-in-place concrete placed over two (2) 72-inch cast in drill hole (CIDH) piles that will displace a total of 125.6 cubic feet. The

42-foot wide abutments together will require the excavation of approximately 258 cubic yards of material and the backfill of approximately 149 cubic yards of material. The bridge footing will require 51 cubic yards of concrete. Construction of a temporary trestle over Arroyo de los Playanos will be used during bridge installation to minimize disturbance to the wetlands within the drainage. The trestle will be used year round as a platform from which to conduct bridge construction activities as well as an access route across the creek. Pile-driving will be required for the bridge abutments, which will be located outside of CDFW jurisdiction. Temporary trestle supports will be pile driven in jurisdictional areas. Bent 2 will not require pile driving but will be located within the jurisdictional area. Work within the jurisdictional area will occur between April 15 and October 31 during dry work conditions with the exception of the pile driving for the trestle, which might be done when ground is wet. Other work could continue year round from above the trestle or bridge.

The removal of the existing roadway, 90-inch concrete pipe culvert, head wall, and wing walls at the mouth of Arroyo de los Playanos will require the excavation of an area of approximately 85 feet by 70.6 feet and 12 feet deep and subsequent backfill with approximately 2,667 cubic yards of native and/or clean fill. The area will be compacted and recontoured to a natural topography.

Diversion of flows is not anticipated at this location, but dewatering of groundwater or surface water that is not flowing might become necessary. Final plans for dewatering will be provided to CDFW for review and approval at least 30 days prior to implementation. No dewatering activities will occur until the submitted plans are approved.

Location 2 - Arroyo del Corral:

A box culvert in a perennial stream will be removed and replaced with a bridge that will span the active channel. The bridge will be 380 feet long and will be 115 feet from Abutment 1 to Pier 2, 150 feet from Pier 2 to Pier 3, and another 115 feet from Pier 3 to Abutment 4. Each of the two (2) piers, the supports for where the spans meet, will consist of two (2) 5-foot and 6-inch diameter columns placed over two (2) 72-inch cast in drill hole (CIDH) piles that will displace a total of 475 cubic feet. The 44-foot and 8-inch wide abutments will require the excavation of approximately 312 cubic yards of material and the backfill of approximately 210 cubic yards of material. The bridge footing will require 58 cubic yards of concrete. Dewatering of groundwater might be required for the construction of the new bridge at this location, and will be necessary for the removal of the old culvert (see below). Pile driving will be required for the bridge abutments. Piles will be located outside the active stream channel, but may encounter ground water and require pumping out. Pumped water would be collected in a settling pool and only discharged clean to the natural drainage. Pile driving activities, including for abutments, will occur between June 1 and October 31.

To prepare for the removal of the 12-foot by 7-foot reinforced concrete box (RCB) culvert in Arroyo del Corral, isolation of the work area (about 150 feet) could be necessary to create dry conditions. A coffer dam could suffice, but if the depth of water column and a high groundwater-table preclude proper functioning of a coffer dam,

additional methods such as installation of exclusionary fencing consisting of a silt curtain will be implemented. The work area would remain dewatered or isolated for approximately two (2) weeks to complete the Project. The removal of the existing roadway at Arroyo del Corral and of the culvert, headwall, and wing walls at the mouth of the creek will require excavation of an area approximately 307 feet by 71.6 feet and 13 feet deep, and will require approximately 10,583 cubic yards of native and/or clean fill. The area will be compacted and recontoured to a natural topography.

Final plans for dewatering and/or diversion will be provided to CDFW for review and approval at least 30 days prior to implementation. No dewatering and/or diversion activities are allowed until the submitted plans are approved.

Location 3 - Unnamed Drainage:

Three (3) concrete box culverts, each 4-foot by 4-foot and 89 foot long with a 2-foot embedment for a total height of 6 feet, will replace an existing 90-inch diameter concrete pipe culvert. The inlet of each box culvert will require approximately 16 cubic yards of concrete for each 10-foot-long wing wall. Installation of RSP at the inlet of each box culvert will require 36 square feet of geotextile fabric, 0.8 cubic yards of "No.1" RSP using Method B, and 2.0 cubic yards of "1T" RSP using Method A. The outlet of each box culvert will require approximately 16 cubic yards of concrete for the 10-foot-long wing wall and apron. The installation of RSP at the outlet of each box culvert will require 269 square feet of geotextile fabric and 6.4 cubic yards of "No.1" RSP installed using Method B, 10.7 cubic yards of "Light" RSP installed using Method B, and 2.0 cubic yards of "1T" RSP installed using Method A.

The removal of the existing roadway, 90-inch concrete pipe culvert, head wall, and wing walls at the mouth of the unnamed drainage will require excavation of an area 195 feet by 60.7 feet and 13 feet deep, and the subsequent placement of approximately 130 cubic yards of native and/or clean fill. The area will be compacted and recontoured.

Diversion is not anticipated at this location, but dewatering of groundwater or surface water might become necessary. Final plans for dewatering will be provided to CDFW for review and approval at least 30 days prior to implementation. No dewatering activities are allowed until the submitted plans are approved.

Location 4 - Arroyo del Oso:

An existing 108-inch concrete pipe culvert will be replaced with a 2-span bridge. The bridge will be 216 feet long and will be 108 feet from Abutment 1 to Pier 2 and another 108 feet from Pier 2 to Abutment 3. Pier 2, the support for where the spans meet, will consist of two (2) 4-foot diameter columns made of prestressed cast-in-place concrete girder placed over two (2) 72-inch cast in drill hole (CIDH) piles that will displace a total of 125.6 cubic feet. The 42-foot wide abutments will require the excavation of approximately 202 cubic yards of material and the backfill of approximately 113 cubic yards of material outside 1600 jurisdiction. The bridge footing will require 51 cubic yards of concrete. Construction of a temporary trestle over Arroyo del Oso will be used during bridge installation to minimize disturbance to the wetlands within the drainage.

The trestle will be used as a platform from which to conduct bridge construction activities as well as an access route across the creek. Pile-driving will be required for the bridge abutments and temporary trestle support piles. Permanent piles will be located outside the active stream channel. Pile driving activities will take up to 22 days between June 1 and October 31.

Removal of the existing roadway, 108-inch pipe culvert, head and wing walls, and rock riprap at the mouth of Arroyo del Oso will require excavation of 74 feet by 74.2 feet by 15 feet and less than 3,050 cubic yards of native and/or clean fill. The area will be compacted and recontoured to a natural topography. Arroyo del Oso is expected to be dry at the time of culvert removal so no dewatering or coffer dam installation is expected at this location. If water is present during instream activities associated with construction of the new bridges at this location, than coffer dam installation and dewatering of about 100 linear feet of Arroyo del Oso would be required. The coffer dam would remain in place for no more than 100 days between June 1 and September 30.

Diversion is not anticipated at this location, but dewatering of groundwater or surface water might become necessary. Final plans for dewatering and/or diversion will be provided to CDFW for review and approval at least 30 days prior to implementation. No dewatering activities are allowed until the submitted plans are approved.

Location 5 - Unnamed Drainage:

A 30-inch pipe culvert extending 117.6 linear feet will replace the existing two (2) 18-inch plastic pipe culverts. Permittee will provide the final design plan, including pipe material, to CDFW for review and approval prior to commencing work at this location. The inlet will require approximately 1.5 cubic yards of concrete for the 10-foot-long headwall and apron. Installation of RSP at the inlet will require 150 square feet of geotextile fabric and 6.9 cubic yards of "No.1" RSP installed using Method B. The outlet will require approximately 1.5 cubic yards of concrete for the 10-foot-long headwall and apron. The installation of RSP at the outlet will require 210 square feet of geotextile fabric and 19.4 cubic yards of "Light" RSP installed using Method B.

The removal of the existing roadway, including a double 18-inch plastic pipe culvert and Portland cement concrete headwalls at the mouth of the unnamed drainage will require excavation of 18 feet by 48.7 feet by 4 feet and less than 130 cubic yards of fill. The area will be compacted and recontoured to a natural topography.

Diversion is not anticipated at this location, but dewatering of groundwater or surface water might become necessary. Final plans for dewatering and/or diversion will be provided to CDFW for review and approval at least 30 days prior to implementation. No dewatering activities are allowed until the submitted plans are approved.

- A total of four (4) Arroyo willows (*Salix* spp.) and one (1) Monterey Cypress with trunks sized four (4) inches diameter at breast height (DBH) and larger will be removed as a result of Project implementation.

- Equipment required to complete the Project includes, but is not limited to a backhoe, loader, excavator, scraper, light and heavy duty trucks, water truck, bulldozer, crane, drill rig, and pile driver.
- All Notification materials including the engineered plans, Biological Opinions, Mitigation and Monitoring Plan, and Natural Environment Study and subsequently-submitted Project materials in response to CDFW's September 6, 2013, incomplete notification letter are made part of the Project description.

PROJECT IMPACTS

Location 1 - Arroyo de los Playanos - will result in approximately 25.12 square feet permanent and 13,680 square feet of temporary impacts.

Location 2 - Arroyo del Corral - will result in approximately 95 square feet permanent and 3,800 square feet of temporary impacts.

Location 3 - Unnamed Drainage - will result in approximately 13,940 square feet of permanent and 16,640 square feet of temporary impacts.

Location 4 - Arroyo del Oso - will result in approximately 25.12 square feet of permanent and 9,235 square feet of temporary impacts.

Location 5 - Unnamed Drainage - will result in approximately 1,002 square feet of permanent and 1,089 square feet of temporary impacts.

The Project will result in a total of approximately 0.344 acres of permanent impacts and approximately 1.768 acres of temporary impacts to habitats in the CDFW jurisdictional area. The total linear disturbance for all five (5) Project locations will be approximately 150 linear feet of permanent impacts and 513 linear feet of temporary impacts. Other potential impacts related to disturbance during Project implementation include but are not limited to those resulting from noise, vibration, trampling/crushing, erosion, and surface water contact with new concrete or other construction-related materials.

This Agreement is intended to avoid, minimize, and mitigate adverse impacts to the fish and wildlife resources that occupy the Project area, and the adjacent habitat. Absent implementation of the Protective Measures required by this Agreement, the species presented in Table A and their habitats could potentially be impacted within the area covered by this Agreement, as well other birds, mammals, fish, reptiles, amphibians, invertebrates, and plants that compose the local ecosystem.

TABLE A. Potentially Impacted Species				
Name	Scientific Name	Listing		
		Federal	State	Other
Special Status Wildlife				
Burrowing owl	<i>Athene cunicularia</i>	---	CSC	---
California red-legged frog	<i>Rana draytonii</i>	T	CSC	---
Northern elephant seal	<i>Mirounga angustirostris</i>	---	FPS	MMPA
Snowy plover	<i>Charadrius alexandrinus nivosus</i>	T	---	---
South-central California coast steelhead	<i>Onchorhynchus mykiss</i>	T	CSC	---
Southwestern pond turtle	<i>Actinemys marmorata pallida</i>	---	CSC	---
Tidewater goby	<i>Eucyclogobius newberryi</i>	E	CSC	---
Two-striped garter snake	<i>Thamnophis hammondi</i>	---	CSC	---
Special Status Plants				
Adobe sanicle	<i>Sanicula maritime</i>		R	CNPS 1B.1
Cambria Morning Glory	<i>Calystegia subacaulis ssp. episcopalis</i>			CNPS 1B.2
Compact cobwebby thistle	<i>Cirsium occidentale var. compactum</i>			CNPS 1B.2
Dwarf golden star	<i>Bloomeria humilis</i>		R	CNPS 1B.2
Gairdner's yampah	<i>Perideridia gairdneri ssp. gairdneri</i>			CNPS 4.2
Harlequin lotus	<i>Lotus formosissimus</i>			CNPS 4.2
Hearst's ceanothus	<i>Ceanothus hearstiorum</i>		R	CNPS 1B.2
Hickman's onion	<i>Allium hickmanii</i>			CNPS 1B.2
Maritime ceanothus	<i>Ceanothus maritimus</i>		R	CNPS 1B.2
Nuttall's milk-vetch	<i>Astragalus nuttallii var. nuttallii</i>			CNPS 4.2
Obispo Indian paintbrush	<i>Castilleja densiflora ssp. obispoensis</i>			CNPS 1B.1
San Luis Obispo sedge	<i>Carex obispoensis</i>			CNPS 1B.2
Small-leaved lomatium	<i>Lomatium parvifolium</i>			CNPS 4.2

T = Threatened, E = Endangered, FPS = Fully Protected Species, CSC = California Species of Concern, CNPS = California Native Plant Society, R = Rare, MMPA = Marine Mammal Protection Act

MEASURES TO PROTECT FISH AND WILDLIFE RESOURCES

1 Administrative Measures

Permittee shall meet each administrative Protective Measure described below.

- 1.1 Documentation at Project Site. Permittee shall make this Agreement, any extensions and amendments to this Agreement, and all related notification materials and California Environmental Quality Act (CEQA) documents, readily available at the Project site at all times and shall be presented to CDFW personnel or personnel from another State, Federal, or local agency upon request.
- 1.2 Providing Agreement to Persons at Project Site. Permittee shall provide copies of this Agreement and any extensions and amendments to this Agreement to all

persons who will be working on the Project at the Project site on behalf of Permittee, including but not limited to contractors, subcontractors, inspectors, and monitors.

- 1.3 Notification of Conflicting Provisions. Permittee shall notify CDFW if Permittee determines or learns that a Protective Measure in this Agreement might conflict with a provision imposed on the Project by another local, State, or Federal agency. In that event, CDFW shall contact Permittee to resolve any conflict.
- 1.4 Project Site Entry. Permittee agrees that CDFW personnel may enter the Project site at any time to verify compliance with this Agreement.
- 1.5 Legal Obligations. This Agreement does not exempt Permittee from complying with all other applicable local, State, and Federal law, or other legal obligations.
- 1.6 Unauthorized Take. This Agreement does not authorize the “take” (defined in Fish and Game Code Section 86 as to hunt, pursue, catch, capture, or kill; or attempt to hunt, pursue, catch, capture, or kill) of State- or Federally-listed threatened or endangered species. Any such take shall require separate permitting as may be required.
- 1.7 Property Not Owned by Permittee. To the extent that the Protective Measures of this Agreement provide for activities that require Permittee to enter on another owner’s property, they are agreed to with the understanding that Permittee possesses the legal right to so enter.
- 1.8 Water Diversion. To the extent that the Protective Measures of this Agreement provide for the diversion of water, they are agreed to with the understanding that Permittee possesses the legal right to so divert such water.
- 1.9 Work Schedule. Permittee shall submit a work schedule to CDFW by mail or email to Laura.Peterson-Diaz@wildlife.ca.gov, with reference to Agreement No. 1600-2013-0139-R4, prior to beginning any activities covered by this Agreement. Permittee shall also notify CDFW within 30 days upon the completion of the activities covered by this Agreement.
- 1.10 Training. Prior to starting any activity within the stream bed or bank, all employees, contractors, and visitors who will be present during Project activities shall receive training from a qualified individual on the contents of this Agreement, the resources at stake, and the legal consequences of non-compliance. Documentation of such training shall be submitted to CDFW.

2 Avoidance and Minimization Measures

To avoid or minimize adverse impacts to fish and wildlife resources identified above, Permittee shall implement each Protective Measure listed below.

- 2.1 Construction/Work Hours. All non-emergency work activities shall be confined to daylight hours with the exception of traffic movement and striping. For purposes of this Agreement, "daylight hours" are defined as that daytime period between sunrise and sunset.
- 2.2 Flagging/Fencing. Prior to any activity within the stream, Permittee shall identify the limits of the required access routes and encroachment into the stream. These "work area" limits shall be identified with brightly-colored flagging/fencing. Work completed under this Agreement shall be limited to this defined area only. Flagging/fencing shall be maintained in good repair for the duration of the Project. All CDFW jurisdictional areas beyond the identified work area limits shall be considered Environmentally Sensitive Areas (ESA) and shall not be disturbed.
- 2.3 Listed and Other Special Status Species.
- (a) This Agreement does not allow for the take, or incidental take, of any State- or Federally-listed threatened or endangered species. Liability for any take, or incidental take, of such listed species remains the separate responsibility of Permittee for the duration of the Project.
 - (b) Permittee affirms that no take of listed species will occur as a result of this Project and will take prudent measures to ensure that all take is avoided. Permittee acknowledges that they fully understand that they do not have State incidental take authority. If any State- or Federally-listed threatened or endangered species occur within the proposed work area or could be impacted by the work proposed, and thus taken as a result of Project activities, Permittee is responsible for obtaining and complying with required State and Federally threatened and endangered species permits or other written authorization before proceeding with this Project.
 - (c) Permittee shall immediately notify CDFW of the discovery of any such rare, threatened, or endangered species prior to and/or during Project implementation.
 - (d) Pre-activity surveys for potential rare, listed, or other sensitive species shall be conducted by a qualified biologist within 30 days prior to commencement of each Project activity unless specified in species-specific measures below. Surveys shall be conducted on the work areas and all access routes to avoid and minimize incidental take, confirm previous observations, identify any areas occupied by listed or sensitive species, and clearly mark all resources to be avoided by Project activities. If any State- or Federally-listed threatened, endangered, or candidate species are found or could be impacted by the work proposed, Permittee shall notify CDFW of the discovery, and work shall not commence until CDFW provides written authorization. A new Agreement and/or a 2081(b) State Incidental Take Permit may be necessary and a new CEQA analysis may need to be conducted before work can begin.

- (e) Tidewater Goby, California Red-Legged Frog, and Western Snowy Plover: Permittee shall comply with the terms of the Biological Opinion (8-8-09-F-67) issued by the United States Fish and Wildlife Service (USFWS) that addresses the Project activities covered by this Agreement.
- (f) Steelhead: Permittee shall comply with the terms of the Biological Opinion (SWR/2009/06598) issued by the National Marine Fisheries Service (NMFS) that addresses the Project activities covered by this Agreement.
- (g) Two-Striped Garter Snake and Pacific (Western) Pond Turtle: Any individuals of these species discovered at the site immediately prior to or during Project activities shall be allowed to move out of the area of their own volition; if this is not feasible, individuals shall be captured by a qualified biologist who holds a Scientific Collecting Permit for the species, and relocated out of harm's way to the nearest suitable habitat upstream or downstream from the Project site and outside the influence of the Project site. Any of these species observed or moved shall be documented within the Final Report.
- (h) Burrowing Owl: A qualified biologist shall survey for burrowing owl within a 500-foot radius of each Project site, within 30 days prior to initiating Project activities. If any active burrowing owl burrows are observed, these burrows shall be designated an ESA, protected, and monitored by a qualified biologist (while occupied) during Project-related activities. A minimum 500-foot avoidance buffer shall be established and maintained around each owl burrow during the nesting season (February 1 through August 31). If active burrowing owl burrows are observed outside of the nesting season, a minimum 150-foot no disturbance buffer shall be established around each burrow. Implementation of passive relocation with one-way doors is not authorized by CDFW in this Agreement.
- (i) Sensitive Plant Species: Several sensitive plant species have the potential to be present throughout the Project site. Botanical surveys have been conducted for the Project site, as documented in the Natural Environment Study provided with the Notification, and four (4) State rare plants were identified within the Biological Study Area. Permittee shall flag a 50-foot "no-operations" buffer zone around all rare plant(s) or groupings of rare plants and any other listed or special status plants detected before or during Project activities, or take alternative protective action proposed by Permittee and approved by CDFW in advance and in writing. State rare plant species may not be taken at any time pursuant to Fish and Game Code Section 1907 and full avoidance of these species shall occur during Project implementation.

2.4 Fish and Wildlife.

- (a) If any fish or wildlife is encountered during the course of Project activities, said fish and wildlife shall be allowed to leave the Project area unharmed.
- (b) Pursuant to FGC Sections 3503 and 3503.5, it is unlawful to take, possess, or destroy the nest or eggs of any bird or bird-of-prey. To protect nesting birds,

no Project activity shall be completed from March 1 through August 31 unless the following surveys are completed by a qualified biologist within 30 days prior to commencing Project activities at each location.

Raptors: Survey for nesting activity of raptors within a 500-foot radius of the Project site. Surveys shall be conducted at appropriate nesting times and concentrate on mature trees. If any active nests are observed, these nests and nest trees shall be designated an ESA and protected by a 500-foot radius until the young have fledged and are no longer reliant on the nest tree or parental care.

Other Avian Species: Survey for nesting activity within a 250-foot radius of the Project boundaries. If any active nests are observed, these nests shall be designated an ESA and protected with a minimum 250-foot buffer until the young have fledged and are no longer reliant on the nest site or parental care.

CDFW may consider variances from these buffers when there is a compelling biological or ecological reason to do so, such as when the Project area would be concealed from a nest site by topography.

2.5 Vegetation.

- (a) Trimming and removal of vegetation shall be limited to the minimal amount necessary to complete the Project.
- (b) Permittee shall document the number and species of all riparian woody-stemmed plants in excess of four (4) inches DBH that are cut, trimmed, or otherwise removed or are damaged during Project activities. Riparian trees and shrubs with a DBH of four (4) inches or greater that are damaged or removed shall be replaced by replanting appropriate native species at a 3:1 ratio (replaced to lost), except that heritage trees 24-inches or greater shall require replanting of like species at a 10:1 ratio in or immediately adjacent to the Project site, according to Compensatory Measure 3.1(a) Revegetation and Restoration.
- (c) Vegetation or material removed from the Project site shall be disposed of at an appropriate and legal off-site location where the material cannot enter the stream channel. No such material shall be stockpiled in the streambed, banks, or channel, except that native vegetation removed from the channel may be chipped and the chips used as mulch for disturbed soil sites in or near the Project area.
- (d) All invasive, exotic plant species disturbed by Project activities shall be bagged, removed from the Project site, and appropriately disposed of offsite. Non-native species shall not be used in mulching, composting, or otherwise placed in or around the Project site.

- (e) Heavy equipment and other machinery shall be inspected for the presence of undesirable species and cleaned prior to on-site use to reduce the risk of introducing exotic plant species into the Project site.

2.6 Vehicles and Equipment.

- (a) Vehicles shall not be operated in areas where surface water is present, and shall only operate in the streambed and banks during naturally dry conditions except as part of a Diversion or Dewatering Plan that is approved in advance and in writing by CDFW.
- (b) Vehicle access to the stream banks and bed shall be limited to predetermined ingress and egress corridors on existing roads. All other CDFW jurisdictional areas adjacent to the work site shall be considered an ESA and shall remain off-limits to vehicles and equipment.
- (c) Any equipment or vehicles driven and/or operated within or adjacent to the stream shall be checked and maintained daily to prevent leaks of materials that, if introduced to water, could be deleterious to aquatic and terrestrial life.
- (d) Staging and storage areas for equipment, materials, fuels, lubricants, and solvents shall be located outside of the stream channel and banks. Stationary equipment such as motors, pumps, generators, compressors, cranes, and welders, located within or adjacent to the stream, shall be positioned over drip-pans. Vehicles shall be moved at least 100 feet away from the stream prior to refueling and lubrication.

2.7 Structures.

- (a) Permittee confirms that any and all structures and constructed features shall be properly aligned and otherwise engineered, installed, and maintained, to assure resistance to washout, and to erosion of the stream bed, stream banks and/or fill and that they will not cause long-term changes in water flows that adversely modify the existing upstream or downstream stream bed/bank contours or increase sediment deposition. Permittee shall ensure that all structures and other constructed features are designed to accommodate and withstand 100-year flood events.
- (b) Permittee shall submit the final design plans for the culvert at Location 5 to CDFW at least 14 days in advance of planned activity at Location 5. Initiation of Project activity at Location 5 shall not commence until CDFW has reviewed and provided written approval of the final design plan.

2.8 Fill/Spoil.

- (a) Spoil storage sites shall not be located within the stream, or where spoil will be washed into the stream. Rock, gravel, and/or other materials shall not be imported into or moved within the bed or banks of the stream, except as otherwise addressed in this Agreement.

- (b) Fill shall be limited to the minimal amount necessary to accomplish the agreed activities. Excess fill material shall be moved off-site at Project completion.

2.9 Erosion.

- (a) No ground disturbing work within the banks of the stream shall be conducted during or within 24 hours following significant rainfall events ($\frac{1}{4}$ of 1 inch of rain in any 24-hour period) or when water is flowing within the channel, unless the site is dewatered according to an approved Diversion or Dewatering Plan.
- (b) All disturbed soils within the Project site shall be stabilized to reduce erosion potential, both during and following Project activity. Temporary erosion control devices, such as straw bales, silt fencing, and sand bags, may be used, as appropriate, to prevent siltation of the stream. To minimize the risk of ensnaring and strangling wildlife, coir rolls, erosion control mats or blankets, straw or fiber wattles, or similar erosion control products shall be composed entirely of natural-fiber, biodegradable materials. Permittee shall not use "photodegradable" or other plastic erosion control materials.
- (c) If it is determined that silt levels resulting from Project-related activities constitute a threat to aquatic life, activities associated with the siltation shall be halted until effective CDFW-approved control devices are installed, or abatement procedures are initiated.

2.10 Pollution.

- (a) During Project implementation, Permittee shall not dump any litter or debris within the stream. All such debris and waste shall be picked up daily and properly disposed of at an appropriate site.
- (b) Raw cement, concrete or washings thereof, asphalt, paint or other coating material, oil or other petroleum products, or any other substances that could be hazardous to fish or wildlife resulting from Project-related activities, shall be prevented from contaminating the soil and/or entering the "Waters of the State".
- (c) Permittee shall install the necessary containment structures to control the placement of any wet concrete/cement and to prevent it from entering into the channel outside of those structures. No concrete/cement shall be poured or applied below the top of bank if the 7-day weather forecast indicates any chance of rain. At all times when Permittee is pouring or working with wet concrete/cement there shall be a designated monitor to inspect the containment structures and ensure that no concrete or other debris enters into the channel outside of those structures. Poured concrete/cement shall remain isolated from surface waters and soils that could become saturated, and allowed to cure for a minimum of 30 days or until the pH as tested with tap water does not exceed 9.5. Any rain water that comes into contact with

- the concrete structures shall be contained and isolated from stream flows, and disposed of in a lawful manner at an off-site location; the water pH shall be tested, and water shall be removed from the site and disposed of lawfully if the pH exceeds 9.5. Permittee shall submit to CDFW the methods and results of all pH testing, including measurements that demonstrate a pH at or below 9.5 and the pH as tested 30 days after concrete pouring.
- (d) Prior to the discharge of encountered groundwater into the stream channel, Permittee shall provide CDFW with the appropriate authorization from the Regional Water Quality Control Board.
 - (e) Permittee and all contractors shall be subject to the water pollution regulations found in FGC Sections 5650 and 12015.
 - (f) In the event that a spill occurs, all Project activities shall immediately cease until cleanup of the spilled materials is completed. CDFW shall be notified immediately by Permittee of any spills and shall be consulted regarding cleanup procedures.
 - (g) All Project-generated debris, building materials, and rubbish shall be removed daily from the stream bed and banks, and from areas where such materials could be washed into the stream bed and banks.

2.11 Fish Rescue. If fish are present in the work site and dewatering is necessary, a qualified biologist with all necessary State and Federal permits shall rescue any fish within the work site prior to diverting water. Rescued fish shall be moved to the nearest appropriate site outside of the work area. A record shall be maintained of all fish rescued and moved. The record shall include, at a minimum, the date of capture and relocation, the method of capture, location of relocation in relation to the Project site, and the number and type of fish captured and relocated. The record shall be provided to CDFW within two (2) weeks of the fish rescue activity. Any fish rescue activity shall not conflict with the Biological Opinion (SWR/2009/06598) from NMFS obtained for this Project.

2.12 Work Site Dewatering. All Project activity shall be performed in the absence of surface water in the Project work area. If necessary to create or maintain dry conditions within the work area, diversion of water flow shall be implemented, and Permittee shall submit a Diversion or Dewatering Plan to CDFW for approval at least 30 days prior to Project commencement. The Plan shall incorporate, at a minimum, the following:

- (a) Check dams, cofferdams, or other barriers shall not be made of silt, sand and gravel, or other substances subject to erosion unless first enclosed by sheet piling, rock riprap, sandbags, or other protective material. The enclosure and supportive material shall be removed when the work is completed and removal shall normally proceed from downstream in an upstream direction.

- (b) If it is necessary to dewater the work site, either by pump or by gravity flow, the suction end of the intake pipe shall be fitted with fish screens meeting Department and National Marine Fisheries Service (NMFS) criteria to prevent entrainment or impingement of small fish:
(http://www.dfg.ca.gov/fish/Resources/Projects/Engin/Engin_ScreenCriteria.asp). Any turbid water pumped from the work site itself to maintain it in a dewatered state shall be placed in a settling pool to allow the sediment to drop out. Once the water is clear, it shall be returned to the stream bed below the culvert to maintain water flow.
- (c) The check dams, cofferdams, or other barriers shall be constructed to prevent seepage to maximum extent possible. Any infiltrating water shall be pumped to a low-gradient vegetated upland area before discharging into the stream channel. Other filtration methods may be used depending upon site-specific conditions. Water pumped to upland areas shall be discharged in a manner as to not cause erosion (i.e., installation of velocity dissipaters at the outfall). If infiltrating water has come into contact with uncured concrete, all water shall be removed from the site and not allowed to enter the stream, per Avoidance and Minimization Measure 2.10(c).

3 Compensatory Measures

To compensate for adverse impacts to fish and wildlife resources identified above that cannot be avoided or minimized, Permittee shall implement each Protective Measure listed below.

3.1 Revegetation and Restoration.

- (a) If any trees four (4) inches in DBH or greater are removed as part of the Project, Permittee shall develop a Revegetation Plan for the site and submit it to CDFW for approval at least 30 days prior to Project commencement. The Revegetation Plan shall specifically address plantings of native trees, shrubs, herbs and grasses removed, as indicated in Avoidance and Minimization Measure 2.5 (b) above, and include monitoring and maintenance to ensure a minimum of 70 percent survival for the plantings after five (5) years, including up to three (3) years with supplemental water and at least two (2) years without such assistance. The Plan shall also identify remedial action to be taken if the survival success criteria are not met, and methods for annual monitoring and reporting to CDFW.
- (b) If the Project causes any exposed slopes or exposed areas on the stream banks, these areas shall be seeded (with weed-free straw or mulch) with a blend of a minimum of three (3) locally native grass species. One (1) or two (2) sterile non-native perennial grass species may be added to the seed mix provided that amount does not exceed 25 percent of the total seed mix by count. Locally native wildflower and/or shrub seeds may also be included in the seed mix. The seeding shall be completed as soon as possible, but no later than November 15 of the year Project activity ends in any location. A

seed mixture shall be submitted to CDFW for approval prior to application. At the discretion of CDFW, all exposed areas where seeding is considered unsuccessful after 90 days shall receive appropriate soil preparation and a second application of seeding, straw, or mulch as soon as is practical on a date mutually agreed upon.

- (c) Where suitable vegetation cannot be reasonably expected to become established, non-erodible materials shall be used for such stabilization. Any installation of non-erodible materials not described in the original Project description shall be coordinated with CDFW. Coordination may include the negotiation of additional Protective Measures for this activity.

4 Reporting Measures

Permittee shall meet each reporting requirement described below.

4.1 Obligations of Permittee.

- (a) Permittee shall have primary responsibility for monitoring compliance with all Protective Measures in this Agreement. Protective Measures must be implemented within the time periods indicated in this Agreement and according to the reporting described below.
- (b) Permittee (or Permittee's designee) shall ensure the implementation of the Protective Measures of this Agreement, and shall monitor the effectiveness of the Protective Measures.

4.2 Reports. Permittee shall submit the following Reports to CDFW:

- Construction/work schedule, submitted to CDFW prior to Project commencement (Administrative Measure 1.9).
- Documentation of worker training submitted to CDFW within one (1) week of the training (Administrative Measure 1.10).
- Results of pre-activity surveys, submitted to CDFW at least one (1) week prior to commencing Project activities (Avoidance and Minimization Measure 2.3(d)).
- Results of surveys for nesting birds, if any work is scheduled during the avian nesting season, received by CDFW at least one (1) week prior to commencing each Project activity (Avoidance and Minimization Measure 2.4(b)).
- Final design plans for the culvert at Location 5, submitted for CDFW approval at least 14 days in advance of planned commencement of work at Location 5 (Avoidance and Minimization Measure 2.7(b)).

- Fish Rescue Record, submitted within two (2) weeks of completing fish rescue activity (Avoidance and Minimization Measure 2.11).
- Water Diversion/Dewatering Plan, submitted to CDFW for approval at least 30 days prior to implementing the Plan (Avoidance and Minimization Measure 2.12).
- Documentation of riparian woody-stemmed plants in excess of four (4) inches DBH that are removed (Avoidance and Minimization Measure 2.5(b)) and a Revegetation Plan, submitted to CDFW for approval at least 30 days prior to Project commencement (Compensatory Measure 3.1(a)).
- A Final Project Report to be submitted to CDFW within 30 days after the Project is completed. The final report shall summarize the Project and describe the implementation of each Protective Measure of this Agreement, including documentation of species observed or moved per the terms of this Agreement. “Before and after” photo documentation of the Project site shall be included in the report.

CONTACT INFORMATION

Any communication that Permittee or CDFW submits to the other shall be in writing and any communication or documentation shall be delivered to the address below by U.S. mail, fax, or email, or to such other address as Permittee or CDFW specifies by written notice to the other.

To Permittee:

California Department of Transportation (Caltrans)
Jennifer Moonjian
50 Higuera Street
San Luis Obispo, California 93401
Phone: (805) 542-4763
Fax: (805) 549-3233
jennifer.moonjian@dot.ca.gov

To CDFW:

California Department of Fish and Wildlife
Region 4 – Central Region
1234 East Shaw Avenue
Fresno, California 93710
Attn: Lake and Streambed Alteration Program – Laura Peterson-Diaz
Notification No. 1600-2013-0139-R4
Phone: (559) 243-4017, extension 225
Fax: (559) 243-4020
laura.peterson-diaz@wildlife.ca.gov

LIABILITY

Permittee shall be solely liable for any violations of this Agreement, whether committed by Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents or contractors and subcontractors, to complete the Project or any activity related to it that this Agreement authorizes.

This Agreement does not constitute CDFW's endorsement of, or require Permittee to proceed with the Project. The decision to proceed with the Project is Permittee's alone.

SUSPENSION AND REVOCATION

CDFW may suspend or revoke in its entirety this Agreement if it determines that Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents, or contractors and subcontractors, is not in compliance with this Agreement.

Before CDFW suspends or revokes this Agreement, it shall provide Permittee written notice by certified or registered mail that it intends to suspend or revoke. The notice shall state the reason(s) for the proposed suspension or revocation, provide Permittee an opportunity to correct any deficiency before CDFW suspends or revokes this Agreement, and include instructions to Permittee, if necessary, including but not limited to a directive to immediately cease the specific activity or activities that caused CDFW to issue the notice.

ENFORCEMENT

Nothing in this Agreement precludes CDFW from pursuing an enforcement action against Permittee instead of, or in addition to, suspending or revoking this Agreement.

Nothing in this Agreement limits or otherwise affects CDFW's enforcement authority or that of its enforcement personnel.

OTHER LEGAL OBLIGATIONS

This Agreement does not relieve Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents, or contractors and subcontractors, from obtaining any other permits or authorizations that might be required under other Federal, State, or local laws or regulations before beginning the Project or an activity related to it.

This Agreement does not relieve Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents, or contractors and subcontractors, from complying with other applicable statutes in the FGC including, but not limited to, FGC sections 2050 *et seq.* (threatened and endangered species), 3503 (bird nests and eggs), 3503.5 (birds of prey), 5650 (water pollution), 5652 (refuse disposal into water), 5901 (fish passage), 5937 (sufficient water for fish), and 5948 (obstruction of stream).

Nothing in this Agreement authorizes Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents, or contractors and subcontractors, to trespass.

AMENDMENT

CDFW may amend this Agreement at any time during its term if CDFW determines the amendment is necessary to protect an existing fish or wildlife resource.

Permittee may amend this Agreement at any time during its term, provided the amendment is mutually agreed to in writing by CDFW and Permittee. To request an amendment, Permittee shall submit to CDFW a completed CDFW "Request to Amend Lake or Streambed Alteration" form and include with the completed form payment of the corresponding amendment fee identified in CDFW's fee schedule at the time of the request (see Cal. Code Regs., Title 14, § 699.5).

TRANSFER AND ASSIGNMENT

This Agreement may not be transferred or assigned to another entity, and any purported transfer or assignment of this Agreement to another entity shall not be valid or effective, unless the transfer or assignment is requested by Permittee in writing, as specified below, and thereafter CDFW approves the transfer or assignment in writing.

The transfer or assignment of this Agreement to another entity shall constitute a minor amendment, and therefore to request a transfer or assignment, Permittee shall submit to CDFW a completed CDFW "Request to Amend Lake or Streambed Alteration" form and include with the completed form payment of the minor amendment fee identified in CDFW's fee schedule at the time for the request (see Cal. Code Regs., Title 14, § 699.5).

EXTENSIONS

In accordance with FGC section 1605(b), Permittee may request one (1) extension of this Agreement, provided the request is made prior to the expiration of this Agreement's term. To request an extension, Permittee shall submit to CDFW a completed CDFW "Request to Extend Lake or Streambed Alteration" form and include with the completed form payment of the extension fee identified in CDFW's fee schedule at the time of the request (see Cal. Code Regs., Title 14, § 699.5). CDFW shall process the extension request in accordance with FGC 1605(b) through (e).

If Permittee fails to submit a request to extend this Agreement prior to its expiration, Permittee must submit a new notification and notification fee before beginning or continuing the Project this Agreement covers (FGC, § 1605, subd. (f)).

EFFECTIVE DATE

This Agreement becomes effective on the date of CDFW's signature, which shall be:
1) after Permittee's signature; 2) after CDFW complies with all applicable requirements

under the California Environmental Quality Act (CEQA); and 3) after payment of the applicable FGC section 711.4 filing fee listed at http://www.wildlife.ca.gov/habcon/ceqa/ceqa_changes.html.

TERM

This Agreement shall remain in effect for four (4) years beginning on the date signed by CDFW, unless it is terminated or extended before then. All Protective Measures in this Agreement shall remain in force throughout its term. Permittee shall remain responsible for implementing any Protective Measures specified herein to protect fish and wildlife resources after this Agreement expires or is terminated, as FGC section 1605(a)(2) requires.

CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA) COMPLIANCE

In approving this Agreement, CDFW is independently required to assess the applicability of CEQA. The features of this Agreement shall be considered as part of the overall Project description.

Permittee's concurrence signature on this Agreement serves as confirmation to CDFW that the activities conducted under the terms of this Agreement are consistent with the Project as described in the CEQA Environmental Impact Report prepared by the California Department of Transportation as the Lead Agency for the Piedras Blancas Realignment (State Clearinghouse No. 2008031059), with a Notice of Determination filed on August 18, 2010.

CDFW, as a CEQA Responsible Agency, shall make findings and submit a Notice of Determination to the State Clearinghouse upon signing this Agreement.

EXHIBITS

The document listed below is included as an exhibit to this Agreement and is incorporated herein by reference.

Figure 1. Project Location USGS Quad Map.

AUTHORITY

If the person signing this Agreement (signatory) is doing so as a representative of Permittee, the signatory hereby acknowledges that he or she is doing so on Permittee's behalf and represents and warrants that he or she has the authority to legally bind Permittee to the terms herein.

AUTHORIZATION

This Agreement authorizes only the Project described herein. If Permittee begins or completes a Project different from the Project this Agreement authorizes, Permittee may be subject to civil or criminal prosecution for failing to notify CDFW in accordance with FGC section 1602.

CONCURRENCE

The undersigned accepts and agrees to comply with all the terms of this Agreement.

**FOR CALIFORNIA DEPARTMENT OF
TRANSPORTATION**

Jennifer Moonjian
Associate Environmental Planner (Natural Science)

Date

**FOR CALIFORNIA DEPARTMENT OF FISH AND
WILDLIFE**

Jeffrey R. Single, Ph.D.
Regional Manager – Central Region

Date

Prepared by: Laura Peterson-Diaz
Environmental Scientist

Central Coast Regional Water Quality Control Board

October 29, 2014

Larry Bonner
Caltrans
50 Higuera St
San Luis Obispo, CA 93401
email: larry.bonner@dot.ca.gov

VIA ELECTRONIC MAIL

Dear Mr. Bonner:

WATER QUALITY CERTIFICATION NUMBER 34013WQ14 FOR PIEDRAS BLANCAS REALIGNMENT PROJECT, SAN LUIS OBISPO COUNTY

Thank you for the opportunity to review your September 9, 2013 application for water quality certification of the Piedras Blancas Realignment Project (Project). The application was completed on September 17, 2013. The project, if implemented as described in your application and with the additional mitigation and other conditions required by this Clean Water Action Section 401 Water Quality Certification (Certification), appears to be protective of beneficial uses of State waters. We are issuing the enclosed Standard Letter of Certification.

At this time, we do not anticipate issuing additional requirements based on your application. Should new information come to our attention that indicates a water quality problem, we may require additional monitoring and reporting, issue Waste Discharge Requirements, or take other action.

Your Certification application and California Environmental Quality Act (CEQA) documents indicate that project activities have the potential to affect beneficial uses and water quality. The Central Coast Regional Water Quality Control Board (Central Coast Water Board) issues this Certification to protect water quality and associated beneficial uses from project activities. We need reports to determine compliance with this Certification. All technical and monitoring reports requested in this Certification, or any time after, are required per Section 13267 of the California Water Code.

Failure to submit reports required by this Certification, or failure to submit a report of technical quality acceptable to the Executive Officer, may subject you to enforcement action per Section 13268 of the California Water Code. The Central Coast Water Board will base enforcement actions on the date of certification. Any person affected by this Central Coast Water Board action may petition the State Water Resources Control Board (State Water Board) to review this action in accordance with California Water Code Section 13320; and Title 23, California Code of Regulations, Sections 2050 and 3867-3869. The State Water Board, Office of Chief Counsel, PO Box 100, Sacramento, CA 95812, must receive the petition within 30 days of the date of this Certification. We will provide upon request copies of the law and regulations applicable to filing petitions.

If you have questions please contact **Tamara Anderson** at (805) 549-3334 or via email at Tamara.Anderson@waterboards.ca.gov, or Phil Hammer at (805) 549-3882. Please mention the above certification number in all future correspondence pertaining to this project.

Sincerely,

for
Kenneth A. Harris, Jr.
Executive Officer

Enclosures: 1. Action on Request for CWA Section 401 Water Quality Certification
2. Piedras Blancas Construction Restriction Summary

cc: With enclosures

Jennifer Moonjian
Caltrans
50 Higuera St
San Luis Obispo, CA 93401
email: jennifer.moonjian@dot.ca.gov

Linda Connolly
California Department of Fish and Wildlife
Lake and Streambed Alteration
1234 E. Shaw Avenue
Fresno, CA 93710
email: Linda.Connolly@wildlife.ca.gov

Theresa Stevens
U.S. Army Corps of Engineers
Ventura Office
Regulatory Section
2151 Alessandro Drive, Suite 110
Ventura, CA 93001
email: theresa.stevens@usace.army.mil

Laura Peterson-Diaz
California Department of Fish and Wildlife
1234 E. Shaw Avenue
Fresno, CA 93710
email: Laura.Peterson-Diaz@wildlife.ca.gov

Holly Costa
U.S. Army Corps of Engineers
San Francisco District
Regulatory Section
1455 Market Street, Floor 16
San Francisco, CA. 94103-1398
email: holly.n.costa@usace.army.mil

401 Program Manager
State Water Resources Control Board
Division of Water Quality
email: Stateboard401@waterboards.ca.gov

U.S. Environmental Protection Agency
email: R9-WTR8-Mailbox@epa.gov

Dr. Jeffrey Single
California Department of Fish and Wildlife
Lake and Streambed Alteration
1234 E. Shaw Avenue
Fresno, CA 93710
email: Jeff.Single@wildlife.ca.gov

Ashley Betance-Kearn
Central Coast Water Board
email:
Ashley.Betance-Kearn@waterboards.ca.gov

Tamara Anderson
Central Coast Water Board
email: Tamara.Anderson@waterboards.ca.gov

Action on Request for
Clean Water Act Section 401 Water Quality Certification
for Discharge of Dredged and/or Fill Materials

PROJECT: Piedras Blancas Realignment Project

APPLICANT: Larry Bonner
Caltrans
50 Higuera St
San Luis Obispo, CA 93401

ACTION:

1. Order for Standard Certification
2. Order for Technically-conditioned Certification
3. Order for Denial of Certification

STANDARD CONDITIONS:

1. This Certification action is subject to modification or revocation upon administrative or judicial review, including review and amendment per section 13330 of the California Water Code and section 3867 of Title 23 of the California Code of Regulations (23 CCR).
2. This Certification action is not intended to apply to any discharge from any activity involving a hydroelectric facility requiring a Federal Energy Regulatory Commission (FERC) license or an amendment to a FERC license unless the pertinent Certification application was filed per 23 CCR subsection 3855(b) and the application specifically identified that a FERC license or amendment to a FERC license was being sought.
3. The validity of any non-denial Certification action (Actions 1 and 2) is conditioned upon total payment of the fee required under 23 CCR section 3833, unless otherwise stated in writing by the certifying agency.

ADMINISTRATIVE CONDITIONS:

1. This Certification is subject to the acquisition of all local, regional, state, and federal permits and approvals as required by law. Failure to meet any conditions contained herein or any conditions contained in any other permit or approval issued by the State of California or any subdivision thereof may result in the revocation of this Certification and civil or criminal liability.
2. In the event of a violation or threatened violation of this Certification, the violation or threatened violation shall be subject to any remedies, penalties, process or sanctions as provided for under state law. For purposes of Section 401(d) of the Clean Water Act, the applicability of any state law authorizing remedies, penalties, process or sanctions for the violation or threatened violation constitutes a limitation necessary to assure compliance with the water quality standards and other pertinent requirements incorporated into this Certification.

3. In response to a suspected violation of any condition of this Certification, the Central Coast Water Board may require the holder of any permit or license subject to this Certification to furnish, under penalty of perjury, any technical or monitoring reports the Central Coast Water Board deems appropriate, provided that the burden, including costs, of the reports shall have a reasonable relationship to the need for the reports and the benefits obtained from the reports.
4. In response to any violation of the conditions of this Certification, the Central Coast Water Board may add to or modify the conditions of this Certification as appropriate to ensure compliance.
5. The Central Coast Water Board reserves the right to suspend, cancel, or modify and reissue this Certification, after providing notice to the applicant, if the Central Coast Water Board determines that the Project fails to comply with any of the terms or conditions of this Certification.
6. A copy of this Certification, the application, and supporting documentation must be available at the Project site during construction for review by site personnel and agencies. A copy of this Certification must also be provided to the contractor and all subcontractors who will work at the Project site. All personnel performing work on the proposed Project shall be familiar with the content of this Certification and its posted location on the Project site.
7. The Applicant shall grant Central Coast Water Board staff, or an authorized representative, upon presentation of credentials and other documents as may be required by law, permission to enter the Project site at reasonable times, to ensure compliance with the terms and conditions of this Certification and/or to determine the impacts the Project may have on waters of the State.
8. The Applicant must, at all times, fully comply with the application, engineering plans, specifications, and technical reports submitted to support this Certification; all subsequent submittals required as part of this Certification; and the attached Project Information and Conditions. The conditions within this Certification and attachment(s) supersede conflicting provisions within applicant submittals.
9. The Applicant shall notify the Central Coast Water Board within 24 hours of any unauthorized discharge to waters of the U.S. and/or State; measures that were implemented to stop and contain the discharge; measures implemented to clean-up the discharge; the volume and type of materials discharged and recovered; and additional BMPs or other measures that will be implemented to prevent future discharges.
10. This Certification is not transferable to any person except after notice to the Executive Officer of the Central Coast Water Board. The Applicant shall submit this notice in writing at least 30 days in advance of any proposed transfer. The notice must include a written agreement between the existing and new responsible party containing a specific date for the transfer of this Certification's responsibility and coverage between the current responsible party and the new responsible party. This agreement shall include an acknowledgement that the existing responsible party is liable for compliance and violations up to the transfer date and that the new responsible party is liable from the transfer date on.
11. This Certification expires if Project construction does not begin (a) prior to expiration of the associated U.S. Army Corps of Engineers (Corps) authorization or permit for the Project, or

(b) within five years from the date of this Certification. If a Corps authorization or permit was unnecessary for this Project due to coverage under a non-reporting Nationwide Permit (NWP), and Project construction has not begun, this Certification expires when the non-reporting NWP expires. If the Corps issues a one-year grace period for uncompleted projects that began under a NWP that has since expired, this Certification is valid during the grace period for such projects. If this Certification does not expire as described above, it remains in effect until the Applicant complies with all Certification requirements and conditions.

12. The total fee for this project is \$39,139.00. The remaining fee payable to the Central Coast Water Board is \$0.

CENTRAL COAST WATER BOARD CONTACT PERSON:

Tamara Anderson
(805) 549-3334
Tamara.Anderson@waterboards.ca.gov

Please refer to the above certification number when corresponding with the Central Coast Water Board concerning this project.

WATER QUALITY CERTIFICATION:

I hereby issue an order certifying that as long as all the conditions listed in this Certification are met, any discharge from the Piedras Blancas Realignment Project shall comply with the applicable provisions of sections 301 ("Effluent Limitations"), 302 ("Water Quality Related Effluent Limitations"), 303 ("Water Quality Standards and Implementation Plans"), 306 ("National Standards of Performance"), and 307 ("Toxic and Pretreatment Effluent Standards") of the Clean Water Act. This discharge is also regulated pursuant to State Water Board Water Quality Order No. 2003-0017-DWQ, which requires compliance with all conditions of this Certification.

Except insofar as may be modified by any preceding conditions, all Certification actions are contingent on (a) the discharge being limited and all proposed mitigation being completed in strict compliance with the applicant's project description and the attached Project Information and Conditions, and (b) compliance with all applicable requirements of the Central Coast Water Board's policies and Water Quality Control Plan (Basin Plan).

for _____
Kenneth A. Harris, Jr.
Executive Officer
Central Coast Water Board

October 29, 2014
Date

PROJECT INFORMATION AND CONDITIONS

Application Date	Received: September 9, 2013 Completed: September 17, 2013
Applicant	Larry Bonner Caltrans 50 Higuera St San Luis Obispo, CA 93401 larry.bonner@dot.ca.gov (805) 549-3337
Applicant Representatives	Jennifer Moonjian Caltrans 50 Higuera St San Luis Obispo, CA 93401 jennifer.moonjian@dot.ca.gov (805) 542-4763
Project Name	Piedras Blancas Realignment Project
Application Number	34013WQ14
Type of Project	Highway realignment
Project Location	Piedras Blancas Latitude: 35.67122° N Longitude: 121.28177° W
County	San Luis Obispo
Receiving Water(s)	Arroyo de Los Playanos 310.13 Estero Bay Hydrologic Unit Arroyo del Corral 310.13 Estero Bay Hydrologic Unit Arroyo del Oso 310.13 Estero Bay Hydrologic Unit Pacific Ocean 310.13 Estero Bay Hydrologic Unit
Water Body Type	Streambed, riparian area, wetland
Designated Beneficial Uses	Municipal and Domestic Supply (MUN) Agricultural Supply (AGR) Ground Water Recharge (GWR) Water Contact Recreation (REC-1) Non-Contact Recreation (REC-2) Wildlife Habitat (WILD) Cold Fresh Water Habitat (COLD) Warm Fresh Water Habitat (WARM) Migration of Aquatic Organisms (MIGR) Spawning, Reproduction, and/or Early Development (SPWN) Rare, Threatened or Endangered Species (RARE) Estuarine Habitat (EST) Freshwater Replenishment (FRSH) Navigation (NAV) Commercial and Sport Fishing (COMM) Marine Habitat (MAR)
Project Description (purpose/goal)	The purpose of this project is to provide a long term solution to the adverse effects of shoreline erosion, on the segment of Highway 1

	<p>from just north of Piedras Blancas lighthouse to the Arroyo de la Cruz bridge, by realigning approximately 2.8 miles of roadway.</p> <p>Central Coast Regional Water Quality Control Board (Central Coast Water Board) staff understands that the project includes the following activities:</p> <ol style="list-style-type: none"> 1. Realigning approximately 2.8 miles of highway a maximum of 475 feet east of the existing highway; 2. Installing roadway with two 12-foot wide lanes and 8-foot wide shoulders; 3. Installing three bridges; 4. Installing culverts within seven jurisdictional drainages; 5. Installing stormwater control measures to provide treatment for stormwater runoff; 6. Removing previously installed rock facing, used to stabilize the bluffs, at two locations; and 7. Removing the old roadbed and culverts and returning the area to a natural state.
U.S. Army Corps of Engineers Permit No.	SPL-2013-00512-TS
Federal Public Notice	NA
Dept. of Fish and Wildlife Streambed Alteration Agreement	Streambed Alteration Agreement is pending. Final, signed copy shall be forwarded immediately upon execution.
Status of CEQA Compliance	Environmental Impact Report Lead Agency: Caltrans
Total Certification Fee	\$39,139.00
Area of Disturbance	<p>Approximately 12.31 acres total</p> <p>Streambed: 0.13 acre temporary</p> <p>Riparian Area: 0.07 acre permanent, 0.07 acre temporary</p> <p>Wetland: 3.46 acres permanent, 5.69 acres temporary</p> <p>Freshwater Seep at Arroyo de la Cruz: 2.9 acres temporary</p>
Dredge Volume	NA

<p>Compensatory Mitigation Requirements</p>	<ol style="list-style-type: none"> 1. The project shall include the following compensatory mitigation: <ol style="list-style-type: none"> a. 3.46 acres of permanent wetland impacts shall be mitigated at a 3:1 ratio through the restoration of 2.85 acres of wetland habitat on-site and 7.5 acres of wetland habitat off-site. The U.S. Army Corps of Engineers only requires that the 3.46 acres of permanent wetland impacts be mitigated at a 2.3:1 ratio through the restoration of 2.85 acres of wetland habitat on-site and 5.27 acres of wetland habitat off-site; the additional wetland mitigation beyond the 2.3:1 ratio is required by the Central Coast Water Board. b. 0.07 acre of permanent riparian area impacts shall be mitigated at a 2:1 ratio through the restoration of 0.07 acres of riparian habitat on-site and establishment of 0.07 acre of riparian habitat off-site. c. 5.69 acres of temporary wetland impacts shall be mitigated at a 1:1 ratio through the restoration of 5.69 acres of wetland habitat. d. 0.07 acre of temporary riparian area impacts shall be mitigated at a 1:1 ratio through the restoration of 0.07 acre of riparian area habitat. e. 0.13 acre of temporary streambed impacts shall be mitigated at a 1:1 ratio through the restoration of 0.13 acre of streambed habitat. f. 2.9 acres of temporary impacts to the freshwater seep at Arroyo de la Cruz shall be mitigated at a 1:1 ratio through restoration of 2.9 acres of freshwater seep habitat. 2. The Applicant shall implement compensatory mitigation installation, maintenance, and monitoring as described in the 'Mitigation and Monitoring Plan - Piedras Blancas Realignment' dated October 27, 2014. 3. Onsite compensatory mitigation for temporary impacts shall be installed within 6 months of temporary impacts. Onsite and offsite compensatory mitigation for permanent impacts shall be installed within 24 months of permanent impacts.
<p>Project Requirements</p>	<p><u>Project practices that are required to comply with 401 Water Quality Certification are as follows:</u></p> <ol style="list-style-type: none"> 1. All work performed within waters of the State shall be completed in a manner that minimizes impacts to beneficial uses and habitat. Measures shall be employed to minimize land disturbances that will adversely impact the water quality of waters of the State. Disturbance or removal of vegetation shall not exceed the minimum necessary to complete Project implementation. 2. The Applicant shall adhere to the timeframes outlined in "Piedras Blancas Construction Restriction Summary" (see Enclosure 2) for construction activities below top of creek banks or in other waters. Requests to conduct construction activities below top of creek banks or in other waters, within timeframes not specified in Enclosure 2, shall be submitted to Central Coast Water Board staff at least 21 days prior to the planned work

	<p>date.</p> <ol style="list-style-type: none">3. Erosion and sediment control measures shall be on site prior to the start of construction and kept on site at all times so they are immediately available for installation in anticipation of rain events.4. The Applicant shall implement and maintain an effective combination of erosion and sediment control measures (e.g., revegetation, fiber rolls, erosion control blankets, hydromulching, compost, straw with tackifiers, temporary basins) to prevent erosion and capture sediment. The Applicant shall implement and maintain washout, trackout, dust control, and any other applicable source control BMPs.5. Erosion and sediment control measures and other construction BMPs shall be implemented and maintained in accordance with all specifications governing their proper design, installation, operation, and maintenance.6. The Applicant shall not conduct construction activities below top of creek banks or in other waters of the State during rain events. The Applicant shall implement effective erosion control, sediment control, and other protective measures prior to the start of any rain events. If work below top of creek banks or in other waters of the State is allowed during the time period between October 1 and May 30 (pursuant to Project Requirement No. 2 above), the Applicant shall not conduct construction activities below top of creek banks or in other waters of the State on any day for which the National Weather Service has predicted a 25% or more chance of at least 0.1 inch rain in 24 hours. In preparation for any such predicted rain event between October 1 and May 30, the Applicant shall install effective erosion control, sediment control, and other protective measures no later than the day prior to the predicted rain event. Construction activities below top of creek banks or in other waters of the State may resume after the rain has ceased, the National Weather Service predicts clear weather, and site conditions are dry enough to continue work without discharge of sediment or other pollutants from the project site.7. Any material stockpiled that is not actively being used during construction shall be covered with plastic unless reserved for seed banking, which requires alternative erosion and dust control BMPs.8. The Applicant shall retain a spill plan and appropriate spill control and clean up materials (e.g., oil absorbent pads) onsite in case spills occur.9. The Applicant shall confine all trash and debris in appropriate enclosed bins and dispose of the trash and debris at an approved site at least weekly.10. All construction vehicles and equipment used on site shall be well maintained and checked daily for fuel, oil, and hydraulic fluid leaks or other problems that could result in spills of toxic materials.
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	<p>11. The Applicant shall designate a staging area for equipment and vehicle fueling and storage at least 100 feet away from waterways, in a location where fluids or accidental discharges cannot flow into waterways.</p> <p>12. All vehicle fueling and maintenance activity shall occur at least 100 feet away from waterways, and in designated staging areas.</p> <p>13. Dewatering and stream diversion measures are not authorized based on the application. If the project requires dewatering or diversion, the Applicant shall submit detailed dewatering/diversion plans for Central Coast Water Board staff approval at least 21 days prior to any dewatering or diversion. Dewatering/diversion plans shall include the area to be dewatered, timing of dewatering, and method of dewatering to be implemented. All temporary dewatering/diversion methods shall be designed to have the minimum necessary impacts to waters of the State to isolate the immediate work area. All dewatering/diversion methods shall be installed such that natural flow is maintained upstream and downstream of the project area. Any temporary dams or diversions shall be installed such that the diversion does not cause sedimentation, siltation, or erosion upstream or downstream of the project area. All dewatering/diversion methods shall be removed immediately upon completion of dewatering/diversion activities. Dewatering or diversion shall not commence until applicant has obtained Central Coast Water Board staff approval of the dewatering/diversion plans.</p> <p>14. Post-construction stormwater control measures shall be implemented in compliance with the supplemental information submitted by Caltrans and functioning prior to completion of the project. Caltrans shall adhere to the design parameters specified below for treating runoff generated from the following impervious surfaces:</p> <p>a. <u>All New and Replaced Impervious Surfaces (Except Bridge Decks and 0.019 Acres of Pavement South of the Arroyo Del Oso Bridge)</u> – Caltrans shall install stormwater control measures to treat an equivalent of 100 percent of the runoff that will discharge to surface waters, from the 15.25 acres of new and replaced impervious surfaces (except bridge decks and 0.019 acres of pavement south of the Arroyo Del Oso Bridge), generated by the 85th percentile 24-hour storm event or 0.18 inch hourly rainfall intensity. Stormwater control measures shall be implemented within the project area. Pursuant to the Water Quality Summary and Watershed Treatment Area plan sheets, submitted on August 8, 2014, the treatment system shall include a combination of sheet flow and concentrated flow stormwater control measures, including bio-filtration strips, vegetated buffer strips, vegetated slopes, approved vegetated swales, and other vegetated swales.</p> <p>b. <u>Arroyo De los Playaños Bridge Deck</u> – Pursuant to</p>
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	<p>information provided in Caltrans' email dated October 20, 2014, Caltrans shall utilize a 10-foot long vegetated swale, with a 1-foot high check dam providing a hydraulic residence time of a minimum of 45 seconds, to treat runoff from the Arroyo De los Playaños bridge deck.</p> <p>c. <u>Arroyo del Corral Bridge Deck</u> – Pursuant to information provided in Caltrans' email dated October 20, 2014, Caltrans shall utilize a 15-foot long vegetated swale, with a 1-foot high check dam providing a hydraulic residence time of a minimum of 60 seconds, to treat runoff from the Arroyo del Corral bridge deck.</p> <p>d. <u>Arroyo Del Oso Bridge Deck</u> – Pursuant to information provided in Caltrans' email dated October 15, 2014, Caltrans shall utilize a vegetated slope, with a minimum of 3 inches of compost incorporated into native soil, to treat runoff from the Arroyo Del Oso bridge deck.</p> <p>15. Caltrans shall maintain post-construction stormwater control measures associated with the project such that the post-construction stormwater control measures continue to function effectively in perpetuity. Caltrans shall ensure the conditions outlined in Caltrans' email, dated October 20, 2014, are implemented such that the check dams within the post-construction stormwater control measures treating runoff from the Arroyo De los Playaños and Arroyo del Corral bridge decks continue to function effectively in perpetuity. If a stormwater control measure loses its effectiveness, and maintenance cannot restore the feature, Caltrans must reconstruct the feature to its original design specifications, or install a different feature that provides equivalent or greater capacity for reducing pollutant loads.</p> <p>16. In perpetuity, during routine inspections of the project's culvert inlets and outlet structures, Caltrans shall ensure Rock Slope Protection (RSP) fabric is not exposed. If inspections identify exposed RSP fabric, Caltrans shall take corrective action to ensure the RSP fabric does not have the potential to break apart and become trash in the environment.</p> <p>17. All construction-related equipment, materials, and any temporary BMPs no longer needed shall be removed and cleaned from the site upon completion of the project.</p> <p>18. Central Coast Water Board staff shall be notified if mitigations as described in the 401 Water Quality Certification application for this project are altered by the imposition of subsequent permit conditions by any local, state or federal regulatory authority. The Applicant shall inform Central Coast Water Board staff of any modifications that interfere with compliance with this Certification.</p>
<p>Monitoring and Reporting Requirements</p>	<p>The Applicant shall conduct the following monitoring:</p> <ol style="list-style-type: none"> 1. Visually inspect the project site and areas of waters of the State adjacent to project impact areas following completion of project construction and for a minimum of five subsequent rainy

	<p>seasons to ensure that the project is not causing excessive erosion, stream instability, or other water quality problems. If the project does cause water quality problems, contact the Central Coast Water Board staff member overseeing the project. You will be responsible for obtaining any additional permits necessary for implementing plans for restoration to prevent further water quality problems.</p> <ol style="list-style-type: none">2. Monitor the compensatory mitigation sites for a minimum of five years. Caltrans shall monitor both the on- and off-site compensatory mitigation sites for a minimum of three years post-irrigation of container plants and willow cuttings. This could entail monitoring for more than five years. If success criteria are not achieved within that time, continue annual monitoring and maintenance until success criteria are achieved. Compensatory mitigation monitoring shall include assessment of growth, survival, percent cover, general health and stature, signs of reproduction, progress towards achieving success criteria, and any other measures identified in the 'Mitigation and Monitoring Plan - Piedras Blancas Realignment' dated October 27, 2014.3. Monitor the representative culverts, identified in the 'Mitigation and Monitoring Plan - Piedras Blancas Realignment' dated October 27, 2014, pursuant to the conditions outlined in the plan. <p>The Applicant shall provide the following reporting to RB3_401Reporting@waterboards.ca.gov:</p> <ol style="list-style-type: none">1. Project Commencement Notification - Contact Central Coast Water Board staff when the project begins to allow for a site visit.2. Streambed Alteration Agreement - Submit a signed copy of the Department of Fish and Wildlife's streambed alteration agreement to the Central Coast Water Board immediately upon execution and prior to any discharge to waters of the State.3. Project Completion Report - Within 30 days of project completion, submit a project completion report that contains:<ol style="list-style-type: none">a. Date of construction initiation;b. Date of construction completion;c. Status of post-construction BMPs;d. A summary of daily activities, monitoring and inspection observations, and problems incurred and actions taken;e. Clearly identified photo-documentation of all areas of permanent and temporary impact, prior to and after project construction;f. Clearly identified representative photo-documentation of other project areas, prior to and after project construction; andg. Photo-documentation of all permanent post-construction BMPs.4. Annual Report – The Applicant shall submit to the Central Coast Water Board an Annual Report by May 31 of each year following
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	<p>the issuance of this Certification, regardless of whether project construction has started or not. The Applicant shall submit Annual Reports until the Applicant has conducted all required monitoring, mitigation has achieved all success criteria, and the Applicant has notified the Central Coast Water Board of mitigation completion. Each Annual Report shall include at a minimum:</p> <ul style="list-style-type: none">a. The status of the project: construction not started, construction started, or construction complete.b. The date of construction initiation, if applicable.c. The date of construction completion, if applicable.d. If project construction is complete, a description of the results of the annual visual inspection of the project site and areas of waters of the State adjacent to project impact areas, including:<ul style="list-style-type: none">i. Erosion conditions;ii. Stream stability conditions;iii. Water quality and beneficial use conditions;iv. Representative photographs of the project site and areas of waters of the State adjacent to project impact areas; andv. If the visual inspection monitoring period is over, but water quality problems persist, the Annual Report shall identify corrective measures to be undertaken, including extension of the monitoring period until the project is no longer causing excessive erosion, stream instability, or other water quality problems.vi. Results from the culvert monitoring, pursuant to the 'Mitigation and Monitoring Plan - Piedras Blancas Realignment' dated October 27, 2014.e. Mitigation reporting, if mitigation installation has started, including the following information:<ul style="list-style-type: none">i. Date of initiation of mitigation installation and date mitigation installation was completed;ii. If mitigation installation was completed, confirmation mitigation was installed according to the requirements of this Certification and as described in the application, 'Mitigation and Monitoring Plan - Piedras Blancas Realignment' dated October 27, 2014, and any other associated submittals;iii. Analysis of monitoring data collected in the field;iv. Quantification of growth, percent cover, survival, general health and stature, signs of reproduction, and documentation of progress toward achieving all mitigation performance criteria included in the 'Mitigation and Monitoring Plan - Piedras Blancas Realignment' dated October 27, 2014;v. Qualitative and quantitative comparisons of current mitigation conditions with preconstruction conditions and previous mitigation monitoring results;
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	<ul style="list-style-type: none">vi. Any remedial or maintenance actions taken or needed;vii. Any additional information specified in the 'Mitigation and Monitoring Plan - Piedras Blancas Realignment' dated October 27, 2014; andviii. Annual photo-documentation representative of all mitigation areas, taken from vantage points from which Central Coast Water Board staff can identify changes in size and cover of plants. Compare photos of installed mitigation with photos of the mitigation areas prior to installation. <p>f. A description of mitigation completion status, that identifies the amount of mitigation monitoring and maintenance remaining, or certifies that mitigation is complete and all required mitigation monitoring and maintenance has been conducted and all success criteria achieved. If the monitoring period is over, but all success criteria have not been achieved, the Annual Report shall identify corrective measures to be undertaken, including extension of the monitoring period until the criteria are met.</p>
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Piedras Blancas Construction Restriction Summary
Date Submitted to Central Coast Water Board: October 8, 2014

Wetlands

Work will occur year round within jurisdictional wetlands, above bed and banks of drainages.

Arroyo De los Playaños

Permanent abutment piles can be installed anytime. Temporary piles, which include those necessary for the trestle and/or falsework, will only be installed from April 15 and Oct. 31. Temporary piles can remain year round but must be removed from April 15 and Oct. 31. A trestle will be constructed on top of the temporary piles to be used for access and as a platform for construction year-round. CIDH piles are permanent piles and will only be installed from April 15 to October 31.

Arroyo del Corral

Permanent abutment piles and temporary piles can only be installed from June 1 and October 31. However, building the bridge is allowed year round once the wetland mats are installed. Permanent CIDH piles can be installed at any time because they are outside of the bed and bank of the drainage. All falsework will span over the ESA area.

Arroyo Del Oso

Permanent abutment piles, permanent CIDH piles, and temporary piles can only be installed between June 1 and October 31. Temporary piles can remain year round but must be removed from June 1 and October 31.

Unnamed Drainage (System 25)

Culvert work at this location may take place year round, but only when there is no water present within the drainage feature.

Culvert Removal

Culverts at Arroyo de los Playaños, Arroyo del Corral, and Arroyo del Oso will only be removed between June 1 and October 31. Culverts at all other locations will be removed only when there is no water present within the drainage feature.



United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ventura Fish and Wildlife Office
2493 Portola Road, Suite B
Ventura, California 93003



IN REPLY REFER TO:
81440-2009-F-0499

February 26, 2010

Chuck Cesena
Senior Environmental Planner
Department of Transportation
50 Higuera Street
San Luis Obispo, California 93401-5415

Subject: Biological Opinion for the Piedras Blancas Realignment Project, San Luis Obispo County, California (8-8-09-F-67)

Dear Mr. Cesena:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion regarding the California Department of Transportation's (Caltrans) proposed realignment of State Route (SR) 1 between the Piedras Blancas lighthouse and Arroyo de la Cruz (post mile 64.0-R67.2), and its effect on the federally endangered tidewater goby (*Eucyclogobius newberryi*) and its critical habitat, and the federally threatened California red-legged frog (*Rana aurora draytonii*) and western snowy plover (*Charadrius alexandrinus nivosus*). In addition, Caltrans requested a conference opinion on the revised proposed critical habitat for the California red-legged frog. This biological opinion is issued in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). Your request for formal consultation, dated August 31, 2009, was received by our office on September 4, 2009.

Caltrans has assumed Federal Highway Administration's (FHWA) authority and responsibility for compliance with NEPA and other environmental laws. The Memorandum of Understanding (MOU) between the Federal Highway Administration and California Department of Transportation concerning the State of California's Participation in the Surface Transportation Project Delivery Pilot Program allows Caltrans to serve as the Federal lead agency on this project (U.S. Department of Transportation 2007).

This biological opinion was prepared using the biological assessment prepared by Caltrans (2009) that was included with your request for consultation as well as information contained in our files. A complete administrative record for this biological opinion is available at the Ventura Fish and Wildlife Office.



BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

Caltrans proposes to realign approximately 2.8 miles of SR 1, between post mile 64.0 and R67.2, which has been susceptible to coastal erosion. The shoreline within the proposed project area has receded at an average rate of 20 inches per year since 1957, resulting in the need for rock slope protection to be placed on the beach to temporarily protect the existing highway from erosion. This rock slope protection would be removed as part of the proposed project. The new alignment would branch off of the existing roadway approximately 1,400 feet north of the Piedras Blancas Lighthouse and reconnect with the existing roadway just before the Arroyo de la Cruz Bridge. The new alignment would be located at varying distances between 80 to 475 feet east of the existing roadway. The proposed two-lane road would have 12-foot wide lanes with 8-foot wide shoulders. Caltrans anticipates construction starting in 2013 and concluding in approximately 3 years.

As part of the realignment, three large bridges are proposed to cross Arroyo del Oso, Arroyo del Corral, and Drainage #2 (south of Arroyo del Corral). The bridges are approximately 281 feet long, 605 feet long, and 250 feet long, respectively. Caltrans designed these bridges to span the entire floodplain of all three drainages to maximize habitat connectivity and minimize adverse affects to the California red-legged frog. All existing culverts along the abandoned roadway would be removed and natural drainage contours would be restored. A new box culvert, with an approximate dimension of 9 feet by 8.5 feet, would be placed in an unnamed swale east of SR 1 and the Piedras Blancas Motel to maintain habitat connectivity for California red-legged frogs.

To maintain access to visitor facilities, the proposed project would include construction of a driveway to connect the new alignment with the Piedras Blancas Motel. Existing utilities would be relocated inland parallel to the new alignment. Potential staging locations include the Piedras Blancas Motel parking lot, private property, and a large pullout south of Arroyo de la Cruz.

In anticipation of a proposed California Coastal Trail segment, the California Department of Parks and Recreation has requested that Caltrans follow specific guidelines in rehabilitating the abandoned roadway. Therefore, Caltrans will remove the entire roadway (i.e. asphalt and road base) in several locations and grade the roadbed to re-create natural contours. In the remaining locations, the old asphalt would be removed, but half the width of the existing road base would be left in place for use as part of the proposed trail. In all areas of disturbance, the top 4 to 6 inches of topsoil would be salvaged and stockpiled to be used for restoration of the coastal prairie habitat.

To offset impacts to jurisdictional wetlands and coastal prairie habitat, Caltrans proposes to restore and enhance wetlands and coastal prairie on a 40-acre, fallow agricultural field on the west side of SR 1 and north of Arroyo de la Cruz, to pre-farming, wetland conditions. As part of this restoration project Caltrans will create a 0.1 acre pond intended to provide additional breeding habitat for the California red-legged frog.

A complete list and description of all protective measures proposed by Caltrans can be found in the biological assessment (Caltrans 2009), and are hereby incorporated by reference. Caltrans proposes to implement the following protective measures for the California red-legged frog and tidewater goby:

1. Removal of existing culverts at Arroyo del Corral and Arroyo del Oso would be conducted in a manner that would not cause sandbars to breach, and lagoons to flush;
2. Environmentally Sensitive Area (ESA) fencing would be depicted on project plans and installed in the field, to reduce impacts to biological resources outside of the construction areas;
3. Work within creek channels would be restricted to June 1 through October 31, when water levels are lowest; and
4. If dewatering is not possible (i.e. culvert removal at Arroyo del Corral), a water-permeable exclusion fence (i.e. silt fencing) will be installed and all tidewater gobies and California red-legged frogs would be captured and relocated out of harm's way, to adjacent suitable habitat prior to culvert removal. If a beach seine is used, it will be pulled to shore in a deliberate manner with care being taken to avoid rolling the lead line inward.

In addition Caltrans proposes to implement the protective measures included in the Programmatic Biological Opinion for Projects Funded or Approved under the Federal Aid Program (Service 2003). These measures have been modified to address the tidewater goby and western snowy plover where appropriate:

1. Only Service-approved biologists will participate in activities associated with the capture, handling, and monitoring of California red-legged frogs, tidewater gobies, and western snowy plovers;
2. Ground disturbance will not begin until written approval is received from the Service that the biologist is qualified to conduct the work;
3. A Service-approved biologist will survey the project site 48 hours before the onset of work activities. If any life stage of the California red-legged frog or tidewater goby is found, and these individuals are likely to be killed or injured by work activities, the approved biologist will be allowed sufficient time to move them from the site before work activities begin. The Service-approved biologist will relocate the California red-legged frogs the shortest distance possible to a location that contains suitable habitat and will not be affected by activities associated with the proposed project. The Service-approved biologist will maintain detailed records of any individuals that are moved (e.g.,

- size, coloration, any distinguishing features, photographs [digital preferred]) to assist him or her in determining whether translocated animals are returning to the original point of capture;
4. Before any activities begin on a project, a Service-approved biologist will conduct a training session for all construction personnel. At a minimum, the training will include a description of the California red-legged frog, tidewater goby, and western snowy plover and their habitats, and the specific protective measures that will be implemented to conserve these species. Brochures, books and briefings may be used in the training session, provided that a qualified person is on hand to answer any questions;
 5. A Service-approved biologist will be present at the work site until all California red-legged frogs and tidewater gobies have been relocated, workers have been instructed, and disturbance of habitat has been completed. Caltrans will then designate a person to monitor on-site compliance with all minimization measures. The Service-approved biologist will ensure that this monitor receives the training outlined in measure 4 and in the identification of California red-legged frogs and tidewater gobies, and western snowy plovers;
 6. During project activities, all trash that may attract predators will be properly contained, removed from the work site, and disposed of regularly. Following construction, all trash and construction debris will be removed from work areas;
 7. All refueling, maintenance, and staging of equipment and vehicles will occur at least 60 feet from riparian habitat or water bodies and preferably, not in a location from where a spill would drain directly toward aquatic habitat. The monitor will ensure contamination of habitat does not occur during such operations. Prior to the onset of work, Caltrans will ensure that a plan is in place for prompt and effective response to any accidental spills. All workers will be informed of the importance of preventing spills and of the appropriate measures to take should a spill occur;
 8. Project sites will be revegetated with an assemblage of native riparian, wetland, and upland vegetation suitable for the area. Locally collected plant materials will be used to the extent practicable. Invasive, exotic plants will be controlled to the maximum extent practicable. This measure will be implemented in all areas disturbed by activities associated with the project;
 9. Habitat contours will be returned to their original configuration at the end of project activities. This measure will be implemented in all areas disturbed by activities associated with the project, unless the Service and Caltrans determine that it is not feasible or modification of original contours would benefit the California red-legged frog or tidewater goby;

10. The number of access routes, size of staging areas, and the total area of the activity will be limited to the minimum necessary to achieve the project goal. Environmentally Sensitive Areas will be established to confine access routes and construction areas to the minimum area necessary to complete construction, and minimize the impact to California red-legged frog, tidewater goby, and western snowy plover habitat; this goal includes locating access routes and construction areas outside of wetlands and riparian areas to the maximum extent practicable;
11. Caltrans will attempt to schedule work activities for times of the year when impacts to the California red-legged frog and tidewater goby would be minimal. For example, work that would affect large pools that may support breeding would be avoided, to the maximum degree practicable, during the breeding season (November through May). Isolated pools that are important to maintain California red-legged frogs through the driest portions of the year would be avoided, to the maximum degree practicable, during the late summer and early fall;
12. To control sedimentation during and after project implementation, Caltrans will implement best management practices outlined in any authorizations or permits, issued under the authorities of the Clean Water Act, that it receives for the proposed project. If best management practices are ineffective, Caltrans will attempt to remedy the situation immediately, in consultation with the Service;
13. If a work site is to be temporarily dewatered by pumping, intakes will be completely screened with wire mesh not larger than 0.2 inch to prevent California red-legged frogs and tidewater gobies from entering the pump system. Water will be released or pumped downstream at an appropriate rate to maintain downstream flows during construction. The methods and materials used in any dewatering will be determined by Caltrans in consultation with the Service. Upon completion of construction activities, any diversions or barriers to flow will be removed in a manner that would allow flow to resume with the least disturbance to the substrate. Alteration of the stream bed will be minimized to the maximum extent possible; any imported material will be removed from the stream bed upon completion of the project;
14. Unless approved by the Service, water will not be impounded in a manner that may attract California red-legged frogs; and
15. A Service-approved biologist will permanently remove any individuals of exotic species, such as bullfrogs (*Rana catesbeiana*), crayfish, and centrarchid fishes from the project area, to the maximum extent possible. The Service-approved biologist will be responsible for ensuring his or her activities are in compliance with the California Fish and Game Code.

In addition, Caltrans will limit the work to remove the culvert at Arroyo del Corral Beach to the non-nesting season. However, due to restrictions on in-stream work that limits bridge

construction activities to the June 1 through October 31 timeframe, Caltrans is unable to restrict pile driving activities to the non-nesting season for the western snowy plover (generally October through February). Therefore, Caltrans will monitor nesting western snowy plovers at Arroyo del Corral Beach during pile driving and bridge construction activities. This monitoring would provide information on potential adverse effects to nesting western snowy plovers as a result of noise from pile driving and other bridge construction activities.

ANALYTICAL FRAMEWORK FOR THE JEOPARDY AND ADVERSE MODIFICATION DETERMINATIONS

Jeopardy Determination

The jeopardy analysis in this biological opinion relies on four components: (1) the *Status of the Species*, which evaluates the range-wide condition of the tidewater goby, California red-legged frog, and western snowy plover, the factors responsible for that condition, and the species' survival and recovery needs; (2) the *Environmental Baseline*, which evaluates the condition of the tidewater goby, California red-legged frog, and western snowy plover in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of these species; (3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the tidewater goby, California red-legged frog, and western snowy plover; and (4) the *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on the tidewater goby, California red-legged frog, and western snowy plover.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed federal action in the context of the current status of the tidewater goby, California red-legged frog, and westerns snowy plover, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of the tidewater goby, California red-legged frog, or western snowy plover in the wild.

The jeopardy analysis in this biological opinion places an emphasis on consideration of the range-wide survival and recovery needs of the tidewater goby, California red-legged frog, and western snowy plover and the role of the action area in the survival and recovery of these species as the context for evaluation of the significance of the effects of the proposed federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

Adverse Modification Determination

This biological and conference opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02. Instead, we have relied on the statutory provisions of the ESA to complete the following analysis with respect to critical habitat.

In accordance with policy and regulation, the adverse modification analysis in this biological opinion relies on four components: (1) the *Status of Critical Habitat*, which evaluates the range-wide condition of designated critical habitat for the tidewater goby and proposed critical habitat for the California red-legged frog in terms of primary constituent elements (PCEs), the factors responsible for that condition, and the intended recovery function of the critical habitat overall; (2) the *Environmental Baseline*, which evaluates the condition of the critical habitat in the action area, the factors responsible for that condition, and the recovery role of the critical habitat in the action area; (3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated and interdependent activities on the PCEs and how that will influence the recovery role of the affected critical habitat units; and (4) *Cumulative Effects*, which evaluates the effects of future non-Federal activities in the action area on the PCEs and how that will influence the recovery role of affected critical habitat units.

For purposes of the adverse modification determination, the effects of the proposed federal action on the critical habitat of the tidewater goby and proposed critical habitat for the California red-legged frog are evaluated in the context of the range-wide condition of the critical habitat, taking into account any cumulative effects, to determine if the critical habitat range-wide would remain functional (or would retain the current ability for the PCEs to be functionally established in areas of currently unsuitable but capable habitat) to serve its intended recovery role for the tidewater goby and California red-legged frog.

The analysis in this biological opinion places an emphasis on using the intended range-wide recovery function of critical habitat for the tidewater goby and California red-legged frog and the role of the action area relative to that intended function as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the adverse modification determination.

STATUS OF THE SPECIES

Tidewater Goby

The tidewater goby was listed as endangered on March 7, 1994 (59 FR 5494). On June 24, 1999, the Service proposed to remove the populations occurring north of Orange County, California, from the endangered species list (64 FR 33816). In November 2002, the Service withdrew this proposed delisting rule and determined to retain the tidewater goby's listing as endangered throughout its range (67 FR 67803).

We originally designated critical habitat for the tidewater goby on November 20, 2000 (65 FR 69693). In November 2006, we proposed to revise that designated critical habitat (71 FR 68914), and subsequently designated critical habitat in January 2008 (73 FR 5920). A recovery plan for the tidewater goby was completed on December 12, 2005 (Service 2005).

Much of the information in this species account is summarized from the following sources: Wang (1982), Irwin and Soltz (1984), Lafferty et al. (1999a, 1999b), Swift et al. (1989, 1993, 1997), Worcester (1992), Swenson (1995, 1999), and Swenson and McCray (1996).

The tidewater goby is endemic to California and typically inhabits coastal lagoons, estuaries, and marshes; preferring relatively low salinities of approximately 12 parts per thousand (ppt). Tidewater goby habitat is characterized by brackish estuaries, lagoons, and lower stream reaches where the water is fairly still but not stagnant. They tend to be found in the upstream portions of lagoons. Tidewater gobies can withstand a range of habitat conditions and have been documented in waters with salinity levels that range from 0 to 42 ppt, temperatures from 46 to 77 degrees Fahrenheit, and depths from approximately 10 inches to 6.5 feet.

The tidewater goby is primarily an annual species in central and southern California, although some variation in life history has been observed. If reproductive output during a single season fails, few (if any) tidewater gobies survive into the next year. Reproduction typically peaks from late April or May to July and can continue into November or December depending on the seasonal temperature and amount of rainfall. Males begin the breeding ritual by digging burrows (3 to 4 inches deep) in clean, coarse sand of open areas. Females then deposit eggs into the burrows, averaging 400 eggs per spawning effort. Males remain in the burrows to guard the eggs. They frequently forego feeding which may contribute to the mid-summer mortality observed in some populations. Within 9 to 10 days, larvae emerge and are approximately 0.20 to 0.27 inch in length. They live in vegetated areas in the lagoon until they are 0.60 to 0.70 inch long. When they reach this life stage, they become substrate-oriented, spending the majority of time on the bottom rather than in the water column. Both males and females can breed more than once in a season, with a lifetime reproductive potential of 3 to 12 spawning events. Vegetation is critical for over-wintering tidewater gobies because it provides refuge from high water flows.

Tidewater gobies feed on small invertebrates, including mysids, amphipods, ostracods, snails, aquatic insect larvae, and particularly chironomid midge larvae. Tidewater gobies of less than 0.30 inch probably feed on unicellular phytoplankton or zooplankton similar to many other early stage larval fishes.

Historically, the tidewater goby occurred in at least 126 California coastal lagoons and estuaries from Tillas Slough near the Oregon border south to Agua Hedionda Lagoon in northern San Diego County. The southern extent of its distribution has been reduced by approximately 8 miles. The species is currently known to occur in about 98 locations, although the number of sites fluctuates with climatic conditions. Currently, the most stable populations are in lagoons and estuaries of intermediate size (5 to 124 acres) that are relatively unaffected by human activities.

In Santa Barbara County during the fall of 1994, tidewater gobies were reported as common in the Santa Ynez River at 4 miles distance above the lagoon (Swift et al. 1997), however, by January, 1995, they were absent at the upstream sites. Tidewater gobies that are found upstream

of the lagoons in summer and fall tend to be juveniles. The highest densities of tidewater gobies are typically present in the fall.

Tidewater gobies enter the marine environment when sandbars are breached during storm events. The species' tolerance of high salinities (up to 60 ppt) for short periods of time enables it to withstand marine environment conditions where salinities are approximately 35 ppt, thereby allowing the species to re-establish or colonize lagoons and estuaries following flood events. However, genetic studies indicate that individual populations rarely have contact with other populations so natural recolonization may be rare.

Native predators are not known to be important regulators of tidewater goby population size in the lagoons of southern California. Rather, population declines are attributed to environmental conditions. During high flows streams, flood and breach lagoon barriers that create strong tidal conditions. As a result, populations plummet. Populations typically recover quickly in summer, with mean densities of between 54 to 323 fish per square foot recorded. Tidewater goby densities are greatest among emergent and submergent vegetation (Moyle 2002).

The decline of the tidewater goby is attributed primarily to habitat loss or degradation resulting from urban, agricultural, and industrial development in and around coastal wetlands. Tidewater gobies have been extirpated from water bodies that are impaired by degraded water quality (e.g., Mugu Lagoon, Ventura County), but still occur in others (e.g., Santa Clara River, Ventura County). Some extirpations are believed to be related to pollution, upstream water diversions, and the introduction of non-native predatory fish species (most notably, centrarchid sunfish and bass). These threats continue to affect some of the remaining populations of tidewater gobies.

Critical Habitat for the Tidewater Goby

We originally designated critical habitat for the tidewater goby on November 20, 2000 (65 FR 69693); however, on January 31, 2008, we published a revised critical habitat designation (73 FR 5920). The revised critical habitat designation for the tidewater goby encompasses approximately 10,003 acres. This is an increase of approximately 8,422 acres from the previously designated critical habitat. In the previous rule, critical habitat was designated only in Orange and San Diego Counties due to uncertainty over the future listing status of tidewater goby populations to the north. The revised critical habitat is located in Del Norte, Humboldt, Mendocino, Sonoma, Marin, San Mateo, Santa Cruz, Monterey, San Luis Obispo, Santa Barbara, Ventura, and Los Angeles Counties, California.

This revised designation identifies areas supporting primary constituent elements (PCEs) that exist at coastal lagoons, estuaries, backwater marshes, and associated freshwater tributaries, and that are necessary to support the life history functions, of the tidewater goby. Because not all life history functions require all the PCEs, not all revised critical habitat contain all the PCEs.

All of the areas of revised critical habitat for the tidewater goby are within the species' historical geographic range and contain PCEs to support at least one of the tidewater goby's essential life

history functions. Based on our current knowledge of the life history, biology, and ecology of the tidewater goby and the requirements of the habitat to sustain the essential life history functions of this species, we have determined that the PCEs for the tidewater goby are:

- (1) Persistent, shallow (in the range of about 0.1 to 2 meters), still-to-slow-moving, aquatic habitat most commonly ranging in salinity from less than 0.5 ppt to about 10 to 12 ppt, which provides adequate space for normal behavioral, individual and population growth;
- (2) Substrates (e.g., sand, silt, mud) suitable for the construction of burrows for reproduction;
- (3) Submerged and emergent aquatic vegetation, that provides protection from predators; and
- (4) Presence of a sandbar(s) across the mouth of a lagoon or estuary during the late spring, summer, and fall that closes or partially closes the lagoon or estuary, thereby providing relatively stable water levels and salinity.

California red-legged Frog

The California red-legged frog was federally listed as threatened on May 23, 1996 (61 FR 25813). The Service published a recovery plan in 2002 (Service 2002).

The historical range of the California red-legged frog extended coastally from southern Mendocino County and inland from the vicinity of Redding, California, southward to northwestern Baja California, Mexico (Jennings and Hayes 1985; Storer 1925). The California red-legged frog has been extirpated or nearly extirpated from 70 percent of its former range. Historically, this species was found throughout the Central Valley and Sierra Nevada foothills. Four additional occurrences have been recorded in the Sierra Nevada foothills since listing, bringing the total to five extant populations, compared to approximately 26 historical records (71 FR 19244). Currently, California red-legged frogs are only known from 3 disjunct regions in 26 California counties and 1 disjunct region in Baja California, Mexico (Grismer 2002; Fidenci 2004; R. Smith and D. Krofta, in litt. 2005).

California red-legged frogs have been found at elevations that range from sea level to about 5,000 feet. In the Sierra Nevada Mountains, California red-legged frogs typically occur below 4,000 feet and occurrences above this elevation are atypical for the subspecies (71 FR 19244).

The California red-legged frog uses a variety of habitat types, including various aquatic systems, riparian, and upland habitats. The diet of California red-legged frogs is highly variable. Tadpoles eat algae (Jennings et al. 1992). Hayes and Tennant (1985) found invertebrates to be the most common food item of adults. Vertebrates, such as Pacific chorus frogs (*Pseudacris regilla*) and California mice (*Peromyscus californicus*), represented over half of the prey mass eaten by larger frogs (Hayes and Tennant 1985). Feeding activity occurs along the shoreline and on the surface of the water. Hayes and Tennant (1985) found juveniles to be active diurnally and nocturnally, whereas adults were largely nocturnal.

California red-legged frogs breed from November through March; earlier breeding has been recorded in southern localities (Storer 1925). Males appear at breeding sites from 2 to 4 weeks before females (Storer 1925). Female California red-legged frogs deposit egg masses on emergent vegetation so that the masses float on the surface of the water (Hayes and Miyamoto 1984). Egg masses contain about 2,000 to 5,000 moderate-sized, dark reddish brown eggs (Storer 1925; Jennings and Hayes 1985). Eggs hatch in 6 to 14 days (Storer 1925). Larvae undergo metamorphosis 3.5 to 7 months after hatching (Storer 1925; Wright and Wright 1949). Sexual maturity can be attained at 2 years of age by males and 3 years of age by females (Jennings and Hayes 1985); adults may live 8 to 10 years (Jennings et al. 1992) although the average life span is considered to be much lower. The California red-legged frog is a relatively large aquatic frog ranging from 1.5 to 5 inches from the tip of the snout to the vent (Stebbins 1985).

California red-legged frogs breed in aquatic habitats. Larvae, juveniles and adults have been collected from streams, creeks, ponds, marshes, plunge pools and backwaters within streams, dune ponds, lagoons, and estuaries. California red-legged frogs frequently breed in artificial impoundments, such as stock ponds, if conditions are appropriate. Although California red-legged frogs successfully breed in streams and riparian systems, high spring flows and cold temperatures in streams often make these sites risky environments for eggs and tadpoles. The importance of riparian vegetation for this species is not well understood. When riparian vegetation is present, California red-legged frogs spend considerable time resting and feeding in it; the moisture and camouflage provided by the riparian plant community likely provide good foraging habitat and may facilitate dispersal in addition to providing pools and backwater aquatic areas for breeding.

Juvenile and adult California red-legged frogs may disperse long distances from breeding sites throughout the year. They can be encountered living within streams at distances exceeding 1.8 miles from the nearest breeding site, and have been found up to 400 feet from water in adjacent dense riparian vegetation (Bulger et al. 2003). During periods of wet weather, starting with the first rains of fall, some individuals may make overland excursions through upland habitats. Most of these overland movements occur at night. Bulger et al. (2003) found marked California red-legged frogs in Santa Cruz County making overland movements of up to 2 miles over the course of a wet season. These individual frogs were observed to make long-distance movements that are straight-line, point to point migrations over variable upland terrain rather than using riparian corridors for movement between habitats. For the California red-legged frog, suitable habitat is potentially all aquatic and riparian areas within the range of the species and includes any landscape features that provide cover and moisture (61 FR 25813).

Habitat loss and alteration, combined with over-exploitation and introduction of exotic predators, were important factors in the decline of the California red-legged frog in the early to mid-1900s. Continuing threats to the California red-legged frog include direct habitat loss due to stream alteration and loss of aquatic habitat, indirect effects of expanding urbanization, competition or predation from non-native species including the bullfrog, catfish (*Ictalurus* spp.), bass (*Micropterus* spp.), mosquito fish (*Gambusia affinis*), red swamp crayfish, and signal crayfish.

Chytrid fungus (*Batrachochytrium dendrobatidis*) is a waterborne fungus that can decimate amphibian populations, and is considered a threat to California red-legged frog populations.

Proposed Critical Habitat for the California red-legged Frog

On September 16, 2008, the Service proposed a new, revised rule to designate 1.8 million acres as critical habitat for the California red-legged frog, an area that is 300 percent larger than the 2006 designation for the subspecies. We proposed this increase to better reflect the lands containing those essential habitat features necessary for the conservation of the California red-legged frog. A detailed discussion of the methods used in developing proposed critical habitat can be found in the revised proposed rule (73 FR 53492).

The proposed critical habitat is located in Alameda, Butte, Contra Costa, El Dorado, Kern, Los Angeles, Marin, Merced, Monterey, Napa, Nevada, San Benito, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Solano, Ventura and Yuba Counties, California. The proposed critical habitat units constitute our best assessment of areas determined to be occupied at the time of listing, that contain the physical and biological features essential for the conservation of the subspecies (PCEs) and that may require special management, and those areas not occupied at the time of listing but which have been found to be essential to the conservation of the California red-legged frog.

The proposed PCEs include: 1) aquatic breeding habitat, 2) aquatic non-breeding habitat, 3) upland habitat, and 4) dispersal habitat. Detailed descriptions of the proposed PCE's can be found in the revised proposed rule (73 FR 53492). The following is a brief summary of the proposed PCEs:

- (1) Aquatic breeding habitat is comprised of natural and manmade ponds, slow moving streams or pools within streams and other ephemeral or permanent water bodies that typically become inundated during winter rains and hold water for a sufficient amount of time to allow the California red-legged frog to complete the aquatic portion of its life cycle (a minimum of 20 weeks in all but the driest of years).
- (2) Aquatic non-breeding habitat is comprised of the freshwater habitats as described for aquatic breeding habitat but which may or may not hold water long enough for the subspecies to complete the aquatic portion of its lifecycle. Aquatic non-breeding habitat must provide shelter, foraging opportunities, predator avoidance, and aquatic dispersal habitat for juvenile and adult California red-legged frogs. Aquatic non-breeding habitat may include plunge pools within intermittent creeks, seeps, quiet water refugia during high water flows, ponds and springs that do not dry up in the summer.
- (3) We revised the PCE that described the upland habitat surrounding water features (PCE 3). Based on new biological information regarding the protection of breeding and non-breeding aquatic features for the California red-legged frog, and movements between breeding and non-breeding habitat (Fellers and Kleenman 2007), we removed the specific

200 foot distance used in the 2006 designation. Characterization of this habitat feature would be made on a case by case basis, based on localized differences in topography around aquatic habitat, but in general upland habitat would be limited to 1 mile in most cases depending on the surrounding landscape and dispersal barriers.

- (4) Because dispersal habitat (PCE 4) provides connectivity between aquatic and associated upland habitat, generally up to 1 mile away, we removed the 0.7 mile distance, and included a 1 mile distance between accessible upland and wetland habitat. Although California red-legged frogs can move up to 2.2 miles, we conclude that 2.2 miles is likely near the upward limit of dispersal capability for the California red-legged frog within a single season and that a 1-mile dispersal distance will, in most instances, provide for connectivity between breeding aquatic habitats, nonbreeding aquatic habitats, and areas of non-aquatic (i.e., upland) habitat and can be used as a general guide for habitat use. However, we also concur with Fellers and Kleeman (2007) in that the exact extent of habitat use by the California red-legged frog should be determined on a site-by-site basis.

Revisions to the designated PCE's including the use of watershed boundaries as a feature to help clarify upland and dispersal habitat, has resulted in changes to some units to include additional areas containing essential habitat features, as well as additional units not previously designated. The revised proposed critical habitat unit description that would be affected by the proposed action is included in the Environmental Baseline section of this biological opinion.

Western snowy plover

The Pacific coast population of the western snowy plover was federally listed as threatened on March 5, 1993 (58 FR 12864), and critical habitat was designated on September 29, 2005 (70 FR 56970). The proposed project site is not within designated critical habitat for the western snowy plover. We issued a recovery plan for the western snowy plover in September 2007 (Service 2007).

The western snowy plover, a small shorebird in the family Charadriidae, weighs from 1.2 to 2 ounces and ranges in length from 5.9 to 6.6 inches (Page et al. 1995). It is pale gray-brown above and white below, with a white hindneck collar and dark lateral breast patches, forehead bar, and eye patches. The bill and legs are blackish. In breeding plumage, males usually have black markings on the head and breast; in females, usually one or more of these markings are dark brown. Early in the breeding season, a rufous crown may be evident on breeding males, but it is not typically seen on females. In non-breeding plumage, sexes cannot be distinguished because the breeding markings disappear. Fledged juveniles have buffy edges on their upper parts and can be distinguished from adults until approximately July through October, depending on when in the nesting season they hatched. After this period, molt and feather wear makes fledged juveniles indistinguishable from adults. Individual birds 1 year or older are considered to be breeding adults. The mean annual life span of western snowy plovers is estimated at about 3 years, but at least one individual was at least 15 years old when last seen (Page et al. 1995).

Historical records indicate that nesting western snowy plovers were once more widely distributed and abundant in coastal Washington, Oregon, and California. Prior to 1970, western snowy plovers bred at 53 coastal locations in California. Between 1970 and 1981, western snowy plovers stopped breeding in parts of San Diego, Ventura, and Santa Barbara counties, most of Orange County, and all of Los Angeles County (Page and Stenzel 1981). In 2007, there were two nesting attempts documented on Los Angeles County beaches (SWCA 2007).

On the Washington coast, western snowy plover populations appear to have increased overall since the early 1990s, although consistent, intensive surveys have been conducted only since the mid-1990s. In Oregon, western snowy plovers historically nested at more than 20 sites on the coast, but only seven core nesting sites are consistently used (Lauten et al. 2006a, 2006b). Populations reached a low from 1991 to 1993 but have generally increased from 1994 to 2006 due to the implementation of management actions for the benefit of western snowy plovers and California least terns, including predator management and protection and restoration of suitable habitat.

The current Pacific Coast population of the western snowy plover is sparse in Washington, Oregon, and northern California. In 2006, estimated populations were 70 adults along the Washington coast (Pearson et al. 2006), 177 to 179 adults along coastal Oregon (Lauten et al. 2006b), and 2,231 adults in coastal California and San Francisco Bay (window survey including correction factor) (Page 2006, Service 2006). The California population of western snowy plovers comprises at least 90 percent of the listed Pacific Coast population. Eight geographic areas support over three-quarters of the California coastal breeding population: San Francisco Bay, Monterey Bay, Morro Bay, the Callendar-Mussel Rock Dunes area, the Point Sal to Point Conception area (VAFB), the Oxnard lowland, Santa Rosa Island, and San Nicolas Island (Page et al. 1991). A recent population estimate suggests the Baja California, Mexico population is approximately 1,000 breeding adults (E. Palacios, Pers. Comm. 2008).

The Pacific Coast population of western snowy plovers nests near tidal waters along the mainland coast and offshore islands from Damon Point, Washington, to Bahía Magdalena, Baja California, Mexico. Most nesting occurs on unvegetated to moderately vegetated, dune-backed beaches and sand spits. Other less common nesting habitats include salt pans, dredge spoils, and salt pond levees. Nests consist of a shallow scrape or depression, sometimes lined with beach debris (e.g., small pebbles, shell fragments, plant debris, and mud chips); nest lining increases as incubation progresses. Nests are usually located within 328 feet of water, but can be farther away when there is no formative vegetative barrier between the nest and water (Page and Stenzel 1981). The majority of western snowy plovers are site-faithful (returning to the same breeding area in subsequent breeding seasons); some also disperse within and between years (Warriner et al. 1986, Stenzel et al. 1994).

The nesting season of the western snowy plover extends from early March through late September. Generally, the breeding season may be 2 to 4 weeks earlier in southern California than in Oregon and Washington. The earliest nests on the California coast occur during the first week of March in some years and by the third week of March in most years (Page et al. 1995).

Peak initiation of nesting is from mid-April to mid-June (Warriner et al. 1986; Powell et al. 1997). On the Oregon coast, nesting may begin as early as mid-March, but most nests are initiated from mid-April through mid-July (Wilson-Jacobs and Meslow 1984). Peak nest initiation occurs from mid-May to early July (Stern et al. 1990). On the Washington coast, most adults arrive during late April, with maximum numbers present from mid-May to late June.

The typical clutch size of western snowy plovers is three with a range from two to six (Warriner et al. 1986, Page et al. 1995). Both sexes incubate the eggs, which take about 27 days to hatch, with the female tending to incubate during the day and the male at night (Warriner et al. 1986). After losing a clutch or brood or successfully hatching a nest, western snowy plovers may re-nest at the same site or move up to several hundred kilometers (1 kilometer equals 0.62 mile) to nest at other sites (Stenzel et al. 1994, Powell et al. 1997). Re-nesting occurs 2 to 14 days after failure of a clutch, and up to five re-nesting attempts have been observed for a pair (Warriner et al. 1986).

Western snowy plover chicks are precocial (capable of a high degree of independence from birth), feeding on their own within hours of hatching. However, they are unable to fly until 1 month after hatching. Females generally desert males and broods by the sixth day, and thereafter the chicks are typically accompanied by only males. Females obtain new mates and initiate new nests while males rear the broods (Page et al. 1995).

Western snowy plovers are primarily visual foragers, using the run-stop-peck method of feeding typical of *Charadrius* species. They forage on invertebrates in the wet sand and amongst surf-cast kelp within the intertidal zone, in dry sand areas above the high tide, on salt pans, on spoil sites, and along the edges of salt marshes, salt ponds, and lagoons. Western snowy plovers sometimes probe for prey in the sand and pick insects from low-growing plants. Their food sources consist of immature and adult forms of aquatic and terrestrial invertebrates. Little quantitative information is available on food habits. The recovery plan (Service 2007) identifies specific prey items for coastal western snowy plovers.

In western North America, the western snowy plover winters mainly in coastal areas from southern Washington to Central America (Page et al. 1995); however, the majority of birds winter south of Bodega Bay, California (Page et al. 1986). In winter, western snowy plovers are found on many of the beaches used for nesting, as well as some beaches where they do not nest. They also occur in man-made salt ponds and on estuarine sand and mud flats. In California, the majority of wintering western snowy plovers assemble on sand spits and dune-backed beaches. Some also occur on urban and bluff-backed beaches, which are rarely used for nesting (Page et al. 1986). Western snowy plovers that breed on the coast and inland are very site-faithful in winter.

Western snowy plover habitat is subject to erosion and accretion and is highly susceptible to degradation by mechanized beach cleaning; construction of seawalls, breakwaters, jetties, piers, homes, hotels, parking lots, access roads, trails, bike paths, day-use parks, marinas, ferry terminals, recreational facilities, and support services that may cause direct and indirect losses of

breeding and wintering habitat for the western snowy plover. Urban development has permanently eliminated valuable nesting habitat on beaches in southern Washington (Brittall et al. 1976), Oregon (Oregon Department of Fish and Wildlife 1994), and California (Page and Stenzel 1981). Increased development increases human use of the beach, thereby increasing disturbance to nesting plovers. Human activities such as walking, jogging, fishing, fireworks, unleashed pets, horseback riding, and off-road vehicles can destroy the western snowy plover's cryptic nests and chicks.

In addition to causing direct loss of habitat, urban development can result in additional adverse impacts to western snowy plovers. Human activities can interfere with foraging activities by disrupting the ability of adults and chicks to get to the wet beach to feed and return to the dunes or their nest (Burger and Fry 1993). Chicks can also become separated from their parents as a result of human disturbance of broods. Such disturbance could cause or contribute to chick mortality by interfering with essential chick-rearing behaviors or by causing intolerable stresses directly to the chicks (Cairns and McLaren 1980). For example, separation of chicks and their parent can lead to lethal exposure to wind and cold temperatures or disturbance that interferes with foraging could result in the starvation of western snowy plover chicks. In some instances, disturbance associated with these types of recreational activities is expected to temporarily flush western snowy plovers and not affect the birds in such a substantial manner. In other cases, such disturbance could interfere with the metabolism and thermoregulation of western snowy plover chicks and migrating or wintering adults such that they starve or egg production is impaired during the subsequent nesting season (Cairns 1982). The available information regarding the energetics of western snowy plovers is inadequate to assess the likelihood that such injury or mortality would result.

As has been shown with piping plovers (*Charadrius melodus*), a species that is behaviorally and ecologically similar to the western snowy plover, kites flown by people may be perceived as potential predators by western snowy plovers. Stunt kites may cause a greater response from western snowy plovers than traditional, more stationary kites. Hoopes et al. (1992) found that piping plovers responded to kites at an average distance of 279 feet, moved an average distance of over 328 feet, and responded for an average duration of 70 seconds. At Ocean Beach in San Francisco, California, western snowy plovers' reaction to kites ranged from increased vigilance while roosting in close proximity to the kite flying to walking or running approximately 33 to 82 feet away and resting again while remaining alert (Hatch 1997). Other kite-like instruments or sails, such as parachutes used to wind-surf or para-surf, can have the same adverse effect on western snowy plovers as kites, especially if parachutes are raised over the beach or in the surf near the shoreline.

West Nile virus, a mosquito-borne disease which can infect birds, reptiles, and mammals, has spread rapidly across the United States from the initial introduction in New England (National Audubon Society 2006). In 2004 to 2006 the disease was reported from two coastal counties (Lane and Lincoln) in Oregon but has not been reported from any coastal counties in Washington

(U.S. Geological Survey 2006). The virus has been identified in dead piping plovers and killdeer (*Charadrius vociferus*), both of which are closely related to the western snowy plover (Center for Disease Control 2004).

Predator density is an important factor affecting the quality of western snowy plover nesting habitat (Stenzel et al. 1994). The presence of humans near western snowy plover nesting areas can increase the presence of predators due to improper disposal of trash. Predation can result in the loss of adults, chicks, or eggs. Predators can also separate chicks from adults, which can lead to chick mortality. Predation by both native and non-native species limits western snowy plover reproductive success at many Pacific Coast sites. Non-native predators include eastern red foxes (*Vulpes vulpes regalis*), domestic and feral dogs, and Virginia opossums. Coyotes, American crows, common ravens, American kestrels, loggerhead shrikes, and several gull species (*Larus* spp.) are native predators of the western snowy plover. Domestic and feral cats are widespread predators. The threat of predation by domestic cats intensifies when housing is constructed near western snowy plover breeding habitat. In addition, unnatural habitat features such as landscaped vegetation (e.g., palm trees), telephone poles, transmission towers, fences, buildings, and landfills near western snowy plover nesting areas attract predators (Service 2007).

One of the most dramatic causes of habitat loss for coastal breeding western snowy plovers has been the encroachment of introduced European beachgrass (*Ammophila arenaria*) and American beachgrass (*Ammophila breviligulata*). European beachgrass was introduced to the west coast around 1898 to stabilize dunes (Wiedemann 1987); it has spread up and down the coast and now is found from British Columbia, Canada, to Ventura County in southern California. American beachgrass is native to the East Coast and the Great Lakes region. Currently, American beachgrass is the dominant introduced beachgrass species in much of the western snowy plover's range in the State of Washington (Seabloom and Wiedemann 1994).

In addition to the loss of nesting habitat, introduced beachgrass may adversely affect western snowy plover food sources. Slobodchikoff and Doyen (1977) found that beachgrass markedly depressed the diversity and abundance of sand-burrowing arthropods at coastal dune sites in central California. The beachgrass communities may also provide habitat for western snowy plover predators that historically would have been largely precluded by the lack of cover in the dune community (Stern et al. 1991).

Other non-native plant species that have invaded coastal dunes, thereby reducing western snowy plover breeding habitat, include Scotch broom (*Cytisus scoparius*), gorse (*Ulex europaeus*), South African iceplant (*Carpobrotus edulis*), pampas grass (*Cortaderia selloana*), jubata grass (*Cortaderia jubata*), and iceplant (*Mesembryanthemum* sp.). Shore pine (*Pinus contorta*) is a native plant species that has invaded coastal dunes and resulted in similar impacts to western snowy plovers (Schwendiman 1975, California Native Plant Society 1996, Powell 1996). Many non-native weed species also occur on and along San Francisco Bay salt pond levees, resulting in unsuitable nesting habitat for western snowy plovers (Service 2007).

The Pacific Coast population of western snowy plovers has experienced widespread loss of nesting habitat and reduced reproductive success at many nesting locations. The reasons for the

decline and degree of threats vary by geographic location; however, the primary threat is habitat destruction and degradation. Habitat loss and degradation can be primarily attributed to human disturbance, urban development, introduced beachgrass, and expanding predator populations. Natural factors, such as inclement weather, have also affected the quality and quantity of western snowy plover habitat (Service 1993).

ENVIRONMENTAL BASELINE

The implementing regulations for section 7(a)(2) of the Act define the “action area” as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). For the purposes of this biological opinion, we consider the action area to include the 619-acre biological study area as described in the biological assessment (Caltrans 2009), that would be temporarily, permanently and indirectly affected by the proposed action. Along the proposed alignment for SR 1, the action area extends from 500 to 1,000 feet inland (east) of SR 1 and up to 500 feet to the west of SR 1, or to the Pacific Ocean, whichever is closer. The action area also encompasses the entire 40-acre wetland restoration site north and west of Arroyo de la Cruz.

Tidewater Goby

Tidewater gobies have been observed in Arroyo del Corral in 1981, 1995, 2005, 2008, and 2009 (CNDDDB 2009), although none were observed during surveys of this location in 1990. Habitat extends from the lagoon to approximately 0.1 mile upstream.

Tidewater gobies were last observed in Arroyo del Oso in 1989. Habitat modification of this drainage and its lagoon due to erosion and a large culvert covered with riprap may have lead to the extirpation of the tidewater goby at this site (Caltrans 2009). Tidewater goby habitat has the potential to extend as far as 0.25 mile upstream from the mouth of the lagoon.

Critical Habitat for the Tidewater Goby

The proposed action would occur within critical habitat unit SLO-1, that encompasses the Arroyo del Corral drainage. Primary constituent elements 1 through 4 (described previously) occur at this site which is likely a source population for this region. SLO-1 is separated from the nearest extant population by 4.3 miles (73 FR 5920).

California red-legged frog

California red-legged frogs are known to occur throughout the action area and can be readily found in most of its drainages and pools. In 2006, adult California red-legged frogs were observed in the Arroyo del Oso and Arroyo del Corral drainages and in a ponded area of the swale south of the farmhouse (Caltrans 2009). During egg mass surveys conducted in March 2007, 74 California red-legged frogs were observed in the five drainages within the action area, and 11 egg masses in Arroyo del Corral and Arroyo del Oso. One egg mass was also

documented in the Arroyo del Corral pool, south of the Arroyo del Corral drainage, in 2005 (Caltrans 2009). Suitable breeding habitat likely fluctuates within, and between, these locations from year to year based on precipitation and local hydrological conditions.

Proposed Critical Habitat for the California red-legged frog

The proposed action would occur within proposed critical habitat unit SLO-2 (Piedras Blancas to Cayucos Creek). This unit is mapped from occurrences recorded at time of listing and subsequent to the time of listing. SLO-2 contains the features that are essential for the conservation of the subspecies. The unit also contains aquatic habitat for breeding and non-breeding activities (PCE 1 and PCE 2) and upland habitat for foraging and dispersal activities (PCE 3 and PCE 4). SLO-2 provides connectivity within the Santa Lucia Range, and between this range and the inner Coast Ranges in San Luis Obispo County, and is occupied by the species. The unit contains high-quality habitat, indicated by the high density of extant occurrences, permanent and ephemeral aquatic habitats suitable for breeding, and accessible upland areas for dispersal, foraging, and shelter.

Western Snowy Plover

The western snowy plover nests on the sandy beach at the mouth of Arroyo del Corral. The main nesting area is a fairly level, sparsely vegetated dune area less than one-eighth mile long. The California Department of Parks and Recreation (CDPR) manages this beach for nesting western snowy plovers by placing symbolic fencing and signage to deter trespass into the nesting area. Breeding habitat occurs approximately 85 feet from the SR 1 culvert at Arroyo del Corral and approximately 330 feet from the proposed bridge over Arroyo del Corral (Caltrans 2009).

Between 2005 and 2009, a maximum of four adult western snowy plovers were observed during the annual breeding season window survey. In 2008, one 3-egg nest was found at Arroyo del Corral beach in early June. All three eggs in the nest successfully hatched. In 2009, two nests failed; one failed due to predation and the other failed due to heavy winds (CDPR unpublished data 2009).

EFFECTS OF THE ACTION

Tidewater Goby

The proposed project would temporarily adversely affect the tidewater goby. No permanent adverse effects are anticipated. Temporary adverse effects, such as sedimentation and noise and vibrations are likely to occur during the project activities. Noise and vibration are likely to disturb tidewater gobies to some degree, but these effects are temporal and last only for the duration of the project. Sedimentation of the habitat is possible. Tidewater gobies are able to adapt to sedimentation to a certain extent because they breed in sandy substrates, but increased sedimentation usually creates large amounts of shallow, warm habitats that may be unsuitable

(Moyle 2002). Caltrans will implement best management practices to minimize the adverse effects of sedimentation.

The construction of the bridges is scheduled to occur between June 1 and October 31, when water levels would be at their lowest and outside of the peak breeding periods for tidewater gobies. The project requires the use of heavy equipment and pile driving within the drainage, but access will be limited to the maximum extent practicable. Any tidewater gobies that are present within the work areas will be captured and relocated by a Service-approved biologist.

The new bridge at Arroyo del Oso has the potential to displace approximately 0.02 acre of tidewater goby habitat if the placement of the bridge piers/abutments within aquatic habitat is unavoidable. The construction of the bridge at this site is estimated to temporarily adversely affect approximately 0.18 acre and 110 linear feet of tidewater goby habitat. Dewatering may be required for a temporary stream crossing or for access. No tidewater gobies have been observed in Arroyo del Oso since 1989; however, if present, tidewater gobies will be relocated prior to diverting the stream.

The existing culvert at Arroyo del Oso affects the lagoon formation on the inland side of the culvert; no lagoon exists at the outlet which is often inundated with waves. We anticipate that removing the culvert would affect how and when the sandbar forms, affecting the timing and extent of the lagoon. It is anticipated that the lagoon would still form and continue upstream; however, there is likely to be a rapid change in conditions at the creek mouth. How this rapid change would affect tidewater gobies is not known, but we expect the creek to provide suitable habitat.

Tidewater gobies are expected to be present at Arroyo del Corral during the construction of the new bridge. We anticipate that the habitat would be dewatered prior to the bridge construction activities. Caltrans estimated that diverting the stream would temporarily disturb approximately 0.11 acre and 110 linear feet of tidewater goby habitat, but the new bridge would not displace any aquatic habitat. Tidewater gobies may be entrained by pump intakes if such devices are used to dry out work areas. Screening pump intakes with wire, no greater than 0.2 inch mesh diameter, would reduce the potential for tidewater gobies to be caught in the inflow. Handling of tidewater gobies to move them from a work area may result in injury or mortality because of the stress created by the capture efforts. Individuals could suffocate if water becomes depleted of oxygen as a result of a rise in temperature or from excessive crowding once captured. The use of Service-approved biologists to conduct the capture and relocation efforts, however, would minimize these adverse effects to tidewater gobies. Tidewater gobies could also be crushed in seines by the weighted lead line if it should roll inward while being pulled out of the water. To minimize this potential adverse effect, Caltrans will pull seines ashore in a deliberate manner, with care being taken to avoid rolling the weighted line inward.

Culvert removal at Arroyo del Corral would temporarily disturb approximately 0.05 acre of tidewater goby habitat. Due to the high groundwater table, dewatering the work area around the culvert is not possible. Therefore, monitors will be onsite during the culvert removal activities

and tidewater gobies will be captured and relocated and (or) excluded by fencing from the work area. Little to no riparian vegetation occurs west of the proposed bridge location. Approximately 0.05 acre of tidewater goby habitat would be restored by removing the culvert, headwalls, and associated roadways.

Riparian vegetation, the streambank, and floodplain would be subject to temporary adverse effects, but Caltrans will restore all temporarily impacted areas to pre-construction conditions to the maximum extent feasible. Overall, tidewater goby habitat would increase within Arroyo del Oso and Arroyo del Corral and in the long term may reestablish more natural conditions at the creek mouths and lagoons.

Tidewater Goby Critical Habitat

Arroyo del Corral is within critical habitat unit SLO-1 for the tidewater goby. The proposed project would not result in permanent adverse effects to tidewater goby habitat. Upon completion of work activities, tidewater gobies will likely regain use of the disturbed habitat areas after restoration actions or natural processes restore appropriate conditions for their survival such as water depths and substrate.

California red-legged frog

The proposed project would permanently and temporarily directly adversely affect the California red-legged frog. Permanent impacts include the loss of breeding area at the Arroyo del Oso breeding pool and the loss of non-breeding aquatic habitat at the swale south of the farmhouse and Drainage #2. Temporary impacts include the short-term loss of aquatic and riparian habitat in areas immediately adjacent to and within the work areas. Caltrans would minimize the adverse effects to breeding adults because the construction of the bridges is scheduled to occur between June 1 and October 31, when water levels would be at their lowest. The project requires the use of heavy equipment and pile driving within the drainage, but access will be limited to the maximum extent practicable. Any California red-legged frogs that are present within the work areas will be captured and relocated by a Service-approved biologist.

Chytrid fungus could be spread if infected California red-legged frogs are relocated to areas with uninfected California red-legged frogs. Chytrid fungus is a water-borne fungus that can be spread through direct contact between aquatic animals and a spore that can move short distances through the water. The fungus only attacks the parts of an amphibian's skin that have keratin (thickened skin), such as the mouthparts of tadpoles and the tougher parts of adults' skin, such as the toes. The fungus can decimate amphibian populations, causing fungal dermatitis which usually results in death in 1 to 2 weeks, but not before infected animals may have spread the fungal spores to other ponds and streams. Once a pond has become infected with Chytrid fungus, the fungus stays in the water for an undetermined amount of time. Caltrans would reduce the risk of spreading Chytrid fungus by using Service-approved biologists.

The new alignment at Arroyo del Oso would place a bridge over approximately 0.03 acre of breeding habitat at the Arroyo del Oso pond. The presence of the bridge may degrade the habitat for breeding because the additional shading created by the bridge structure could affect water temperatures. In addition, the bridge piers and (or) encroaching abutments may be placed within the drainage adjacent to the breeding pool, resulting in approximately 0.2 acre of further permanent impacts. Construction access at Arroyo del Oso would temporarily adversely affect approximately 0.06 acre of aquatic breeding habitat.

Removing the existing highway and concrete pipe culvert at Arroyo del Oso would temporarily affect 0.03 acre of potential aquatic breeding habitat. The culvert is situated where the beach sandbar would form under natural conditions. The culvert would be removed in the dry season to avoid a breach. Without the protection of the culvert and rock armoring, it is expected that greater wave action would influence the lagoon and may decrease the suitability of the lagoon for California red-legged frogs.

The swale south of the farmhouse provides saturated soils for much of the year. Scour pools and a spring box located upstream of the new alignment provide perennial aquatic habitat adequate for breeding. The proposed project would not affect the spring box or the surrounding pools south of the farmhouse; however, the placement of two large box culverts would permanently adversely affect approximately 0.40 acre of non-breeding aquatic habitat. The existing scour pool at the outlet of the culvert at SR 1 is non-breeding aquatic habitat. Removing this culvert is anticipated to restore approximately 0.20 acre of habitat.

No permanent adverse effects to California red-legged frog breeding habitat would occur at Arroyo del Corral. Construction access would temporarily adversely affect approximately 0.11 acre of aquatic habitat about 70 feet downstream of breeding habitat. The bridge would span the waterway with the piers located outside of the creek channel. There is little to no riparian vegetation west of the proposed bridge; thus, impacts to the riparian area around Arroyo del Corral would be mostly avoided. As part of the project actions, Caltrans will use cuttings to help reestablish willows (*Salix* spp.) along Arroyo del Corral.

Removing the existing roadway and culvert would temporarily adversely affect 0.05 acre of non-breeding aquatic habitat at Arroyo del Corral. Due to the high groundwater table, dewatering the work area is not possible; however, monitors will be onsite during the culvert removal activities and Caltrans will delineate the work area with a permeable exclusion fence and relocate California red-legged frogs out of the project site. Coupled with the Arroyo del Corral pond immediately south of the drainage, approximately 0.59 acre of perennial brackish water habitat would be restored by removing the culvert.

Bridge construction at Drainage #2 (the drainage south of Arroyo del Corral) would temporarily adversely affect approximately 0.34 acre of non-breeding aquatic habitat. This habitat holds water for most of the year, but only consists of saturated soils rather than standing water. Approximately 0.02 acre of wet marsh that is likely used by California red-legged frogs for dispersal and foraging may be lost due to the placement of two sets of piers. The scour pool at

the culvert outlet is a spring and summer pool for California red-legged frogs, but does not support breeding. Removing this culvert would temporarily adversely affect approximately 0.09 acre of non-breeding aquatic habitat, but would restore 0.45 acre of shallow freshwater marsh adjacent to the scour pool.

The vegetation surrounding the aquatic habitat within the work areas is primarily coastal prairie that affords little cover for California red-legged frogs; however, these vegetated areas serve as dispersal and upland habitat because of the close proximity of two or more breeding locations, several permanent water sources, and the ability of California red-legged frogs to travel distances of up to 2 miles across upland areas. The adverse effects to upland/dispersal habitat would be minimal. A new alignment would be constructed while the old alignment would be removed, except for the portions that would be left in place for the proposed California Coastal Trail. Nevertheless, approximately 10 acres of upland/dispersal habitat would be restored due to the removal of the old alignment and 1.24 acres of suitable aquatic habitat would be restored when the culverts are removed.

Riparian vegetation, the streambank, and floodplain subject to temporary adverse effects will be restored to pre-construction conditions to the maximum extent feasible. Topsoil will be collected from all disturbed areas prior to construction to preserve the native seed bank. This method has proven successful in a previous realignment in the same area, where natives were successfully reestablished (Caltrans 2009). Riparian areas will be replanted with willows; at a minimum, Caltrans will plant enough area to ensure that there is no net loss of riparian habitat.

Additional enhancement, preservation, and (or) creation of wetlands with the project boundaries is necessary to satisfy the State and Federal no net loss policy for wetlands. Therefore, Caltrans will mitigate on State Parks-owned property within the northern floodplain of Arroyo de la Cruz. This area was previously farmed and has been substantially altered. In conjunction with the wetland restoration efforts, a California red-legged frog breeding pool will be created at the Arroyo de la Cruz mitigation site. This proposed pond will likely reside over the old river footprint. The pond is expected to be 0.1 acre and excavated to provide a depth of at least 4 feet of water during the rainy season.

California red-legged frog Proposed Critical Habitat

The project footprint is within proposed critical habitat unit SLO-2 for the California red-legged frog. The proposed project actions would temporarily and permanently adversely affect approximately 0.06 and 0.03 acre of aquatic breeding habitat, 0.89 and 0.44 acre of aquatic, non-breeding habitat, 2.21 and 2.49 acres of upland habitat, and 6.90 and 24.82 acres of dispersal habitat, respectively. However, after the completion of the project actions, we anticipate that California red-legged frogs would continue to use the disturbed habitat areas after restoration actions or natural processes restore appropriate conditions for their survival.

Western snowy plover

The proposed project would temporarily adversely affect the western snowy plover. Heavy equipment, pile driving, and daily construction noise may disrupt western snowy plover behaviors. Known breeding habitat is approximately 330 feet from the proposed bridge over Arroyo del Corral. Known disturbances due to noise from some construction equipment (e.g., pile drivers) may extend up to 500 feet from the source. Caltrans is not able to avoid the nesting season of western snowy plover due to the seasonal restriction, from June 1 to October 30, to minimize the adverse effects to the tidewater goby and California red-legged frog. Disruption of western snowy plovers during the breeding season could lead to lower or no reproductive success. These effects would be temporary and may continue through more than one breeding season. At other known breeding sites, western snowy plovers have shown the ability to reestablish themselves after short-term disturbances. To gain additional data on whether these construction activities and associated noise adversely affects breeding behaviors of western snowy plovers, Caltrans has proposed to have a Service-approved biologist onsite while construction activities occur during the nesting season.

The culvert at Arroyo del Corral is approximately 85 feet from the breeding habitat. Unlike, the bridge work, Caltrans will be able to avoid the breeding season when removing the culvert because this work is only expected to take approximately 2 weeks. Therefore, there would be no adverse effects to breeding western snowy plovers when removing the culvert.

CUMMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they would require separate consultation pursuant to section 7 of the Act. We are not currently aware of any non-federal actions that are reasonably certain to occur in the action area.

CONCLUSION

After reviewing the current status of the tidewater goby, California red-legged frog, and western snowy plover, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the Piedras Blancas Realignment Project, as proposed, is not likely to jeopardize the continued existence of the tidewater goby, California red-legged frog or western snowy plover, or adversely modify designated critical habitat for the tidewater goby or proposed critical habitat for the California red-legged frog.

We have reached this conclusion for the following reasons:

1. Caltrans has proposed measures to reduce the adverse effects of the proposed work on the tidewater goby, California red-legged frog, and western snowy plover;

2. Only a small amount of habitat for California red-legged frog and tidewater goby may be permanently lost relative to the amount of habitat available for these species within their affected recovery units and throughout their respective ranges;
3. Western snowy plovers may lose up to three breeding seasons worth of production due to the project actions occurring during the breeding season; however, the western snowy plover population at Arroyo del Corral has only had a maximum of four adults since 2005 during the annual breeding season window survey; and
4. Caltrans will restore temporarily disturbed areas to their pre-project conditions to the maximum extent practicable. In addition, by removing the existing culverts, Caltrans is helping to reestablish more natural conditions at creek mouths and lagoons, which is expected to improve the overall habitat quality in the long-term.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary and Caltrans must include them as binding conditions of any contracts associated with the proposed action, for the exemption in section 7(o)(2) to apply. Caltrans has a continuing duty to regulate the activity covered by this incidental take statement. If Caltrans fails to require its' contractors to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to its authorization, or contracts, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, Caltrans must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

All California red-legged frogs found within project footprint would be subject to take because Caltrans will attempt to capture and relocate all life stages of California red-legged frogs out of work areas prior to the onset of any project activities that may result in adverse effects to California red-legged frogs. We assume that a very small percentage of the captured California

red-legged frogs could succumb to injury or mortality; however, the purpose of capturing and relocating is to reduce the overall risk to California red-legged frogs that could result from implementing the project actions. While California red-legged frogs that are not detected and moved out of harm's way may be killed or injured by the construction activities, we anticipate that few, if any, California red-legged will be injured or killed during the proposed action. Incidental take of California red-legged frogs is difficult to detect because of their small body size and finding a dead or injured specimen is unlikely. California red-legged frog may be taken only within the defined boundaries of the work area.

All tidewater gobies within project area would be subject to take because Caltrans will attempt to capture and relocate all life stages of tidewater gobies out of work areas prior to the onset of any project activities that may result in adverse effects to these species. We assume that a very small percentage of the captured tidewater gobies could succumb to injury or mortality; however, similar to the California red-legged frog, the purpose of capturing and relocating is to reduce the overall risk to tidewater gobies that could result from implementing the project actions. Quantification of take for the tidewater goby is similarly difficult to detect due to the species' small size, aquatic habitat, and annual life history. These factors make it difficult to detect where tidewater gobies are present and if any have been affected by the action. This also indicates that some individuals may not be captured and relocated and could be killed or injured by the activities. Tidewater goby may be taken only within the defined boundaries of the work area.

Western snowy plovers at Arroyo del Corral would be subject to take in the form of harassment. Constructing a new bridge structure at Arroyo del Corral could occur during the breeding season and the breeding area is only 330 feet from the proposed bridge location. Thus, the construction activities and associated noise may be severe enough to disrupt normal breeding behaviors and preclude the initiation of any nests at Arroyo del Corral. Based on the maximum number of adults observed at this location, we anticipate that up to four adults would be taken as a result of the project. Caltrans will have monitors onsite for the bridge construction during the breeding season to gather data on the effects of these actions to breeding western snowy plovers.

This biological opinion provides an exemption from the prohibition against the taking of listed species, contained in section 9 of the Act, only for the activities described in the Description of the Proposed Action section of this biological opinion and in the biological assessment (Caltrans 2009), and only within the Action Area defined in the Environmental Baseline section of this biological opinion.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of the California red-legged frog and tidewater goby:

1. The FHWA and Caltrans must ensure that the level of incidental take during project implementation is commensurate with the analysis contained in this biological opinion.

2. Biologists must be authorized by the Service before they survey for, capture, and move California red-legged frogs and (or) tidewater gobies from the construction area.

The Service's evaluation of the effects of the proposed action includes consideration of the measures to minimize the adverse effects of the proposed action on the California red-legged frog that were included in the programmatic biological opinion developed by FHWA and the Service. Any subsequent changes in these measures may constitute a modification of the proposed action and may warrant re-initiation of formal consultation, as specified at 50 CFR 402.16. The above reasonable and prudent measures are intended to supplement the protective measures that were proposed by FHWA and Caltrans as part of the proposed action.

TERMS AND CONDITIONS

To be exempted from the prohibitions of section 9 of the Act, Caltrans should ensure that the following terms and conditions, which implement the reasonable and prudent measures described above, are implemented:

1. The following terms and conditions implement reasonable and prudent measure 1:
 - a. If one (1) adult or juvenile California red-legged frog is found dead or injured, Caltrans must notify our office immediately. We will then review the project activities to determine if additional protective measures are needed. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.
 - b. Because we are unable to anticipate with a great deal of certainty the number of tidewater gobies that may be killed or injured, Caltrans must notify the Service if more than five (5) individuals are found killed or injured. We will then review the project activities to determine if additional protective measures are needed. The cause of death or injury must be determined by a Service-approved biologist. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.
2. The following term and condition implements reasonable and prudent measure 2:
 - a. Caltrans must request our approval of any biologists that they employ to conduct monitoring activities for the tidewater goby, California red-legged frog, or western snowy plover pursuant to this biological opinion. Such requests must be in writing, and be received by the Ventura Fish and Wildlife Office at least 30 days prior to any such activities being conducted. Please be advised that possession of a 10(a)(1)(A) permit for the covered species does not substitute for the implementation of this measure. A section 10(a)(1)(A) recovery permit is limited to any act otherwise prohibited by section 9 of the Act for scientific purposes or to enhance the propagation or survival of the affected species. Capture and relocation of listed species can only be authorized through the

incidental take anticipated by this biological opinion or through the section 10(a)(1)(B) incidental take permitting process. Authorization of Service-approved biologists is valid for this project only.

- b. To avoid transferring disease or pathogens between aquatic habitats during the course of surveys and handling of California red-legged frogs, the Service-approved biologist shall follow the Declining Amphibian Population Task Force's Code of Practice. A copy of this Code of Practice is enclosed. You may substitute a bleach solution (0.5 to 1.0 cup of bleach to 1.0 gallon of water) for the ethanol solution. Care must be taken so that all traces of the disinfectant are removed before entering the next aquatic habitat.

REPORTING REQUIREMENTS

Caltrans must provide a written report to the Service within 90 days following completion of the proposed project. The report must document the number and size of any California red-legged frogs and (or) tidewater gobies relocated from the action area, the date and time of relocation, and a description of relocation sites. The report must also state the number of California red-legged frogs and (or) tidewater gobies killed or injured, describing the circumstances of the mortalities or injuries if known. The report must contain a brief discussion of any problems encountered in implementing minimization measures, results of biological surveys and sighting records, and any other pertinent information such as the acreage affected and restored or undergoing restoration of each habitat type. We encourage you to submit recommendations regarding modification of or additional measures that would improve or maintain protection of the California red-legged frogs, and tidewater goby, while simplifying compliance with the Act.

DISPOSITION OF DEAD OR INJURED SPECIMENS

Upon locating a dead or injured tidewater goby, California red-legged frog, or western snowy plover, you must notify the Ventura Fish and Wildlife Office by telephone (805-644-1766) and in writing (2493 Portola Road, Suite B, Ventura, California 93003). The report must include the date, time, and location of the carcass, a photograph, cause of death, if known, and any other pertinent information.

Care must be taken in handling dead specimens to preserve biological material in the best possible state for later analysis. Should any injured tidewater gobies, California red-legged frogs, or western snowy plovers survive, the Service must be contacted regarding their final disposition. The remains must be placed with educational or research institutions holding the appropriate State and Federal permits, such as the Santa Barbara Natural History Museum (Contact: Paul Collins, Santa Barbara Natural History Museum, Vertebrate Zoology Department, 2559 Puesta Del Sol, Santa Barbara, California 93105, telephone 805/682-4711 ext. 321).

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The Service requests notification of the implementation of any conservation recommendations so we may be kept informed of actions that minimize or avoid adverse effects or that benefit listed species and their habitats.

FHWA and Caltrans should work with local agencies and governments towards the implementation of recovery actions identified in the California red-legged frog and tidewater goby recovery plans.

REINITIATION NOTICE

This concludes formal consultation on the Piedras Blancas Realignment Project in San Luis Obispo County, California. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: 1) the amount or extent of incidental take is exceeded; 2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this biological opinion; 3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this biological opinion; or 4) a new species is listed or critical habitat is designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

If you have any questions, please contact Steve Kirkland of my staff at (805) 644-1766, extension 267.

Sincerely,

/s/: Diane K. Noda

Diane K. Noda
Field Supervisor

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PERSONAL COMMUNICATIONS

- Eduardo Palacios. Biologist. Communication on January 16, 2008, regarding the population status of the Baja California, Mexico portion of Pacific Coast population of the western snowy plover.

The Declining Amphibian Populations Task Force Fieldwork Code of Practice

- A. Remove mud, snails, algae, and other debris from nets, traps, boots, vehicle tires, and all other surfaces. Rinse cleaned items with sterilized (e.g., boiled or treated) water before leaving each work site.
- B. Boots, nets, traps, and other types of equipment used in the aquatic environment should then be scrubbed with 70 percent ethanol solution and rinsed clean with sterilized water between study sites. Avoid cleaning equipment in the immediate vicinity of a pond, wetland, or riparian area.
- C. In remote locations, clean all equipment with 70 percent ethanol or a bleach solution, and rinse with sterile water upon return to the lab or "base camp" Elsewhere, when washing-machine facilities are available, remove nets from poles and wash in a protective mesh laundry bag with bleach on the "delicates" cycle.
- D. When working at sites with known or suspected disease problems, or when sampling populations of rare or isolated species, wear disposable gloves and change them between handling each animal. Dedicate sets of nets, boots, traps, and other equipment to each site being visited. Clean them as directed above and store separately at the end of each field day.
- E. When amphibians are collected, ensure that animals from different sites are kept separately and take great care to avoid indirect contact (e.g., via handling, reuse of containers) between them or with other captive animals. Isolation from unsterilized plants or soils which have been taken from other sites is also essential. Always use disinfected and disposable husbandry equipment.
- F. Examine collected amphibians for the presence of diseases and parasites soon after capture. Prior to their release or the release of any progeny, amphibians should be quarantined for a period and thoroughly screened for the presence of any potential disease agents.
- G. Used cleaning materials and fluids should be disposed of safely and, if necessary, taken back to the lab for proper disposal. Used disposable gloves should be retained for safe disposal in sealed bags.

The Fieldwork Code of Practice has been produced by the Declining Amphibian Populations Task Force with valuable assistance from Begona Arano, Andrew Cunningham, Tom Langton, Jamie Reaser, and Stan Sessions.

For further information on this Code, or on the Declining Amphibian Populations Task Force, contact John Wilkinson, Biology Department, The Open University, Walton Hall, Milton Keynes, MK7 6AA, UK. E-mail: DAPTF@open.ac.uk Fax: +44 (0) 1908-654167



**UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration**

NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

April 19, 2010

2009/06598:MRM

Chuck Cesena
State of California
Department of Transportation
50 Higuera Street
San Luis Obispo, California 93401

Dear Mr. Cesena:

Enclosed with this letter is NOAA's National Marine Fisheries Service's (NMFS) Biological Opinion for the Federal Highway Administration's (FHWA) and California Department of Transportation's (Caltrans) project to realign a segment of Highway 1 from north of the Piedras Blancas Lighthouse to Arroyo de la Cruz in San Luis Obispo County, California. Under the June 7, 2007 assumption of federal responsibilities, Caltrans is the lead agency for this consultation. This Biological Opinion addresses the effects of the proposed action on the threatened South-Central California Coast Distinct Population Segment of steelhead (*Oncorhynchus mykiss*) and critical habitat for this species in accordance with section 7(a)(2) of the Endangered Species Act of 1973, as amended (16 U. S. C. 1531 *et seq.*).

The Biological Opinion concludes that the proposed action is not likely to jeopardize the continued existence of the Federally threatened steelhead or adversely modify critical habitat. NMFS believes the proposed action is likely to result in incidental take of steelhead, and therefore an incidental take statement is attached to the Biological Opinion. The incidental take statement includes reasonable and prudent measures that NMFS believes are necessary and appropriate to minimize and monitor incidental take of steelhead. Please call Matt McGoogan at (562) 980-4026 if you have a question concerning the Biological Opinion or if you would like additional information.

Sincerely,

A handwritten signature in cursive script that reads "Rodney R. McInnis".

Rodney R. McInnis
Regional Administrator

Enclosure



BIOLOGICAL OPINION

AGENCY: California Department of Transportation

ACTION: The Federal Highway Administration is funding a project to realign a segment of Highway 1 from north of the Piedras Blancas Lighthouse to Arroyo de la Cruz in San Luis Obispo County, California.

CONSULTATION CONDUCTED BY: National Marine Fisheries Service, Southwest Region

DATE ISSUED: April 19, 2010

ADMINISTRATIVE RECORD FILE #: SWR/2009/06598

I. CONSULTATION HISTORY

On December 4, 2009, NOAA's National Marine Fisheries Service (NMFS) received a written request for formal consultation from the Federal Highway Administration (FHWA) and California Department of Transportation (Caltrans) for a project to realign a segment of Highway 1 from north of the Piedras Blancas Lighthouse to Arroyo de la Cruz in San Luis Obispo County, California. Caltrans is taking the role of lead agency for this consultation in accordance with the provisions of the Memorandum of Understanding (MOU) between FHWA, California Division and Caltrans Assumption of Responsibility for Categorical Exclusions, which became effective June 7, 2007. Because aspects of this project have the potential to cause unavoidable short-term adverse effects on the threatened South-Central California Coast (SCCC) Distinct Population Segment (DPS) of steelhead (*Oncorhynchus mykiss*) in watersheds within the project reach, Caltrans requested formal consultation with NMFS. The consultation package received by NMFS on December 4, 2009, appeared to comport with the requirements for initiating formal consultation as defined in 50 CFR §402.14, and formal consultation was initiated on the same day. Accordingly, NMFS prepared this biological opinion for this highway realignment project.

This biological opinion is based on the best scientific and commercial data available, including descriptions of the project (Caltrans 2009), observations of the creek and instream habitat noted by a NMFS biologist, expected effects of the project on steelhead, and the ecological literature. A complete administrative record for this consultation is maintained on file at NMFS' Southwest Regional Office (501 W. Ocean Blvd., Suite 4200, Long Beach, California 90802).

II. DESCRIPTION OF THE PROPOSED ACTION

The Federal action involves FHWA's funding of the proposed action. Caltrans will oversee the implementation of the construction activities to complete the project. The purpose of the

proposed action is to realign 2.8 miles of State Highway 1 in order to provide a long-term solution to the progressive coastal bluff erosion that is undermining this portion of the highway. The goal of the project is to protect the highway from bluff erosion for the next 100 years.

Activities related to the proposed action are anticipated to start in 2013 and may take as long as 3 years to complete. Instream activities, however, are expected to be completed over the course of 1 year and between June 1 and October 31. Project activities include the following:

- Removal of the existing roadbed along 2.8 miles of State Highway 1.
- Construction of 2.8 miles of new roadway ranging from 80 to 475 feet inland (east) from the current location of Highway 1.
- Construction of a driveway to connect the new highway alignment with the old Piedras Blancas Motel.
- Relocation of existing utilities to a location inland parallel to the new alignment.
- Possible staging of equipment at locations that include the old Piedras Blancas motel parking lot, private property, and the large pull out area just south of Arroyo de la Cruz.
- Removal of the existing culverts on three drainages (Arroyo del Corral Creek, Arroyo del Oso Creek, and a small unnamed drainage).
- Potential coffer dam installation and dewatering of about 100 linear feet of Arroyo del Oso if water is present during instream activities associated with construction of the new bridge at this location. The coffer dam would remain in place for no more than 100 days between June 1 and September 30. Due to the location of construction activities remaining outside the active stream channel at Arroyo del Corral Creek, no dewatering will be necessary for the construction of the new bridge at this location, but may be needed for the removal of the old culvert (see below).
- Potential installation of a temporary trestle at Arroyo del Corral Creek to assist with bridge construction activities. If needed, this temporary trestle will be placed on support structures located outside of the active creek channel.
- To prepare for the removal of the culvert in Arroyo del Corral, isolation of the work area (about 150 feet) may be achieved by installation of a coffer dam. However, if the depth of water column and a high groundwater-table preclude proper functioning of a coffer dam, the work area will be isolated by installation of exclusionary fencing or silt curtain. Any steelhead found in the area will be relocated as the area is dewatered (in the case of the coffer dam) or by thoroughly seining the isolated area if dewatering is not feasible. The work area would remain dewatered or isolated for about 2 weeks to complete project activities.

- Removal of the road, culvert, and rock riprap at the mouth of Arroyo del Oso Creek and a re-contouring of the work area. Arroyo del Oso Creek is expected to be dry at the time of culvert removal so no dewatering or coffer dam installation is expected at this location.
- Construction of a temporary trestle over Arroyo Del Oso will be used during bridge installation to minimize disturbance to the pristine wetlands within the drainage. The trestle will be used as a platform from which to conduct bridge construction activities as well as an access route across the creek.
- Construction of three new bridges located where the realigned highway crosses each of the 3 drainages. Overall, bridge construction activities at Arroyo del Corral and Arroyo del Oso are expected to take between 150-200 working days. However, as stated above, instream activities associated with bridge construction that would require dewatering would be completed within 100 days.
- Pile-driving bridge abutments and trestle supports at all three bridge locations. Pile driving activities will take up to 22 days at both Arroyo del Corral Creek and Arroyo del Oso Creek between June 1 and October 31. Piles will be located outside of the active stream channel.
- Restoration of stream banks, wetlands, and coastal prairie as existing roadbed is removed and realigned.

The action area includes about 2.8 miles of State Highway 1 between the Piedras Blancas lighthouse and Arroyo de la Cruz along in San Luis Obispo County (postmiles 64.0 to 67.2). The natural communities and land-use types found within the action area are described as riverine, agricultural, nonnative annual grasslands, freshwater marsh, riparian forest, ruderal, landscaped/developed, and existing roads. The majority of the project activities occurs in upland areas away from steelhead or critical habitat. There are two creeks within the action area that have the potential to be habitat for steelhead (Arroyo del Corral Creek and Arroyo del Oso Creek). Arroyo del Corral Creek is listed as critical habitat.

III. Status of the listed species

The status of steelhead and the species' life history and habitat requirements, status of critical habitat, and recent factors affecting populations and critical habitat are described as follows.

A. Status

Steelhead, an ocean-going form of rainbow trout, are native to Pacific Coast streams extending from Alaska to California and have decreased significantly in abundance from historic levels (Swift *et al.* 1993). Reasons for the decline of steelhead (including factors affecting steelhead) include past and present destruction, modification or curtailment of the species habitat; over-utilization for commercial, recreational and educational purposes; disease and predation; and inadequacy of existing regulatory mechanisms (August 18, 1997, 62 FR 43937; January 5, 2006,

71 FR 834). The decline of the species prompted listing of the SCCC Distinct Population Segment (DPS) of steelhead as threatened on 18 August 1997 (62 FR 43937). This coastal steelhead DPS occupies rivers from the Pajaro River, Santa Cruz County, south to but not including the Santa Maria River.

NMFS characterized the abundance of steelhead in the SCCC DPS when the species was originally listed (August 18, 1997, 62 FR 43937) and cited this information as the basis for the recent relisting of SCCC steelhead (71 FR 834). In the mid-1960s the California Department of Fish and Game estimated a total of 27,750 steelhead spawning in this coastal DPS. Recent estimates for those rivers where comparative abundance information is available show a substantial decline during the past 30 years. McEwan and Jackson (1996, as cited in August 18, 1997, 62 FR 43937) reported spawning runs ranging from 1,000 to 2,000 in the Pajaro River in the early 1960s, and Snider (1983, as cited in August 18, 1997, 62 FR 43937) estimated escapement of about 3,200 steelhead for the Carmel River for the 1964 to 1975 period. No recent estimates for total run size exist for this DPS, but recent estimates of run size are available for five rivers (Pajaro River, Salinas River, Carmel River, Little Sur River, and Big Sur River). The total of these estimates is less than 500 fish compared with a total of 4,750 for the same rivers in 1965, which suggests a substantial decline for this entire DPS from 1965 levels. Recent (1988 to 2002) counts of adult steelhead migrating upstream in the Carmel River suggest an increase in localized abundance (Good *et al.* 2005). As part of the recent assessment and relisting of SCCC steelhead, NMFS convened a biological review team (BRT) composed of scientists. The BRT evaluated the viability and extinction risk of naturally spawning populations within each DPS. The BRT found high risks to abundance, productivity, and the diversity of the SCCC DPS and expressed particular concern for the DPS' connectivity and spatial structure. In consideration of this information the majority of the BRT predicted that the SCCC DPS is "likely" to become endangered in the foreseeable future, while a minority of the BRT concluded that the SCCC steelhead is now "in danger of extinction." The recent NMFS population characterization report found some limited evidence that coastal populations of steelhead in this DPS, while lower than historic numbers, may be relatively stable (Boughton *et al.* 2006).

B. Life History and Habitat Requirements

The major freshwater life history stages of steelhead include freshwater rearing and emigration of juveniles, upstream migration of adults, spawning, and incubation of embryos (Shapovalov and Taft 1954; Moyle 1976; Barnhart 1991; Meehan and Bjornn 1991; Busby *et al.* 1996; 62 FR 43937). Steelhead rear in freshwater for one to three years before migrating to the ocean, usually in the spring and fall (Shapovalov and Taft 1954; Bjornn and Reiser 1991), where they may remain for up to four years. The timing of emigration appears to be influenced by photoperiod, streamflow, and temperature (Shapovalov and Taft 1954; Bjornn and Reiser 1991; Holubetz and Leth 1997). In some drainages, immature steelhead may rear in lagoons or estuaries for several weeks prior to entering the ocean. Steelhead grow and reach maturity at age two to four while in the ocean. Generally, adults immigrate to natal streams for spawning during October to March, but some adults may not enter coastal streams until spring. In southern landscapes, such as San Luis Obispo County, adult steelhead enter streams during December through March for spawning. Adults may migrate several miles, hundreds of miles in some watersheds, to reach their spawning grounds. Although spawning may occur in late winter and early spring, the

specific timing of spawning may vary a month or more among streams within a region. Steelhead do not necessarily die after spawning and may return to the ocean, sometimes repeating their spawning migration one or more years. Female steelhead dig a nest in the streambed and then deposit their eggs. After fertilization by the male, the female covers the nest with a layer of gravel; the embryos incubate within this gravel pocket. Hatching time varies from about three weeks to two months depending on water temperature. The young fish emerge from the nest two to six weeks after hatching.

Habitat requirements of steelhead in streams generally depend on the life history stage (e.g., Bjornn and Reiser 1991), and essential features of steelhead habitat include adequate substrate, water quality, water quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space, and safe passage conditions. Generally, discharge, water temperature, and water chemistry must be appropriate for adult and juvenile migration. Low discharge, high water temperature, physical barriers, low dissolved oxygen, and high turbidity can delay or halt upstream migration of adults and timing of spawning, and downstream migration of juveniles and subsequent entry into estuary, lagoon, or ocean. Suitable water depth and velocity, and substrate composition are the primary requirements for spawning, but water temperature and turbidity are also important. Dissolved oxygen concentration, pH, and water temperature are factors affecting survival of incubating embryos. Fine sediment, sand and smaller particles, can fill interstitial spaces between large substrate particle types, thereby reducing water flow through and dissolved oxygen levels within a nest. Juvenile steelhead require living space (different combinations of water depth and velocity), shelter from predators and harsh environmental conditions, food resources, and suitable water quality and quantity, for growth and survival during summer and winter. Young-of-the-year and yearling steelhead generally use riffles, runs and pools (e.g., Roper *et al.* 1994) during much of a given year where these habitats exist. Young-of-the-year and older juveniles may seek cover and cool water in pools during summer (Nielsen *et al.* 1994) particularly as discharge and therefore space declines in summer and fall (Kraft 1972).

C. Status of Critical Habitat

Critical habitat for the SCCC DPS was designated on September 2, 2005, and consists of the stream channels listed in 70 FR 52488, including Arroyo del Corral Creek. Critical habitat does not include occupied habitat areas on Indian tribal lands, or on specific lands owned or controlled by the Department of Defense where a natural resources management plan has been prepared. Riverine areas above major dams that are presently inaccessible to steelhead were not designated as critical habitat. Critical habitat has a lateral extent as defined by the bankfull discharge, also known as a 2-year flood event. Estuarine areas of listed streams are also included in the designation, but the riparian zone is not included in the designation.

The recent final rule on critical habitat describes 6 primary constituent elements (PCE) that are essential features of steelhead critical habitat (September 2, 2005, 70 FR 52488) and therefore essential to the conservation of the species. These PCEs include: (1) Freshwater spawning areas with sufficient water quantity and quality and substrate that would support spawning; (2) Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage

supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks; (3) Freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival; (4) Estuarine areas free of obstruction with water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh and saltwater; natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation; (5) Nearshore marine areas free of obstruction with water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation; and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and (6) Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation.

Streams like Arroyo del Corral Creek that have been designated as critical habitat in the South-Central California Coast DPS have the above PCE attributes to varying degrees, depending on the stream location and the impacts associated with the watershed. NMFS' most recent Status Review Update for West Coast Steelhead (Good *et al.* 2005) identified habitat destruction and degradation as serious ongoing risk factors for this DPS. Urban development, flood control, water development, and other anthropogenic factors have adversely affected the proper functioning and condition of some spawning, rearing, and migratory habitats in streams designated as critical habitat. Urbanization has resulted in some permanent impacts to steelhead critical habitat due to stream channelization, increased bank erosion, riparian damage, migration barriers, and pollution (Good *et al.* 2005). Many streams within the DPS have dams and reservoirs that mute flushing flows, withhold or reduce water levels suitable for fish passage and rearing, physically block upstream fish passage, and retain valuable sediments for spawning and rearing. In addition, some stream reaches within the DPS' designated critical habitat may be vulnerable to further perturbation resulting from poor land use and management decisions.

As part of the process to gather and analyze information related to the designation of critical habitat, several Critical Habitat Analytical Review Teams (CHARTs) were formed. The CHARTs for the SCCC DPS compiled all available information regarding the distribution and habitat use of steelhead within the SCCC DPS, worked with a GIS specialist to develop maps depicting the spatial distribution of each DPS overlaid on stream hydrography at a scale of 1:100,000, verified that PCEs occurred in each CALWATER Hydrologic Subarea (HSA) that were occupied by steelhead, verified the existence of management activities that may affect the PCEs, and finally, performed conservation assessments for all occupied watersheds, including riverine reaches and estuarine areas within each DPS. To assess the conservation value of an HSA, the CHART used their best professional judgment and considered a variety of data sources and employed a generally uniform scoring system based on the quality, quantity, and distribution of physical or biological features associated with spawning, rearing, and migration in each HSA. From this analysis each occupied HSA was given a value of "high," "medium," or "low." Within the freshwater and estuarine range of the SCCC DPS, the CHART identified 30 HSAs that were occupied by steelhead (NMFS 2005). Six HSAs were rated low in conservation value,

11 were rated medium, and 13 were rated as high in conservation value. Essential features for spawning, rearing, and migration are contained in approximately 1,251 miles of occupied stream habitat within these HSAs.

IV. ENVIRONMENTAL BASELINE

This section describes the status of steelhead and critical habitat in the action area and factors affecting steelhead and the primary constituent elements of critical habitat. Each of these is described as follows.

A. Status of Steelhead and Critical Habitat in the Action Area

Arroyo del Corral Creek and Arroyo del Oso Creek are the two creeks within the action area that have the potential to be occupied or provide habitat for steelhead. Arroyo del Corral Creek is listed as critical habitat. Arroyo del Oso Creek is not listed as critical habitat but has instream habitat characteristics that could support steelhead. Instream habitat within Arroyo del Corral Creek consists of riffles, runs, pools, a small side channel area that is connected to the creek and retains water, and a small lagoon. Arroyo del Oso Creek mainly consists of pools and shallow riffles, but has no distinguishable lagoon with the current Highway 1 culvert emptying immediately into the sand and tidal zone on the beach. Near the lagoon surface sediments in the channel of Arroyo del Corral Creek consist primarily of sand and finer particles; farther upstream in the action area surface particle types include more small cobble and gravel. Sediments in Arroyo del Oso are composed mainly of sand and small gravel with some intermittent small cobbles. Both creeks have sparse riparian vegetation and canopy cover. It does appear that both drainages do have increased riparian cover higher in the watershed. In fact, immediately upstream of the action area on Arroyo del Corral Creek the creek enters into a very dense stand of willows, which infers that the action area has the potential to harbor a more extensive riparian corridor. Arroyo del Corral Creek seems to have perennial flow through the action area, while Arroyo del Oso Creek, at this location, often becomes intermittent or dry during the summer months. The lower segments of both creeks in the action area are influenced by and receive tidal waters. In particular, the lagoon on Arroyo del Corral is a brackish water environment.

Based on the characteristics of the instream habitat of Arroyo del Corral Creek at this location (pools, cover, stream flows, gravel composition, perennial flow, lagoon etc.), this section of stream appears to provide suitable habitat for migration (PCE 3), some rearing (PCE 2), an estuarine transition zone (PCE 4), and some, but limited potential for spawning (PCE 1). Arroyo del Oso Creek is not listed critical habitat, but has habitat characteristics through the action area that seems most suitable for migration (PCE 3) and limited rearing (PCE 2) with a very quick estuarine transition (PCE 4). Upper portions of the watershed above the action area in both drainages seem likely to have habitat that provides opportunities for spawning and rearing.

No steelhead were observed in the project area during a February 19, 2009, site visit by NMFS' biologist M. McGoogan or in multiple site visits by several different Caltrans' staff between 2005 and 2009 (Caltrans 2009). However, low water visibility and cover in Arroyo del Corral Creek may have precluded observation from the bank. No recent comprehensive steelhead surveys have been done throughout either drainage, but in consideration of similar drainages

along this coastline that have known populations of steelhead it seems likely that steelhead may be present or utilize these watersheds from time to time. The greatest likelihood of steelhead presence, through the action area is in Arroyo del Corral Creek. In consideration of the habitat present and the previous site visits noted above, NMFS expects that there would be no more than 20 juvenile steelhead in the area during the summer months when instream project activities would occur.

B. Factors Affecting Steelhead and Critical Habitat in the Action Area

The action area is located largely on undeveloped, rural ranch land with a few scattered rural residences. The major land use through the area seems to be light to moderate cattle grazing. Improper grazing can alter the quality and quantity of instream habitat, and decrease production of fish (review by Platts 1991). The degree to which grazing within the action area is affecting steelhead and their habitat both on and offsite is unknown to NMFS, though some bank erosion and potential water quality impacts (cattle defecation in or near the stream channel) that are similar to impacts observed in cattle grazed areas were visible at both sites. Also a potential issue in these watersheds is the alteration or modification of streamflow and instream habitat due to groundwater pumping. Surface water diversion and groundwater pumping may affect instream habitat conditions by reducing available habitat and increasing water temperature. A structure that appeared to be a groundwater pump was observed close to the active channel of Arroyo del Corral Creek within the action area. Also at Arroyo del Corral Creek there appears to be some channel incision and erosion occurring within the action area creating some vertical drops in places that are impediments to upstream migration under low stream flows.

V. EFFECTS OF THE PROPOSED ACTION

This section describes potential effects of the proposed action on SCCC steelhead and critical habitat. In general, temporary construction impacts at Arroyo del Corral Creek are anticipated to be about 0.16 acres and found along a length of about 200 linear feet of the creek. Aside from the 0.08 acres of lagoon habitat expected to be restored with the removal of the culvert, no permanent impacts are expected on Arroyo del Corral Creek and critical habitat. At Arroyo del Oso Creek, temporary construction impacts are anticipated on about 0.21 acres and along about 135 linear feet of the creek. Permanent impacts at Arroyo del Oso Creek are expected to be about 0.02 acres. To identify the potential effects, NMFS reviewed the ecological literature concerning the effect of habitat changes on steelhead and aquatic habitat, and carefully considered the type, amount and extent of habitat changes that are expected to result from the proposed action. A general knowledge of physical and biological processes, population dynamics, and the life history and habitat requirements of steelhead supplemented the literature review, particularly where there was little or no information concerning effects of an impact on steelhead or the aquatic environment. This Biological opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 C.F.R. 402.02. Instead, we have relied upon the statutory provisions of the ESA to complete the following analysis with respect to critical habitat.

A. Alteration of Freshwater Rearing Areas

Either a coffer dam or some combination of sand bags and silt fencing will isolate the work area on Arroyo del Corral Creek prior to instream work activities. If flows are present in Arroyo del Oso Creek, a coffer dam and water diversions will isolate instream work areas and prevent work in flowing water. Installation of these structures on either creek is expected to cause a temporary loss of aquatic habitat and increase the risk that steelhead would be harmed during the process to dewater or isolate the work area. The loss would be confined to discrete sections of Arroyo del Corral and Arroyo del Oso creeks, and would be temporary because the affected workspace would be re-watered or have the exclusion fencing removed after the proposed action is complete. Due to the timing of this project, diversion of surface water would have the most significant impact on the freshwater and brackish water rearing areas for steelhead (PCE 2 and PCE 4). No adult steelhead are expected to be found in the action area during timing of instream project activities (June 1 to October 31)

With regard to the consequences of altering the freshwater or brackish water rearing areas for steelhead, this species requires suitable living space for growth and survival; living space absent surface water is not suitable. Streamflow diversion could harm individual steelhead by concentrating or stranding them in residual wetted areas that are predisposed to dewatering or desiccation, increased water temperature, decreased dissolved oxygen concentration, and predation (Cushman 1985) or by causing them to migrate to adjacent less suitable habitats (Kraft 1972; Campbell and Scott 1984). Steelhead could also be subject to increased likelihood of harm due to capture and relocation through seining of the work area. However, overall the seining and removing of steelhead from the work area will also reduce the likelihood of harm and mortality to those individuals if they were not relocated prior to the commencement of project activities. The likelihood of harm and mortality to steelhead as a result of dewatering or seining will also be reduced by having a fish biologist on site to move steelhead to nearby stream habitats outside of the project area during the dewatering process. There is still some risk to steelhead from this handling and relocation process and this risk will be addressed further in Section B below. Based on observations of the site, there is expected to be adequate habitat to support any steelhead relocated from the dewatered work areas in either creek.

Steelhead also require free movement for development and survival; precluding movement could harm individual steelhead by forcing fish to migrate to adjacent habitats which are less suitable than the work area (Kraft 1972, Campbell and Scott 1984). Installation of coffer dams or silt fencing could impact movement patterns of juvenile steelhead over-summering in the stream. All coffer dams and diversions will be installed during the lowest flows of the year to reduce impacts and avoid main migratory seasons for steelhead. The coffer dam to be installed on Arroyo del Oso and Arroyo del Corral will drain about 100 feet of stream on each creek and will be in place for about 100 days. Overall, while likelihood of steelhead presence and number of steelhead is expected to be low on both streams, Arroyo del Corral Creek is more likely to have steelhead present and incur the impacts described above.

B. Capture and Relocation of Steelhead

During the process to seine or dewater the work areas on Arroyo del Oso Creek and Arroyo del Corral Creek the applicant proposes to monitor and relocate steelhead captured during these activities. In consideration of the habitat present at this location and potential steelhead use of this watershed, NMFS expects no more than 20 juvenile steelhead will be relocated as a result of the project. As many as 2% (1 juvenile steelhead) may be killed, as a result of the proposed action, based on NMFS' experience and knowledge gained in San Luis Obispo County on similar construction project during the last several years. As indicated in the environmental baseline section, the upper portions of Arroyo del Corral Creek would likely have greater capacity to support higher numbers of rearing juveniles. Any steelhead found in the project reach would be a small fraction of the main population. Therefore, if lethal take of 1 juvenile steelhead is observed, NMFS expects the loss would have a negligible effect on the population of steelhead in the Arroyo del Corral Creek watershed. Arroyo del Oso Creek will likely be dry or have negligible flow. If a diversion is necessary, it not expected there will be any steelhead in the area due to habitat characteristics during the summer.

C. Loss of Aquatic Insects

The benthic (bottom-dwelling) aquatic insect assemblage of most waterways typically comprises numerous species. Food resources are important in supporting rearing functions of critical habitat (PCE 2) for juvenile steelhead. Aquatic insects provide a source of food for stream fish populations, and may represent a substantial portion of food items consumed by juvenile steelhead at various times of a year. The sections of stream to be dewatered for this project are composed of a mix of small pools, runs, and riffles. Some species of insects are found in swift-water habitats such as riffle and runs, whereas other species are found in slow-water habitats such as glides and pools. Riffles are generally accepted as the principal food-producing habitat in streams. Nevertheless, any activity that affects instream habitat could reasonably be expected to affect these food resources.

Individual benthic aquatic insects are expected to be lost when discrete sections of the creek within the action area are temporarily dewatered. Effects to aquatic insects resulting from streamflow diversion, work site isolation, and culvert removal will be temporary because construction activities will be relatively short-lived, and rapid (on the order of one to two months) recolonization of disturbed areas by macroinvertebrates is expected (Thomas 1985; Harvey 1986). Furthermore, the effect of insect loss on steelhead is likely to be negligible because food from upstream sources (via macroinvertebrate drift through the culvert) would be available to steelhead immediately downstream of the affected area.

D. Disturbance to Streamside Vegetation

Streamside vegetation provides numerous functional values to stream fish that may benefit migrating, rearing, or spawning steelhead (critical habitat PCEs 1, 2, and 3) (Hall and Lantz 1969; Karr and Schlosser 1978; Lowrance *et al.* 1985; Wesche *et al.* 1987; Gregory *et al.* 1991; Platts 1991; Welsch 1991; Castelle *et al.* 1994; Lowrance *et al.* 1995; Wang *et al.* 1997). Consequently, the trimming of some of the riparian vegetation on and around the vicinity of the

areas for bridge installation and culvert removal are of concern. Loss of trees and vegetation in the area may result in limited temporary impacts to the primary constituent elements of critical habitat and steelhead due to loss of some shading and cover. However, the loss of any trees or vegetation at this site is expected to be temporary (2 to 3 years as vegetation grows back) and minimal, because there is currently little vegetation at the work sites due to cattle grazing and ranching activity at these locations. In addition, a habitat mitigation plan will be implemented, which is intended to compensate for any losses and to reestablish riparian cover in the area. NMFS expects two or three years will be required for the riparian plantings to establish canopy cover in the area that is greater or equivalent to that which existed prior to project implementation.

E. Alteration of Water Quality

Water quality is important for maintaining quality of critical habitat for steelhead rearing (PCE 2). Installing and then removing the temporary stream diversion on either Arroyo del Oso Creek or Arroyo del Corral Creek is expected to temporarily increase the potential for sedimentation (rapid settling of suspended sediment) and turbidity (suspended particulate matter affecting the amount of light that is scattered or absorbed by a fluid). This is of concern because high turbidity concentrations can cause fish mortality, reduce fish feeding efficiency and decrease food availability (Berg and Northcote 1985; McLeay *et al.* 1987; Gregory and Northcote 1993; Velagic 1995). Prolonged exposure to elevated concentrations of inorganic sediment can cause decreased growth in salmonids (Shaw and Richardson 2001). The magnitude and degree of the potential water-quality alteration is unknown because the specific sedimentation and turbidity rates have not been predicted. The actual sedimentation and turbidity rates would depend in part on the amount of time required to install the diversion or silt/exclusionary fencing. Gross increases in sedimentation and turbidity owing to construction activities are not likely because the applicant proposes to implement and maintain erosion control measures, and construction activities will occur in the dry (on Arroyo del Oso Creek) or in an area that has been cleared of aquatic species and isolated (on Arroyo del Corral Creek). Although NMFS expects that turbidity and sedimentation rates will increase, in particular during installation of the temporary diversion, these increases are not expected to be sufficient to diminish the functional value of habitat for steelhead because they are localized and of an expected magnitude that is less than can occur during natural flow events. Culvert removal activities at Arroyo del Corral are likely to increase turbidity in the isolated work area (if not dewatered) but the work area will be cleared of steelhead before activities commence and sediment in the water column will be given time to settle before the silt and exclusionary fencing is removed. Finally, all installation and work activities in the creeks will be conducted during the dry season when streamflows are lowest allowing for greater ease in setting up diversion structures and less opportunity for sediment to be carried downstream.

Heavy equipment may accidentally release fluid (including large spills during refueling) that is harmful to aquatic life. However, the majority of the equipment use will be on trestles or from banks outside of the active stream channel. To further reduce potential inputs of hazardous substances to the stream all equipment and vehicles will be serviced and staged at areas away from the stream channel in designated areas enclosed by spill-containing berms, and a spill contingency plan that covers possible leaks and spills into either Arroyo del Corral or Arroyo del Oso creeks will be developed and implemented.

F. Sound Impacts From Pile-Driving

There are many known instances where noise and vibration from pile-driving have resulted in harm and mortality of fish and other aquatic species. Therefore, the potential impact of pile-driving associated with bridge construction on either Arroyo del Corral or Arroyo del Oso creeks is of concern. The pile-driving for the bridge abutments will take place in dry soils and in upland areas far enough away from the creek that no noticeable impacts to steelhead or critical habitat are expected. However, a temporary trestle may be built over Arroyo del Corral Creek to assist with the construction of the bridge at this location and supports for this trestle will be located much closer to the stream channel. If pile-driving is required for installation of these trestle supports, there is a much greater possibility that this pile-driving could result in impacts on steelhead. Some of the details regarding pile-driving and installation for this temporary trestle will be determined once Caltrans had selected a contractor for this project. Until the contractor submits their final design plans it will be difficult to accurately assess the potential level of impact this pile driving will have. NMFS has criteria that accumulated underwater sound exposure level must not exceed 187 dB sel (the criteria is 183 dB sel for fish that are less than 2 grams) in order to prevent harmful effects to steelhead. Caltrans is proposing to work with their future contractor and NMFS to develop final work plans and minimization measures to ensure that accumulated sound exposure levels resulting from pile driving at this location will be less than 183 dB sel. Caltrans also proposes that these final design plans will be submitted for NMFS review and approval 60 days prior to implementation of these construction activities. At this time, NMFS has proceeded to write this biological opinion with the understanding that more information will be forthcoming during the final project-planning phases. NMFS and Caltrans will continue to collaborate on the proposed action, including after issuance of this biological opinion. In this regard, NMFS expects to continue to provide input, review designs, and participate in the development of monitoring and mitigation measures for the purpose of ensuring that the final design and implementation of various project elements are executed in a manner that will not jeopardize the threatened SCCC DPS of steelhead or destroy or adversely modify critical habitat for this species. As project designs and plans develop, or if key assumptions are found to be invalid, NMFS and Caltrans may need to re-initiate section 7 consultation to incorporate new information and re-assess project effect. Therefore, at this time, NMFS expects that the sound levels that will be emitted by the project will be within NMFS' criteria.

G. Post-Project Hydraulic Conditions

Manipulation of the stream channel, bridge structures, and culverts can result in changes to channel morphology and hydraulic conditions. This can be a concern because changing channel morphology or hydraulic conditions could create barriers or impediments to passage of steelhead at these or other locations. The bridges to be installed at each creek will be span bridges that rest on abutments and a set of piers that are located outside of the active channel with no structures perpendicular to the flow line that could impede steelhead passage. The culverts that will be removed are at or below grade. Removal of these structures is expected to benefit steelhead by restoring some lagoon habitat and providing unimpeded passage for steelhead at these locations. Therefore the project is expected to maintain and improve steelhead passage through the project reach.

VI. CUMULATIVE EFFECTS

Cumulative effects include the effects of future state, local or private actions that are reasonably certain to occur in the action area considered in this Biological Opinion. NMFS is generally familiar with activities occurring in the action area, and at this time is unaware of such actions that would be reasonably certain to occur. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Endangered Species Act. Consequently, NMFS believes no cumulative effect, beyond the continuing effects of present land uses, is likely.

VII. CONCLUSION

After reviewing the best scientific and commercial information available, the recent status of steelhead, the environmental baseline for the action area, and expected effects of the proposed action, it is NMFS' Biological Opinion that the proposed action is not likely to jeopardize the continued existence of the Federally threatened SCCC steelhead DPS. The proposed action is not expected to reduce the likelihood of survival or recovery of the Arroyo Del Corral Creek or Arroyo Del Oso Creek population because short-term effects are expected to be temporary, confined onsite, and are not expected to result in any detectable changes in the number, reproduction, or distribution of the population of either stream. Further, based on the above analysis, implementation of the proposed action is expected to allow critical habitat to remain functional and retain the current ability for the primary constituent elements to serve the intended conservation role for the species. As a result, the proposed action is not expected to adversely modify or destroy critical habitat for this species.

VIII. INCIDENTAL TAKE STATEMENT

Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or to attempt to engage in any such conduct. Harm is further defined by NMFS to include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering. Incidental take is defined as take of listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not the purpose of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary and must be undertaken by Caltrans for the exemption in section 7(o)(2) to apply. Caltrans has a continuing duty to regulate the activity covered by this incidental take statement. If Caltrans (1) fails to assume and implement the terms and conditions or (2) fails to adhere to the terms and conditions of this incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, Caltrans must report the progress of the action and its impact on the species to NMFS as specified in the incidental take statement (50 CFR §402.14(i)(3)).

A. Amount and Extent of Take

NMFS believes the proposed action on Arroyo del Oso Creek and Arroyo del Corral Creek in San Luis Obispo County, California, will result in the incidental take (capture, injury, and mortality) of steelhead when individual work areas are dewatered or seined resulting in the capture and relocation of juvenile steelhead outside the work areas. NMFS anticipates no more than 20 juvenile steelhead will be relocated during project activities and that no more than 1 juvenile steelhead may be killed. The accompanying Biological Opinion does not anticipate any other form of take incidental to the proposed action.

B. Effect of Take

In the accompanying Biological Opinion, NMFS concludes that the anticipated level of take associated with the proposed action is not likely to jeopardize the continued existence of the federally threatened SCCC steelhead DPS.

C. Reasonable and Prudent Measures

NMFS believes the following reasonable and prudent measures are necessary and appropriate to minimize and monitor incidental take of steelhead. The results of the effect analysis provide the basis for the following reasonable and prudent measures:

1. Employ a fisheries biologist for the purposes of monitoring the affected area, and for removing and relocating steelhead from the affected area.
2. Report to NMFS activities associated with minimizing and monitoring proposed action effects on steelhead.
3. Submit future design plans regarding the possible trestle construction at Arroyo del Corral Creek for NMFS' review and approval to ensure associated pile-driving from trestle construction is below NMFS criteria.

Terms and Conditions

In order to be exempt from the take prohibitions of the Endangered Species Act, Caltrans must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring conditions. These terms and conditions are non-discretionary:

1. The following terms and conditions implement reasonable and prudent measure No. 1.
 - A. The Caltrans' biologist shall continuously monitor seining (if it is needed) and placement and removal of the diversion for relocating any steelhead captured during these activities. The biologist shall capture steelhead stranded in residual wetted areas as a result of streamflow diversion and workspace dewatering, and

relocate steelhead to a suitable instream location immediately downstream or upstream of the workspace. One or more of the following NMFS approved methods shall be used to capture steelhead: dip net, seine, throw net, minnow trap, or by hand. Electrofishing is hereby authorized.

- B. The Caltrans' biologist shall continuously monitor construction activities, instream habitat, and performance of sediment control/detention devices for the purpose of identifying and reconciling any condition that could adversely affect steelhead or their habitat. The biologist shall be empowered to halt work activity and to recommend measures for avoiding adverse effects to steelhead and their habitat.
- C. The Caltrans' biologist shall monitor noise levels during pile-driving activities to ensure that noise levels at the stream's edge and underwater are not higher than the 183 dB sel anticipated in the project's biological assessment. Readings should be taken throughout the project reach, and especially at creek locations closest to wherever the pile-driving activity is occurring at the time. If noise levels at the stream's edge or underwater are higher than 183 dB sel, the biologist shall be empowered to halt work and will contact NMFS (Matt McGoogan, 562-980-4026) immediately and prior to continuing pile-driving activities.
- D. The Caltrans' biologist shall contact NMFS (Matt McGoogan, 562-980-4026) immediately if one or more steelhead are found dead or injured. The purposes of the contact shall be to review the activities resulting in take, to determine if additional protective measures are required, and to discuss handling procedures for injured or dead steelhead.

2. The following terms and conditions implement reasonable and prudent measure No. 2.

- A. Caltrans shall provide a written monitoring report to NMFS (Matt McGoogan, 501 W. Ocean Blvd., Suite 4200, Long Beach, California 90802) within 15-working days following completion of the proposed action. The report shall include the number of steelhead killed or injured during the proposed action and biological monitoring; the number and size of steelhead removed and relocated; any effect of the proposed action on steelhead that was not previously considered (reinitiation of consultation would be required, see section IX (2) of the Biological Opinion); and, photographs taken during, before and after work activity.
- B. Caltrans shall provide a written report to NMFS (Matt McGoogan, 501 W. Ocean Blvd., Suite 4200, Long Beach, California 90802) describing results of the revegetation activities to NMFS within 15-working days following completion of revegetation. The report shall include a description of the locations planted or seeded, the area (ft²) revegetated, a plant palette, planting or seeding methods, proposed methods to monitor and maintain the revegetated area, performance or

success criteria, and pre- and post-planting color photographs of the revegetated area.

- C. Caltrans shall provide a written report to NMFS (Matt McGoogan, 501 W. Ocean Blvd., Suite 4200, Long Beach, California 90802) describing the results of the vegetation monitoring to NMFS within 15-working days following completion of the annual site inspections for the 3 years following completion of the project. The report shall include color photographs taken of the project area during each inspection and before and after implementation of the project, and estimated percent of exposed soil remaining within each area affected by the project.

3. The following terms and conditions implement reasonable and prudent measure No. 3.

- A. Caltrans shall provide detailed project designs and an analysis of anticipated pile-driving sound level associated with the trestle installation at Arroyo del Corral Creek to NMFS (Matt McGoogan, 501 W. Ocean Blvd., Suite 4200, Long Beach, California 90802) at a minimum of 60 days prior to commencement of project activities. The report shall include the level of sound expected as a result of pile-driving, an analysis of anticipated sound impacts on steelhead, and a description of minimization measures that will be used to reduce sound impacts from pile-driving.
- B. Caltrans will work with NMFS to employ measures and techniques that will minimize pile-driving sound emitted as a result of this project to the greatest degree possible and at a minimum, will ensure pile-driving sound levels on steelhead will be below NMFS criteria of 183 dB sel.

IX. REINITIATION OF CONSULTATION

This concludes formal consultation on the actions outlined in the project proposal. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded, (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered in this opinion, (3) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, formal consultation shall be reinitiated immediately.

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CALIFORNIA COASTAL COMMISSION

Central Coast District Office
 725 Front Street, Suite 300
 Santa Cruz, CA 95060
 (831) 427-4863



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Date: October 17, 2007

Permit Application No.: 3-07-030

COASTAL DEVELOPMENT PERMIT

On **October 12, 2007**, the California Coastal Commission granted to

California Department of Transportation (Caltrans)

this permit subject to the attached Standard and Special conditions, for development consisting of

Recognition and maintenance of approximately 1,500 linear feet of existing rock arrays and revetments at Rocks 1 and Rocks 2 and allowance of up to approximately 450 linear feet of additional rock at Rocks 2 to protect Highway One. All rock approved is temporary and is to be removed when Highway One is realigned to a more inland location. Approved development also includes recognition of the emergency culvert repair project undertaken within the Rocks 2 area (pursuant to Emergency Coastal Development Permit 3-07-040-G) on the same temporary basis and subject to the same removal parameters as the rock arrays and revetments.

The development is within the coastal zone located at

the shoreline fronting Highway 1 (between post miles 65.3 and 65.9), near Piedras Blancas in northern San Luis Obispo County)

Issued on behalf of the California Coastal Commission by

PETER M. DOUGLAS
 Executive Director


 By: Dan Carl
 Interim District Manager

ACKNOWLEDGMENT:

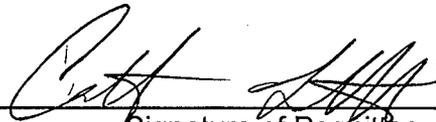
The undersigned permittee acknowledges receipt of this permit and agrees to abide by all terms and conditions thereof.

The undersigned permittee acknowledges that Government Code Section 818.4 which states in pertinent part that: "A Public entity is not liable for injury caused by the issuance. . . of any permit. . ." applies to the issuance of this permit.

IMPORTANT: THIS PERMIT IS NOT VALID UNLESS AND UNTIL A COPY OF THE PERMIT WITH THE SIGNED ACKNOWLEDGMENT HAS BEEN RETURNED TO THE COMMISSION OFFICE. 14 Cal. Admin. Code Section 13158(a).

10/22/07

Date


 Signature of Permittee

COASTAL DEVELOPMENT PERMIT

Date: October 17, 2007

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STANDARD CONDITIONS:

1. **Notice of Receipt and Acknowledgment.** The permit is not valid and development shall not commence until a copy of the permit, signed by the permittee or authorized agent, acknowledging receipt of the permit and acceptance of the terms and conditions, is returned to the Commission office.
2. **Interpretation.** Any questions of intent or interpretation of any condition will be resolved by the Executive Director or the Commission.
3. **Assignment.** The permit may be assigned to any qualified person, provided assignee files with the Commission an affidavit accepting all terms and conditions of the permit.
4. **Terms and Conditions Run with the Land.** These terms and conditions shall be perpetual, and it is the intention of the Commission and the permittee to bind all future owners and possessors of the subject property to the terms and conditions.

SPECIAL CONDITIONS:

1. **Expiration and Scope of Permit.** This coastal development permit is valid for ten (10) years from the date of Commission approval (until October 12, 2017), or until construction of the inland realignment of Highway One is complete and through traffic is diverted to it, whichever occurs first. A new coastal development permit shall be required for the retention of any development authorized by this coastal development permit beyond the end of the term of this permit. While valid this coastal development permit authorizes:
 - (a) **Existing Rock.** Recognition of 1,520 linear feet of existing rock arrays and revetments (150 linear feet of full revetment at Rocks 1 plus 1,370 linear feet of arrays and full revetments at Rocks 2), as shown in Exhibit B.
 - (b) **Additional Rock.** Up to 450 additional linear feet of rock arrays and/or revetments at those portions of Rocks 2 that are currently unarmored (see Exhibit B), and expansion of rock arrays at Rocks 2 up to full revetments as needed (up to 1,780 feet of full revetments). Additional rock shall be no higher than the height of the blufftop edge and no flatter than a 1.5:1 slope. Rock arrays, specifically, shall not extend further seaward than the base of a full size revetment would extend.

COASTAL DEVELOPMENT PERMIT

Date: October 17, 2007

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- (c) **Approved Culvert and Headwall.** Recognition of the emergency repair to the Arroyo del Oso culvert and headwall within the temporary revetment at Rocks 2 undertaken pursuant to emergency coastal development permit 3-07-040-G (see Exhibit B).
 - (d) **Barrier Modifications.** Modifications to the existing concrete barriers at Rocks 2 to minimize viewshed impacts as much as possible to ensure that the barrier as a whole is uniform and as visually unobtrusive as possible, while maintaining the necessary traffic safety requirements.
 - (e) **Maintenance.** Maintenance of the rock, culvert/headwall, and barriers pursuant to the terms of this permit, including Special Condition 2.
2. **Future Augmentation and Maintenance Authorized.** This coastal development permit authorizes future augmentation and maintenance subject to the following:
- (a) **Augmentation.** "Augmentation," as it is understood in this special condition, means placement of up to approximately 450 linear feet of additional rock and any expansion of rock at Rocks 2 as described in Special Condition 1.
 - (b) **Maintenance.** "Maintenance," as it is understood in this special condition, means development that would otherwise require a coastal development permit whose purpose is: (1) to reestablish or place rock within the permitted footprint and/or profile of the Existing Rock and/or the Additional Rock (once initially placed) as described in Special Condition 1; and/or (2) to retrieve any rocks that move seaward of the permitted footprint and/or profile of the Existing and Additional Rock and either restack them (within the approved footprint and profile) or remove them from the project area as soon as is feasible after discovery of the rock movement.
 - (c) **Other Agency Approvals.** The Applicant acknowledges that these maintenance and augmentation stipulations do not obviate the need to obtain permits from other agencies for any future maintenance and/or augmentation episodes.
 - (d) **Augmentation and Maintenance Notification.** At least two weeks prior to commencing any augmentation and/or maintenance event, the Permittee shall notify, in writing, planning staff of the Coastal Commission's Central Coast District Office. The notification shall include: a detailed description of the augmentation and/or maintenance event proposed; any plans, engineering and/or geology reports describing the event; a construction plan that complies with the Construction Plan requirements described below; other agency authorizations; and any other supporting documentation (as necessary) describing the augmentation and/or maintenance event. The augmentation and/or maintenance event shall not commence until the Applicant has been informed by planning staff of the Coastal Commission's Central Coast District Office that the event complies with this coastal development permit. If the Applicant has not received a response within two weeks of

COASTAL DEVELOPMENT PERMIT

Date: October 17, 2007

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submitting the notification, the augmentation and/or maintenance event shall be authorized as if planning staff affirmatively indicated that the event complies with this coastal development permit. The notification shall clearly indicate that the augmentation and/or maintenance event is proposed pursuant to this coastal development permit, and that the lack of a response to the notification within two weeks constitutes approval of it as specified in the permit. In the event of an emergency requiring immediate augmentation and/or maintenance, the notification of such emergency event shall be made as soon as possible, and shall (in addition to the foregoing information) clearly describe the nature of the emergency.

(e) **Construction Plan.** The maintenance and/or augmentation notification shall include a Construction Plan that, at a minimum, provides for the following:

- (1) **Construction Areas.** All areas within which construction activities and/or staging are to take place shall be minimized to the maximum extent feasible in order to minimize construction encroachment on Highway One and the beach, and to have the least impact on public views from Highway One and public access to the shoreline otherwise.
- (2) **Construction Methods and Timing.** All construction methods to be used, including all methods to be used to keep the construction areas separated from public recreational use areas and to minimize public view impacts, shall be clearly identified. Construction shall be limited in duration as much as feasible to limit overall construction impacts. The Plan shall ensure that all erosion control/water quality best management practices to be implemented during construction and their location are provided to the Executive Director prior to commencement of construction.
- (3) **Construction Requirements.** The Plan shall include the following construction requirements specified via written notes on the Plan. Minor adjustments to the following construction requirements may be allowed by the Executive Director if such adjustments: (1) are deemed necessary due to extenuating circumstances; and (2) will not adversely impact coastal resources.
 - All work shall take place during daylight hours and lighting of the beach area is prohibited.
 - Construction equipment operations shall not be conducted below the mean high water line unless tidal waters have receded from the authorized work areas.
 - Grading of intertidal areas is prohibited with one exception as follows: existing rock that has migrated seaward of the rock arrays and/or revetments, that is naturally exposed, and that can be retrieved without substantial excavation of the surrounding sediments, shall be retrieved and reused or removed to an appropriate disposal site offsite. Any existing rock retrieved in this manner shall be recovered by excavation equipment positioned landward of the waterline (i.e., excavator equipment with mechanical extension arms).

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Date: October 17, 2007

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- Only rubber-tired construction vehicles are allowed on the beach, except track vehicles may be used if the Executive Director agrees that they are required to safely carry out construction. When transiting on the beach, all such vehicles shall remain as high on the upper beach as possible and avoid contact with ocean waters and intertidal areas.
- All construction materials and equipment placed on the beach during daylight construction hours shall be stored beyond the reach of tidal waters. All construction materials and equipment shall be removed in their entirety from the beach area by sunset each day that work occurs.
- Equipment and materials shall be stored out of the ocean view as seen from Highway One if feasible.
- Construction (including but not limited to construction activities, and materials and/or equipment storage) is prohibited outside of the defined construction, staging, and storage areas.
- No work shall occur during weekends and/or the summer peak months (i.e., from the Saturday of Memorial Day weekend through Labor Day, inclusive) unless, due to extenuating circumstances (such as tidal issues or other environmental concerns), the Executive Director authorizes such work.
- Equipment washing, refueling, and/or servicing shall not take place on the beach.
- The construction site shall maintain good construction site housekeeping controls and procedures (e.g., clean up all leaks, drips, and other spills immediately; keep materials covered and out of the rain (including covering exposed piles of soil and wastes); dispose of all wastes properly, place trash receptacles on site for that purpose, and cover open trash receptacles during wet weather; remove all construction debris from the beach).
- All erosion and sediment controls shall be in place prior to the commencement of construction as well as at the end of each work day to prevent construction-related runoff and/or sediment from entering into the Pacific Ocean.
- During all construction, copies of the signed coastal development permit and the construction plan shall be maintained in a conspicuous location at the construction job site at all times, and such copies shall be available for public review on request. All persons involved with the construction shall be briefed on the content and meaning of the coastal development permit and the construction plan prior to commencement of construction.
- A construction coordinator to be contacted during construction should questions arise regarding the construction (in case of both regular inquiries and in emergencies) shall be designated, and their contact information (i.e., address, phone

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Date: October 17, 2007

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numbers, etc.) including, at a minimum, a telephone number that will be made available 24 hours a day for the duration of construction, shall be conspicuously posted at the job site where such contact information is readily visible from public viewing areas, along with indication that the construction coordinator should be contacted in the case of questions regarding the construction (in case of both regular inquiries and emergencies). The construction coordinator shall record the name, phone number, and nature of all complaints received regarding the construction, and shall investigate complaints and take remedial action, if necessary, within 24 hours of receipt of the complaint or inquiry.

- The Permittee shall notify planning staff of the Coastal Commission's Central Coast District Office at least 3 working days in advance of commencement of construction, and immediately upon completion of construction.

(f) Restoration. The Permittee shall restore all bluff areas, all beach areas, and all beach access points impacted by construction activities to their pre-construction condition within three days of completion of construction, except that associated landscaping and/or erosion control seeding shall take place within three months of completion of construction, unless a different time period is approved by the Executive Director. Any beach sand impacted shall be cleared of all construction debris as part of these restoration activities.

(g) Non-compliance Proviso. If, in the opinion of the Executive director, the Permittee is significantly out of compliance with the terms and conditions of this coastal development permit at the time that a maintenance and/or augmentation event is proposed, then the event that might otherwise be allowed by this coastal development permit, including the terms of this future augmentation and maintenance condition, shall not be allowed until the Permittee is in full compliance with this permit.

(h) Emergency. In addition to the emergency provision set forth in subsection (d) above, nothing in this condition shall serve to waive any Permittee rights that may exist in cases of emergency pursuant to Coastal Act Section 30611, Coastal Act Section 30624, and Subchapter 4 of Chapter 5 of Title 14, Division 5.5, of the California Code of Regulations (Permits for Approval of Emergency Work).

(i) Duration of Covered Augmentation and/or Maintenance. Future augmentation and/or maintenance under this coastal development permit is allowed subject to the above terms for as long as this coastal development permit remains valid (see Special Condition 1).

3. Annual Progress Reports. On an annual basis, with the first report due one year from the issuance of this coastal development permit, the Permittee shall submit a report to the Executive Director for review and approval demonstrating progress made that year toward the completion of the "Piedras Blancas Realignment Project". Progress shall be measured by the activities, targets, and target deadlines shown in Exhibit D of this report. If a target has not been achieved by the target deadline, then the annual report shall identify a revised target deadline

COASTAL DEVELOPMENT PERMIT

Date: October 17, 2007

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and the measures that will be taken to ensure that the revised target deadline will be met. If, in the opinion of the Executive Director, the Permittee is significantly out of compliance with the terms and conditions of this coastal development permit, including meeting target deadlines in Exhibit D, then the matter shall be scheduled for Coastal Commission review and potential action, where such action at the Coastal Commission's discretion may include modifying the terms and conditions of this coastal development permit, including the end of the term of the permit.

4. **Rock Removal and Restoration Required.** SIX MONTHS PRIOR TO END OF THE TERM OF THIS PERMIT (and by April 12, 2017 at the latest), the Permittee shall submit for Executive Director review and approval, a detailed Rock Removal and Restoration Plan. The goal of the Plan shall be to remove the temporary rock and associated structures authorized by this coastal development permit and to return the area occupied by rock and/or impacted by construction to its pre-rock installation condition. The plan shall describe all BMP's to be implemented and shall include measures to avoid impacts to public views and interference to public access during removal and site restoration activities (with the exception of necessary provisions to protect the public and workers during removal and restoration activities), and shall at a minimum include all of the construction requirements identified in Special Condition 2. The Plan shall provide for the submittal of a final report documenting all removal and restoration activities, including a narrative description and photographic evidence, within three months after completion of removal and restoration activities. The temporary rock and associated structures authorized by this coastal development permit shall be removed and the site restored pursuant to the approved Plan no later than the end of the term of this permit (see Special Condition 1).

CALIFORNIA COASTAL COMMISSION

CENTRAL COAST DISTRICT OFFICE
725 FRONT STREET, SUITE 300
SANTA CRUZ, CA 95060
(831) 427-4863



NOTICE OF COMMENCEMENT OF CONSTRUCTION

I/We hereby notify the CALIFORNIA COASTAL COMMISSION that I/We began the development authorized by Permit No. 3-07-030

on _____ and that the development will be
Date Construction Began

completed in accordance with any conditions imposed in the permit.

Signature of Permittee or Representative
Cathy Stettler, Environmental Coordinator
California Department of Transportation

Date

Memorandum

To: MIKE POPE, CHIEF
Bridge Design Branch 18
Office of Bridge Design South 1
DIVISION OF ENGINEERING SERVICES
STRUCTURES DESIGN – MS 9 4/81

Date: December 1, 2014

Attn: Zihan Yan
Project Engineer

File: 05-SLO-001- PM R64.62
Arroyo De Los Playanos Bridge
Br. No. 49-0258
EA 05-492801
EFIS 0500000576

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES

Subject: Revised Foundation Report

Scope of Work

A Revised Foundation Report (FR) is provided for the above referenced project. The proposed project is located near the town of San Simeon in San Luis Obispo County. Construction of a bridge to carry State Route 001 over Arroyo De Los Playanos is proposed. Review of published geologic data and previous geotechnical reports, field reconnaissance, and design calculations were performed as part of the geotechnical investigation. This Foundation Report supersedes the Preliminary Foundation Report for the Arroyo Del Los Playanos Bridge (formerly named Drainage South Creek Bridge) dated March 30, 2007 and the Foundation Report dated February 5, 2013.

The purpose of this report is to document geotechnical conditions and provide foundation recommendations.

Our Office has evaluated the site conditions and geology based on a review of the existing As-Built Plans, available geologic literature and mapping, aerial photograph interpretation, multiple site visits and a subsurface investigation completed between September and November 2011.

The following publications were used to assist in the assessment of site conditions:

1. *Preliminary Foundation Report*, EA 05-492801, Caltrans, Ron Richman, March 30, 2007.
2. *Caltrans ARS Online*.
3. *Geologic Map of the San Luis Obispo County, California*, (Compiled by Lew Rosenberg).
4. *Geologic Map of the San Simeon-Piedras Blancas Region*, San Luis Obispo County, California (Hall, 1976).

5. *Geotechnical Services Design Manual, Version 1.0*, (Division of Engineering Services, August 2009).
6. *Preliminary Geotechnical Report*, EA 05-492801, Caltrans, Chris Jones, January 19, 2001.

Project Description

According to the general plan sheet dated October 15, 2012, a 2 span bridge is proposed to span the perennial stream at the project location. The bridge will be approximately 240 feet in length, approximately 43.5 feet in width, and supported on one two-column intermediate support.

The datum used for the field investigation was found at SLO-001-PM 64.62. The elevation of this 1 inch ipw is elevation 31.079 feet per the NAVD88. The complete description of this datum can be found on the LOTB.

Field Investigation and Testing Program

Field investigations performed at the project site included geotechnical borings and monitoring of groundwater elevations.

The Office of Geotechnical Design-North conducted a subsurface investigation between September and November 2011. Five mud rotary borings were drilled for the design of the bridge foundation. The mud rotary borings were advanced using a self-cased wire line drilling apparatus that provided continuous soil samples and rock cores. Soils were visually classified in accordance with the Caltrans Soil and Rock Logging, Classification, and Presentation Manual (June 2010).

Standard penetration tests (SPT), ASTM test method 1586, were performed at selected depth intervals to estimate in-place density of the native soil. Empirical correlations of soil strength parameters with SPT blow counts were used to estimate strength parameters of in-situ cohesionless soils. Pocket penetrometer measurements of unconfined compressive strength were used to estimate the undrained shear strength of cohesive soils. The maximum depth of investigation was approximately 120 feet.

A summary of the borings drilled during the 2011 subsurface investigation is included below in Table 1.

Table 1: The 2011 Subsurface Investigation Summary

Boring No.	Completion Date	Drill Rig Type	Hammer Type	Hammer Efficiency (%)	Approx. Ground Surface Elevation (ft)	Boring Depth (ft)
RC-11-005	9/20/2011	CS-2000	Automatic	93	18.8	120
RC-11-006	9/21/2011	CS-2000	Automatic	93	32.6	35.5
RC-11-007	9/21/2011	CS-2000	Automatic	93	33.1	40.5
RC-11-008	10/4/2011	CS-2000	Automatic	93	30.5	39.3
RC-11-009	10/5/2011	CS-2000	Automatic	93	31.6	43.3

Laboratory Testing Program

Laboratory testing was performed on selected samples of the subsurface materials obtained from the 2011 subsurface investigation. Soil samples were also collected and submitted to the Headquarters Geotechnical Laboratory for mechanical analyses, corrosion potential testing, and determination of Atterberg Limits. The corrosion test results for the soil samples may be found in the Corrosion Evaluation section of this report. In addition to the corrosion tests performed on the soil, selected rock samples were tested for unconfined compression strength (ASTM D 2938). The rock specimens for this testing were selected on the basis of the size requirements per the test method. Some of the collected core is considered to be unsuitable for strength testing using the ASTM D2938. Refer to the Log of Test Borings for the site-specific rock and soil data. Laboratory test results are summarized in Attachment 1.

Site Geology and Subsurface Conditions

Regional Setting and Area Geology

The project is located within the Coast Ranges geomorphic province of California, on the border of the Santa Lucia Range.

The geology in the vicinity of the project is characterized by marine terrace deposits overlying Franciscan Mélange. Young and old alluvial deposits are deposited within the drainages, where they overlie the Graywacke and Franciscan Mélange. The drainages are steep walled and geologically recent. A dike and sill complex of green-black diabase is exposed along the coastline from approximately Postmile 65.9 to Arroyo de la Cruz (Postmile 66.8).

The marine terrace deposits are composed of loosely consolidated white to orange-brown sand and conglomerate and range from 3 feet to 20 feet in thickness according to Hall (1976). The upper 2 to 4 feet consists of fine grained silty sand which coarsens downward to the conglomerate. The clasts are described by Hall as being subrounded to angular and as large as 4 feet in diameter. The clasts consist of fragments of Jurassic ophiolite, Franciscan rocks Cambria Felsite, dacite and Monterey chert.

The Franciscan Graywacke is described by Hall as thick-bedded, tan, medium-grained sandstone.

The Franciscan Mélange in the vicinity of this project is described by Hall as being pervasively sheared graywacke consisting, in large part, of sheared greenish-black claystone. Exotic clasts may consist of conglomerate, blueschist, schist, metavolcanic rocks or greenstone, chert, graywacke, shale, diabase, serpentinite, and silica-carbonate rocks. The original structure of the unit has been destroyed by shearing and mixing.

The Arroyo del Oso Fault crosses Highway 1 at approximately Postmile 65.8 and intersects the coastline nearby. However, the Arroyo del Oso Fault is not considered active or potentially active according to the *2007 Caltrans Fault Database*.

Subsurface Conditions

Five mud rotary borings (RC-11-005 through RC-11-009) were conducted in the project area during September 2011 and October 2011. The maximum depth of the investigation was approximately 120 feet. Complete descriptions of the soil and rock are presented on the logs of test borings. A brief summary of the soil and rock descriptions follows.

The borehole logs for the two boreholes at abutment 1 describe soil from the ground surface to approximately elevation 22 as terrace deposits. The soil is medium dense clayey sand and sandy silt, some moderately cemented. Underlying the terrace deposits, to the deepest point reached by the abutment boreholes at approximately elevation -11.7, the borehole log describes zones of metamorphosed siltstone (metasiltstone), metamorphosed graywacke (metagraywacke), and metagraywacke breccia in a metasiltstone matrix. The metasiltstone is described as slightly weathered and fresh, as well as very soft, soft, moderately soft, and moderately hard. It is also described as very intensely fractured with some rock considered to be sheared. The metagraywacke is described as slightly weathered and fresh, as well as moderately hard and hard. It is also described as intensely and very intensely fractured.

The borehole logs for the borehole at pier 2 describe soil from the ground surface to approximately elevation -9 as alluvium. The soil is described as wet, very loose and loose silty sand from the ground surface to approximately elevation 8. Between elevation 8 and approximately elevation -3, the alluvial soil is described as very soft sandy lean clay. Between approximately elevation -3 and approximately elevation -9, very loose silty sand was described. Underlying the alluvial deposits, to the deepest point reached by the pier 2 borehole at approximately elevation -101, the borehole log describes zones of metamorphosed siltstone (metasiltstone), metamorphosed graywacke (metagraywacke), and metagraywacke breccia in sheared metasiltstone matrix. The metasiltstone is described as moderately weathered and very soft, soft, and moderately soft. It is also described as very intensely fractured. The metagraywacke is described as slightly weathered, as well as moderately hard and hard. It is also described as intensely fractured.

The borehole logs for the two boreholes at abutment 3 describe soil from the ground surface to between approximately elevations 26.5 and 29.5 as terrace deposits. The soil is medium dense silty sand, clayey sand and sandy silt. Underlying the terrace deposits, to the deepest point reached by the abutment boreholes at approximately elevation -8.8, the borehole log describes zones of metamorphosed siltstone (metasiltstone), metamorphosed graywacke (metagraywacke), and metagraywacke breccia in a sheared metasiltstone matrix. The metasiltstone is described as decomposed, moderately weathered, slightly weathered and fresh, as well as very soft, soft, moderately soft, and hard. It is also described as very intensely fractured with some rock described as pervasively sheared. The metagraywacke is described as decomposed, moderately weathered and slightly weathered, as well as very soft, hard and very hard. It is also described as moderately, intensely and very intensely fractured, with some shears.

The Logs of Test Borings providing the complete field descriptions of the subsurface materials will be provided at a future date. They are to be included in the plans.

Groundwater

Several of the boreholes drilled for the subsurface investigation were used to construct open-standpipe observation wells for the purpose of monitoring groundwater elevations. They were constructed by installing 1.5 inch diameter slotted PVC pipe in the boreholes, and backfilling the annulus with number 8 sand to within 5 feet of original ground. The wells were protected against surface water intrusion by sealing the remaining annular space with bentonite chips or grout. Well caps were then installed. Some borings were left open for a few days after completion of drilling to measure groundwater elevations after levels had stabilized. These boreholes were abandoned by backfilling with bentonite chips.

A summary of the ground water observations at the Arroyo Del Los Playanos bridge site are provided below, in Table 2.

Table 2: Groundwater Level Observations

<i>Borehole ID</i>	<i>Date¹</i>	<i>Ground Surface Elevation (feet)</i>	<i>Depth to Groundwater (feet)</i>	<i>Groundwater Elevation (feet)</i>
RC-11-005	11/10/2011	18.8	0.0	18.8
	11/15/2011		0.0	18.8
	11/16/2011		0.5 ¹	18.3 ¹
	3/1/2012		0.3	18.5
	12/11/2012		0.3	18.5
RC-11-008	11/10/2011	30.5	9.7	20.8
	11/15/2011		9.8	20.7
	11/16/2011		22.9 ¹	7.6 ¹
	3/1/2012		11.5	19.0
	12/11/2012		11.9	18.6
RC-11-009	11/10/2011	31.6	9.1	22.5
	11/15/2011		9.1	22.5
	11/16/2011		11.0 ¹	20.6 ¹
	3/1/2012		8.5	23.1
	12/11/2012		11.9	19.7

Ground water surface elevations are subject to seasonal fluctuations and may occur at higher or lower elevations depending on preceding seasonal weather conditions and surface water levels at the time of construction.

Scour Evaluation

A Final Hydraulic Report was completed by Structure Hydraulics and Hydrology Branch on May 24, 2012. The report was based on information provided by Structure Design which included a single-span 8.8 foot deep structure. At pier 2, 5.8 feet of local pier scour is predicted. The Hydraulics Report indicates that no degradation and contraction scour are anticipated.

Corrosion Evaluation

Representative soil samples taken during the subsurface investigation were tested for corrosion potential. The Department considers a site corrosive to foundation elements if one or more of the following conditions exist for the representative soil and/or water samples taken at the site:

- Chloride concentration is greater than or equal to 500 ppm
- Sulfate concentration is greater than or equal to 2000 ppm
- The pH is 5.5 or less

¹ Observation wells were bailed after water levels were measured on 11/15/2011. Water levels were measured again on 11/16/2011.

Since resistivity serves as an indicator parameter for the possible presence of soluble salts, tests for sulfate and chloride are usually not performed unless the resistivity of the soil is 1,000 ohm-cm or less.

The results of the laboratory tests determined that the samples were considered to be non-corrosive. The results are provided in Table 3.

Table 3: Corrosion Test Summary of the Composite Samples

SIC Corrosion Number	Boring Number	Sample Depth (ft)	pH	Minimum Resistivity (ohm-cm)	Chloride Content (ppm)	Sulfate Content (ppm)
C1005	RC-11-005	19.5 – 20.5	6.65	588	92	823
C1006	RC-11-005	47.0 – 48.0	8.99	748	106	329
C1007	RC-11-006	11.0 – 12.0	8.43	1800	Not tested	Not tested
C1008	RC-11-008	13.0 – 14.0	8.57	1505	Not tested	Not tested

The proposed structure will be located within 0.25 mile of the ocean.

Seismic Recommendations

Ground Motion

The project is located within a seismically active region of California. Based on the 2009 *Caltrans Seismic Design Procedure*, the following active and potentially active faults are located within the vicinity of the project site. The Caltrans ARS Online Tool, analytical spreadsheets and the 2008 USGS Probabilistic Seismic Hazard Analysis Interactive Deaggregation Tool (Beta) were used to develop ARS curves for deterministic and probabilistic seismic prediction models. An average shear wave velocity of 985 ft/sec (300 m/s) was calculated for the upper 100 feet (30 meters) of soil and rock observed at borehole RC-11-005. The calculations were based on soil shear wave velocities derived from correlations to SPT and estimations for the rock shear wave velocity. The resulting design envelope ARS curve is presented in Figure 1. A basin factor of 1.0 was assumed for this location and a near fault factor was applied to the data due to the proximity of the faults. Recommended design spectral acceleration curve data points are provided in Attachment 2.

Table 4: Active and Potentially Active Faults

Fault Name	Fault Type	Moment magnitude of maximum credible earthquake	Distance from fault to project site - R_{RUP} (miles)	Peak ground acceleration (gravity)
San Simeon - Hosgri	Strike Slip	7.5	2.1	0.45
Oceanic	Reverse	7.4	2.6	0.45

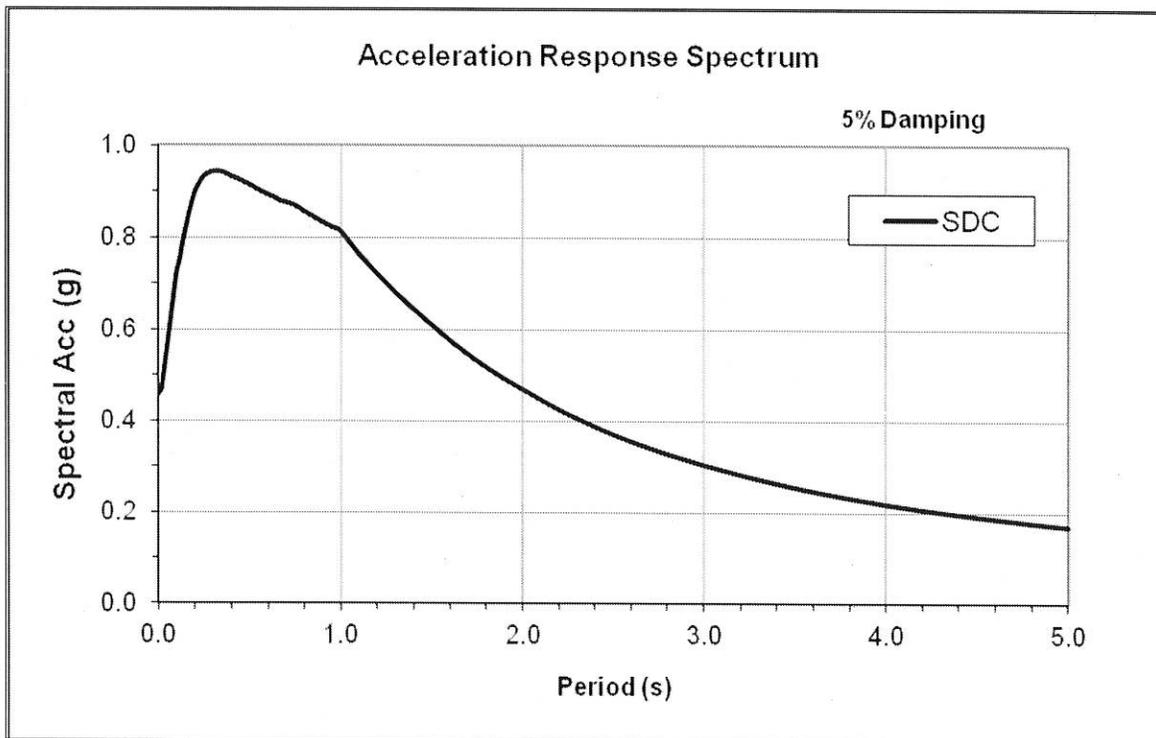


Figure 1: Design ARS Curve

Ground Rupture

Ground rupture hazard at the bridge location is considered low. The *Geologic Map of the San Simeon-Piedras Blancas Region, San Luis Obispo County, California* (Hall, 1976) shows the Arroyo del Oso Fault crossing State Route 1 at Postmile 65.8. However, the Arroyo del Oso Fault is not considered active or potentially active according to the *2007 Caltrans Fault Database*. No other known active or potentially active faults project toward or cross the bridge location.

Liquefaction

Liquefaction is a near-total loss of soil strength due to an increase in pore water pressure during cyclic loading, such as occurs during an earthquake. Loose sands and gravels with 20 percent fines or less that have the potential of being saturated are susceptible to liquefaction. The Terrace deposit soils found immediately below the ground surface at both abutments 1 and 3 are either weakly cemented or contain substantial percentage of fine grained soil particles. The liquefaction potential of these soils is considered low. Liquefaction potential at the locations of the pier 2 columns is moderate to high, from the ground surface to approximately elevation 8. The groundwater elevation was observed at the ground surface, and the observed soils in this interval are very loose and loose, wet silty sand and poorly graded sand with silt. Loss of soil strength due to liquefaction is a possibility. The reduced shear strength for the foundation soil adjacent to

the drilled shaft foundations below the cut off elevation of 13.4 will be considered in the lateral analysis of the bridge foundation for the Extreme Event 1 Limit State.

Foundation Recommendations

Bridge Foundations

The following foundation recommendations are for design of the support system of the proposed Arroyo Del Los Playanos Bridge, Br. No. 49-0258, configured as shown on the General Plan sheet dated October 15, 2012.

The proposed pile tip elevations are based on the subsurface conditions, bottom-of-footing elevations, cut-off elevations, the lowest construction joint elevation shown in the plans, the requirements of Standard Specifications Section 49-3.02C(6) and factored loads provided by the Office of Bridge Design, Branch 18 (October 12, 2012). The intermediate support foundation was designed using the Load and Resistance Factor Design (LRFD) method, and the foundations of the end supports were designed using the Working Stress Design (WSD) method.

Driven HP 14X89 piles are recommended for support of Abutment 1 and 3, and 72-inch diameter drilled shafts (CIDH piles) that will penetrate soil and rock are recommended for support of Pier 2. The nominal resistance of the drilled shafts is based on side resistance within a portion of the penetrated rock. Side resistance for a length of the drilled shafts from the specified tip elevation to a point 4 feet above the specified tip elevation, does not contribute to the calculated nominal resistance. Also, there is no side resistance contribution to the calculated drilled shaft nominal resistances above elevation -12.0 feet at Pier 2. Base resistance does not contribute to the calculated nominal resistance of the CIDH piles shown in the Pile Data Table.

The drilled shaft design is based on an ultimate unit side resistance of 3 ksf. The unit side resistance value is based on the following assumptions:

1. The majority of the area of the borehole side walls is considered rough, with undulations and irregularities.
2. The concrete is placed in direct contact with the foundation material. The foundation material has not been disturbed or loosened by the drilling process, nor has a smear zone been created by the drilling and casing process. It is assumed that a zone of soil-like drill cuttings has not been left between the concrete and native ground by the construction processes.

Any construction method that creates a condition that does not meet these assumptions should not be accepted or permitted. Both the ultimate axial and lateral resistance and stiffness of the drilled shaft will be adversely affected, and the foundation performance may differ from the design assumptions and requirements.

Table 5: Pile Foundation Recommendations for Abutments 1 and 3

Support Location	Pile Type	Cut-off Elevation (ft)	LRFD Service-I Limit State Load (kips) per Support		LRFD Service-I Limit State Total Load (kips) per Pile (Compression)	Nominal Resistance (kips)	Design Tip Elevations (ft)	Specified Tip Elevation (ft)	Nominal Driving Resistance Required (kips)
			Total	Permanent					
Abut. 1	HP 14 X 89	29.67	1534	1186	151	310	12.0 (a)	12.0	310
Abut. 3	HP 14 X 89	27.67	1534	1186	151	310	15.0 (a)	15.0	310

Notes:

- 1) Design tip elevations are controlled by: (a) Compression.
- 2) There are no design tip elevations for settlement because the abutment piles are driven to rock

Table 6: Pile Foundation Recommendations for Pier 2

Support Location	Pile Type	Cut-off Elevation (ft)	Service-I Limit State Load per Support (kips)	Total Permissible Support Settlement (inches)	Required Factored Nominal Resistance (kips)				Design Tip Elevations (ft)	Specified Tip Elevation (ft)
					Strength Limit		Extreme Event			
					Comp. ($\phi = 0.65$)	Tension ($\phi = 0.7$)	Comp. ($\phi = 1$)	Tension ($\phi = 1$)		
Pier 2	72 inch CIDH	13.4	1470	1	2290	0	1348	0	-79.0 (a-I) -40.0(a-II)	-79.0

Notes:

- 1) Design tip elevations are controlled by: (a-I) Compression (Strength Limit), (a-II) Compression (Extreme Event).
- 2) There are no design tip elevations for settlement because the CIDH piles at the piers are embedded into rock.

Table 7: Pile Data Table

Location	Pile Type	Nominal Resistance (kips)		Design Tip Elevation (ft)	Specified Tip Elevation (ft)	Nominal Driving Resistance (kips)
		Compression	Tension			
Abut. 1	HP 14 X 89	310	N/A	12.0 (a)	12.0	310
Pier 2	72 inch CIDH	3530	0	-79.0 (a)	-79.0	N/A
Abut.3	HP 14 X 89	310	N/A	15.0 (a)	15.0	310

Notes:

- 1) *Design tip elevations are controlled by: (a) Compression.*
- 2) *There are no design tip elevations for settlement because the abutment piles are driven to rock and the CIDH piles at the piers are embedded into rock.*
- 3) *The tip elevation of the CIDH piles at Pier 2 shall not be raised above the specified tip elevations.*

Lateral analysis of Pier 2

Per request, soil and rock parameters were provided for development of p-y curves using the program LPILE (Ensoft, Inc.). The parameters are provided in Attachment 3 of this report. For Pier 2, per the recommendation of Reza Mahallati, the calculated “P” value of layer 1 should be reduced by 80% to account for liquefaction of this layer.

Approach Fill Earthwork

Recommendations for the settlement and stability analyses of the approach embankments are provided in the Geotechnical Design Report (Appelbaum, August 10, 2012). In summary, the Geotechnical Design Report provides no fill delay period recommendation for the approach embankments. The approach embankment slopes were also deemed to be stable. Refer to the Geotechnical Design Report for more information.

Notes to Designer

1. All support locations are to be plotted on the Log of Test Borings, in plan view, as stated in “Memo to Designers” 4-2. The support locations should be plotted prior to requesting a final foundation review.
2. If lateral demands exist on the support piles, the structural design engineer shall indicate on the plans, in the pile data table, the design pile tip elevations required to meet the lateral

load demands. If the specified pile tip elevations given in the above pile data table are not adequate for lateral load demands; the Office of Geotechnical Design-North shall be contacted for further recommendations. It is not within the scope of this report to provide considerations for the lateral response of the CIDH piles with regards to the effects of construction methods and the installation of temporary or permanent casings.

Construction Considerations

Rock Cores

1. Rock core samples from the 2011 subsurface investigation are available for bidder viewing at the California Department of Transportation, District 5 Office, 50 Higuera St., San Luis Obispo, CA. Once a request has been made to view the core, the bidders are to allow the State five (5) working days to prepare and display the core. It is highly recommended that the Contractor inspect/observe the core samples at the Caltrans District 5 facility before bidding.
2. During the 2011 subsurface investigation, rock and soil samples were collected from several borings. Samples were submitted to the Caltrans Transportation laboratory for testing. A summary of the laboratory test data is provided in Attachment 1 to this report.

Foundation Construction

1. Groundwater was encountered during the 2011/2 subsurface investigation. Groundwater may be encountered during the construction at all foundation locations. Wet pile installation methods may be necessary at CIDH support locations as groundwater was observed above the construction joint elevations. Groundwater surface elevation is subject to annual and seasonal fluctuations, and may occur at a higher or lower elevation than indicated on the Logs of Test Borings (LOTB) and in this report.
2. Due to the nature of the Franciscan Mélange foundation rock, the contractor should anticipate foundation conditions that: 1) do not match the vertical distribution shown in any of the boreholes, 2) vary significantly from foundation location to foundation location, and 3) vary significantly in the vertical sequence at each foundation location. The data from the boreholes indicates that the variability will include the rock type distribution, rock weathering, rock fracturing, rock shearing and rock hardness. This variability also extends to the distribution of groundwater and the hydraulic conductivity of the rock.
3. Cast-In-Drilled-Hole (CIDH) concrete piles shall be installed in accordance with the State of California, Department of Transportation, Standard Specifications and Special Provisions. The foundation design is based on concrete being placed in direct contact with

undisturbed foundation material, as described in the Foundations Recommendations section of this Revised Foundation Report.

4. Caving of the foundation materials into CIDH pile excavations is a possibility due to the presence of soil, the presence of moderately weathered rock, the presence of sheared and very intensely fractured rock, and the presence of groundwater. The contractor will use his expertise to determine the appropriate construction techniques for the conditions shown on the LOTB's.

Supplemental Project Information

The following information must be provided to bidders as "Supplemental Project Information", per the 2010 Caltrans Standard Specifications, Section 2-1.06B.

Information attached to the project plans:

- A. Log of Test Borings (Arroyo De Los Playanos Bridge, Br. No. 49-0258).

Information included in the Information Handout:

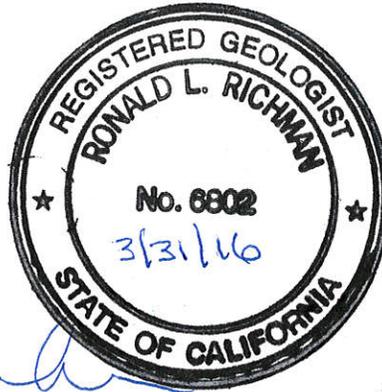
- A. Revised Foundation Report (Arroyo De Los Playanos Bridge, Br. No. 49-0258) dated December 1, 2014.

Information available for viewing at the Caltrans District 5 Office:

- A. Rock Core samples from the 2011 subsurface investigations.

The Foundation Recommendations included in this Foundation Report are based on specific project information regarding structure type and structure location that has been provided by the Office of Bridge Design South 1. If you have any questions or comments, please contact Ron Richman (805) 549-3385.

Report by:



Ronald L. Richman
RONALD L. RICHMAN, P.E. No. 039869, P.G. No. 6802
Senior Materials & Research Engineer
Office of Geotechnical Design-North

- c: Job File - Branch D Records
- Traci Menard - GDN Records

LIST OF ATTACHMENTS

Laboratory Test Data	Attachment 1
Design ARS Curve Data	Attachment 2
Foundation Parameters for LPile	Attachment 3

MATERIAL PROPERTIES SUMMARY

Arroyo De Los Playanos Bridge
SLO-1-R64.62

Boring No.	RC-11-005									
Station	327+97									
Line	"A1" Line; Rte 1 CL									
Distance from Line (Rt. or Lt.)	1' Lt.									
Date Sampled	9/18/2011	9/18/2011	9/18/2011	9/19/2011	9/19/2011	9/19/2011	9/19/2011	9/19/2011	9/19/2011	9/19/2011
Sample ID	1005	C01-1	1006	C02-1	C03-1	C04-1	C05-1	C06-1		
Depth (feet)	19.5'-20.5'	34.0'-34.6'	47.0'-48.0'	71.0'-71.5'	81.0'-82.0'	94.5'-95.5'	101.0'-102.0'	109.0'-110.0'		
USCS Classification	CL		SC - SM							
50 mm (2")										
38 mm (1 1/2")			100							
25 mm (1")			96							
19 mm (3/4")			96							
12 mm (1/2")			96							
9.5 mm (3/8")			96							
4.75 mm (No. 4)			93							
2.36 mm (No. 8)			88							
1.18 mm (No. 16)			82							
600 µm (No. 30)			74							
300 µm (NO. 50)			66							
150 µm (No. 100)			56							
75 µm (NO. 200)			47							
5 µm			21							
1 µm			13							
Liquid Limit			22							
Plasticity Index			7							
Resistivity (ohm-cm)			748							
pH			8.99							
Chlorides (ppm)			106							
Sulfates (ppm)			329							
In Situ Dry Density		141.5		138.6	137.5	139.9	135.1	140.2		
In Situ Moisture Content		3.9	1.6	5.6	7.3	5.6	7.1	5.0		
Specific Gravity										
Unconfined Compressive Strength (psi)		165		46	96	105	61	68		

MATERIAL PROPERTIES SUMMARY

Arroyo De Los Playanos Bridge
SLO-1-R64.62

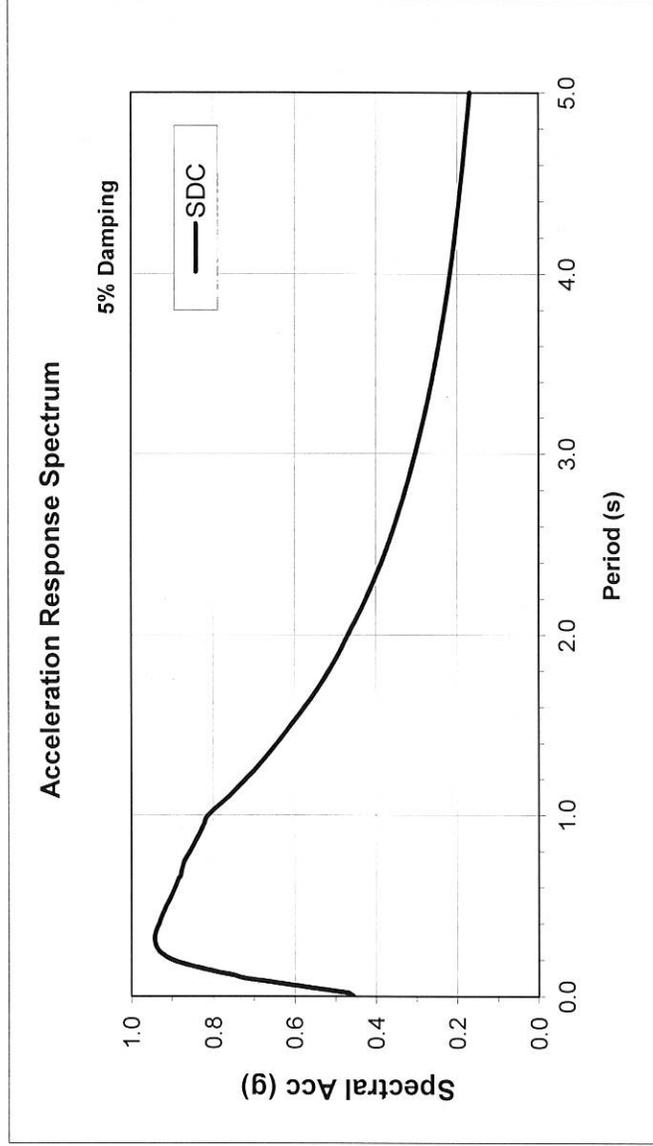
DESCRIPTION	RC-11-006	RC-11-007	RC-11-008	RC-11-009
Boring No.	339+16	326+77	329+15	326+73
Station	"A1", Rte 1 CL	"A1", Rte 1 CL	"A1", Rte 1 CL	"A1" Line; Rte. 1 CL
Line	21' Rt.	21' Rt.	20' Rt.	21' Rt.
Distance from Line (Rt. or Lt.)				
Date Sampled	9/21/2011	9/21/2011	10/4/2011	10/5/2011
Sample ID	1007	C01-1	1008	C01-1
Depth (feet)	11.0'-12.0'	18.5'-19.5'	13.0'-14.0'	4.5'-5.0'
USCS Classification	CL		CL	13.0'-13.5'
50 mm (2")				
38 mm (1 1/2")				
25 mm (1")				
19 mm (3/4")				
12 mm (1/2")				
9.5 mm (3/8")	100		100	
4.75 mm (No. 4)	97		99	
2.36 mm (No. 8)	84		95	
1.18 mm (No. 16)	79		88	
600 µm (No. 30)	75		81	
300 µm (NO. 50)	71		74	
150 µm (No. 100)	65		69	
75 µm (NO. 200)	59		65	
5 µm	31		29	
1 µm	16		15	
Liquid Limit	28		25	
Plasticity Index	10		12	
Resistivity (ohm-cm)	1800		1505	
pH	8.43		8.57	
Chlorides (ppm)	N/A		N/A	
Sulfates (ppm)	N/A		N/A	
In Situ Dry Density		141.3		123.8
In Situ Moisture Content		3.6		10.2
Specific Gravity				6.3
Unconfined Compressive Strength (psi)		127		331
				166

Arroyo De Los Playanos Bridge

Bridge No. 49-0258

SDC Controlling Procedure : Deterministic

Period (s)	SDC
0.010	0.455
0.020	0.468
0.030	0.500
0.050	0.564
0.075	0.643
0.100	0.723
0.120	0.756
0.150	0.819
0.200	0.898
0.250	0.932
0.300	0.942
0.400	0.932
0.500	0.914
0.750	0.868
1.000	0.812
1.500	0.609
2.000	0.469
3.000	0.303
4.000	0.217
5.000	0.168



Deterministic Procedure Data

Fault	San Simeon - Hosgri Fault	R_{rup}	3.42	km
Fault ID	428	R_{jb}	3.42	km
Style	Strike-Slip	R_x	3.42	km
Mmax	7.5	V_{S30}	300	m/s
Dip	90 deg	Z_{1,0}	N/A	m
Z_{TOR}	0 km	Z_{2,5}	N/A	km

Notes

ARS curve was modified for Near Fault Directivity Effect (SDC Section 6.1.2.1)

Memorandum

To: MIKE POPE, CHIEF
Bridge Design Branch 18
Office of Bridge Design South 1
DIVISION OF ENGINEERING SERVICES
STRUCTURES DESIGN – MS 9 4/81

Date: December 1, 2014

Attn: Matt Giovannoni
Project Engineer

File: 05-SLO-001- PM R64.83
Arroyo Del Corral Bridge
Br. No. 49-0259
EA 05-492801
EFIS 0500000576

From: **DEPARTMENT OF TRANSPORTATION
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES**

Subject: Revised Foundation Report

Scope of Work

A Revised Foundation Report (FR) is provided for the above referenced project. The proposed project is located near the town of San Simeon in San Luis Obispo County. Construction of a bridge to carry State Route 001 over Arroyo Del Corral is proposed. Review of published geologic data and previous geotechnical reports, field reconnaissance, and design calculations were performed as part of the geotechnical investigation. This Revised Foundation Report supersedes the Preliminary Foundation Report for the Arroyo Del Corral Bridge dated March 30, 2007 and the Foundation Report dated February 5, 2013.

The purpose of this report is to document geotechnical conditions and provide foundation recommendations.

Our Office has evaluated the site conditions and geology based on a review of the existing As-Built Plans, available geologic literature and mapping, aerial photograph interpretation, multiple site visits and a subsurface investigation conducted between September and October 2011.

The following publications were used to assist in the assessment of site conditions:

1. *Preliminary Foundation Report*, EA 05-492801, Caltrans, Ron Richman, March 30, 2007.
2. *Caltrans ARS Online*.
3. *Geologic Map of the San Luis Obispo County, California*, (Compiled by Lew Rosenberg).
4. *Geologic Map of the San Simeon-Piedras Blancas Region*, San Luis Obispo County, California (Hall, 1976).

5. *Geotechnical Services Design Manual, Version 1.0*, (Division of Engineering Services, August 2009).
6. *Preliminary Geotechnical Report*, EA 05-492801, Caltrans, Chris Jones, January 19, 2001.

Project Description

According to the general plan sheet dated November 16, 2012, a 3 span bridge is proposed to span the perennial stream at the project location. The bridge will be approximately 380 feet in length, approximately 43.5 feet in width, and supported on two two-column intermediate supports.

The datum used for the field investigation was found at SLO-001-PM 64.83. The elevation of this 1 inch ipw is elevation 31.079 feet per the NAVD88. The complete description of this datum can be found on the LOTB.

Field Investigation and Testing Program

Field investigations performed at the project site included geotechnical borings and monitoring of groundwater elevations.

The Office of Geotechnical Design-North conducted a subsurface investigation between September and October 2011. Five mud rotary borings were drilled for the design of the bridge foundation. The mud rotary borings were advanced using a self-cased wire line drilling apparatus that provided continuous soil samples and rock cores. Soils were visually classified in accordance with the Caltrans Soil and Rock Logging, Classification, and Presentation Manual (June 2010).

Standard penetration tests (SPT), ASTM test method 1586, were performed at selected depth intervals to estimate in-place density of the native soil. Empirical correlations of soil strength parameters with SPT blow counts were used to estimate strength parameters of in-situ cohesionless soils. Pocket penetrometer measurements of unconfined compressive strength were used to estimate the undrained shear strength of cohesive soils. The maximum depth of investigation was approximately 121 feet.

A summary of the borings drilled during the 2011 subsurface investigation is included below in Table 1.

Table 1: The 2011 Subsurface Investigation Summary for the proposed Arroyo Del Corral Bridge (Br. No. 49-0259)

Boring No.	Completion Date	Drill Rig Type	Hammer Type	Hammer Efficiency (%)	Approx. Ground Surface Elevation (ft)	Boring Depth (ft)
RC-11-001	9/13/2011	CS-2000	Automatic	93	15.7	120.0
RC-11-002	9/16/2011	CS-2000	Automatic	93	34.5	50.0
RC-11-003	9/17/2011	CS-2000	Automatic	93	30.3	45.5
RC-11-010	10/5/2011	CS-2000	Automatic	93	14.9	120.7
RC-11-011	10/8/2011	CS-2000	Automatic	93	33.7	58.5

Laboratory Testing Program

Laboratory testing was performed on selected samples of the subsurface materials obtained from the 2011 subsurface investigation. Soil samples were also collected and submitted to the Headquarters Geotechnical Laboratory for mechanical analyses, corrosion potential testing, and determination of Atterberg Limits. The corrosion test results for the soil samples may be found in the Corrosion Evaluation section of this report. In addition to the corrosion tests performed on the soil, selected rock samples were tested for unconfined compression strength (ASTM D 2938). The rock specimens for this testing were selected on the basis of the size requirements per the test method. Some of the collected core is considered to be unsuitable for strength testing using the ASTM D2938. Refer to the Log of Test Borings for the site-specific rock and soil data. Laboratory test results are summarized in Attachment 1.

Site Geology and Subsurface Conditions

Regional Setting and Area Geology

The project is located within the Coast Ranges geomorphic province of California, on the border of the Santa Lucia Range.

The geology in the vicinity of the project is characterized by marine terrace deposits overlying Franciscan Mélange. Young and old alluvial deposits are deposited within the drainages, where they overlie the Graywacke and Franciscan Mélange. The drainages are steep walled and geologically recent. A dike and sill complex of green-black diabase is exposed along the coastline from approximately Postmile 65.9 to Arroyo de la Cruz (Postmile 66.8).

The marine terrace deposits are composed of loosely consolidated white to orange-brown sand and conglomerate and range from 3 feet to 20 feet in thickness according to Hall (1976). The upper 2 to 4 feet consists of fine grained silty sand which coarsens downward to the conglomerate. The clasts are described by Hall as being subrounded to angular and as large as 4

feet in diameter. The clasts consist of fragments of Jurassic ophiolite, Franciscan rocks Cambria Felsite, dacite and Monterey chert.

The Franciscan Graywacke is described by Hall as thick-bedded, tan, medium-grained sandstone.

The Franciscan Mélange in the vicinity of this project is described by Hall as being pervasively sheared graywacke consisting, in large part, of sheared greenish-black claystone. Exotic clasts may consist of conglomerate, blueschist, schist, metavolcanic rocks or greenstone, chert, graywacke, shale, diabase, serpentinite, and silica-carbonate rocks. The original structure of the unit has been destroyed by shearing and mixing.

The Arroyo del Oso Fault crosses Highway 1 at approximately Postmile 65.8 and intersects the coastline nearby. However, the Arroyo del Oso Fault is not considered active or potentially active according to the *2007 Caltrans Fault Database*.

Subsurface Conditions

Five mud rotary borings (RC-11-001 through RC-11-003, RC-11-010 and RC-11-011) were conducted in the project area during September 2011 and October 2011. The maximum depth of the investigation was approximately 121 feet. Complete descriptions of the soil and rock are presented on the logs of test borings. A brief summary of the soil and rock descriptions follows.

The borehole logs for the two boreholes at abutment 1 describe soil from the ground surface to approximately elevation 30 as terrace deposits. The soil is hard lean clay and medium dense silty sand, some moderately cemented. Underlying the terrace deposits, to the deepest point reached by the abutment boreholes at approximately elevation -15.5, the borehole log describes zones of metamorphosed siltstone (metasiltstone), metamorphosed graywacke (metagraywacke), and metagraywacke breccia in a sheared metasiltstone matrix. The metasiltstone is described as moderately and slightly weathered, as well as very soft, soft, and moderately soft. It is also described as very intensely fractured with some rock considered to be sheared. The metagraywacke is described as moderately weathered, slightly weathered and fresh, as well as moderately hard, hard, and very hard. It is further described as moderately, intensely and very intensely fractured.

The borehole logs for the borehole at pier 2 describe soil from the ground surface to approximately elevation -25 as alluvium. The soil is described as wet, very loose and medium dense clayey sand, hard lean clay, stiff fat clay, medium stiff silt, and very soft and soft sandy lean clay. Underlying the alluvial deposits, to the deepest point reached by the pier 2 borehole at approximately elevation -104.3, the borehole log describes zones of metamorphosed siltstone (metasiltstone), metamorphosed graywacke (metagraywacke), and metagraywacke breccia in sheared metasiltstone matrix. The metasiltstone is described as decomposed and slightly weathered, as well as very soft, soft, and moderately soft. It is also described as intensely and very intensely fractured. Some of the siltstone is described as pervasively sheared and some is described as sheared. The metagraywacke is described as moderately weathered, slightly

weathered, and fresh, as well as moderately soft, moderately hard and hard. It is also described as moderately, intensely and very intensely fractured.

The borehole logs for the borehole at pier 3 describe soil from the ground surface to approximately elevation -1 as alluvium. The soil is described as moist stiff fat clay and medium dense silty sand. Underlying the alluvial deposits, to the deepest point reached by the pier 2 borehole at approximately elevation -105.8, the borehole log describes zones of metamorphosed siltstone (metasiltstone), metamorphosed graywacke (metagraywacke), and metagraywacke breccia in sheared metasiltstone matrix. The metasiltstone is described as moderately and slightly weathered, as well as soft, moderately soft and moderately hard. It is also described as intensely and very intensely fractured. Some of the siltstone is described as pervasively sheared and some is described as having slickensides. The metagraywacke is described as intensely weathered, moderately weathered, slightly weathered and fresh, as well as very soft, soft, moderately hard, hard and very hard. It is also described as intensely fractured and very intensely fractured.

The borehole logs for the borehole at abutment 4 describe soil from the ground surface to approximately elevation 27.7 as terrace deposits. The soil is medium dense silty sand and clayey sand. Underlying the terrace deposits, to the deepest point reached by the abutment boreholes at approximately elevation -24.8, the borehole log describes zones of metamorphosed siltstone (metasiltstone), metamorphosed graywacke (metagraywacke), and greenstone. The metasiltstone is described as moderately and slightly weathered, as well as soft, moderately soft, and moderately hard. It is also described as intensely and very intensely fractured. The metagraywacke is described as decomposed, intensely weathered, slightly weathered and fresh, as well as moderately soft, moderately hard and very hard. It is also described as moderately, intensely and very intensely fractured. The greenstone is described as slightly weathered and fresh, as well as moderately hard and hard. It is also described as intensely and very intensely fractured.

The Logs of Test Borings providing the complete field descriptions of the subsurface materials will be provided at a future date. They are to be included in the plans.

Groundwater

Several of the boreholes drilled for the subsurface investigation were used to construct open-standpipe observation wells for the purpose of monitoring groundwater elevations. They were constructed by installing 1.5 inch diameter slotted PVC pipe in the boreholes, and backfilling the annulus with number 8 sand to within 5 feet of original ground. The wells were protected against surface water intrusion by sealing the remaining annular space with bentonite chips or grout. Well caps were then installed. Some borings were left open for a few days after completion of drilling to measure groundwater elevations after levels had stabilized. These boreholes were abandoned by backfilling with bentonite chips.

A summary of the ground water observations at the Arroyo Del Corral bridge site are provided below, in Table 2.

Table 2: Groundwater Level Observations

<i>Borehole ID</i>	<i>Date¹</i>	<i>Ground Surface Elevation (feet)</i>	<i>Depth to Groundwater (feet)</i>	<i>Groundwater Elevation (feet)</i>
RC-11-001	11/10/2011	15.7	4.3	11.4
	11/15/2011		4.1	11.6
	11/16/2011		4.2 ¹	11.5 ¹
	2/28/2012		3.8	11.9
	12/11/2012		4.7	11.1
RC-11-003	11/10/2011	30.3	13.5	16.8
	11/15/2011		13.7	16.6
	11/16/2011		16.6 ¹	13.7 ¹
	3/1/2012		15.5	14.8
	12/11/2012		16.8	13.5
RC-11-010	11/10/2011	14.9	4.6	10.3
	11/15/2011		4.2	10.7
	11/16/2011		4.4 ¹	10.5 ¹
	2/28/2012		3.9	11.0
	12/11/2012		4.1	10.8
RC-11-011	11/10/2011	33.7	8.9	24.8
	11/15/2011		9.0	24.7
	11/16/2011		30.9 ¹	2.8 ¹
	2/28/2012		10.9	22.8
	12/11/2012		12.1	21.6

Ground water surface elevations are subject to seasonal fluctuations and may occur at higher or lower elevations depending on preceding seasonal weather conditions and surface water levels at the time of construction.

Scour Evaluation

A Final Hydraulics Report was completed by Structure Hydraulics and Hydrology Branch on May 24, 2012. The report was based on information provided by Structure Design which included a three-span 6.0 foot deep structure. At piers 2 and 3, 5.5 feet of local pier scour is predicted. The Hydraulics Report indicates that no degradation and contraction scour are anticipated.

¹ Observation wells were bailed after water levels were measured on 11/15/2011. Water levels were measured again on 11/16/2011.

Corrosion Evaluation

Representative soil samples taken during the subsurface investigation were tested for corrosion potential. The Department considers a site corrosive to foundation elements if one or more of the following conditions exist for the representative soil and/or water samples taken at the site:

- Chloride concentration is greater than or equal to 500 ppm
- Sulfate concentration is greater than or equal to 2000 ppm
- The pH is 5.5 or less

Since resistivity serves as an indicator parameter for the possible presence of soluble salts, tests for sulfate and chloride are usually not performed unless the resistivity of the soil is 1,000 ohm-cm or less.

The results of the laboratory tests determined that the samples were considered to be non-corrosive. The results are provided in Table 3.

Table 3: Corrosion Test Summary of the Composite Samples

SIC Corrosion Number	Boring Number	Sample Depth (ft)	pH	Minimum Resistivity (ohm-cm)	Chloride Content (ppm)	Sulfate Content (ppm)
C1000	RC-11-001	16.5 - 18	7.17	837	121	51
C1001	RC-11-001	22 - 25	7.39	1055	90	302
C1002	RC-11-002	19 - 20	7.84	1884	not tested	not tested
C1003	RC-11-002	29 - 30	8.32	897	41	523
C1004	RC-11-003	31 - 32	8.40	959	44	418

The proposed structure will be located within 0.25 miles of the ocean.

Seismic Recommendations

Ground Motion

The project is located within a seismically active region of California. Based on the 2009 *Caltrans Seismic Design Procedure*, the following active and potentially active faults are located within the vicinity of the project site. The Caltrans ARS Online Tool, analytical spreadsheets and the 2008 USGS Probabilistic Seismic Hazard Analysis Interactive Deaggregation Tool (Beta) were used to develop ARS curves for deterministic and probabilistic seismic prediction models. An average shear wave velocity of 835 ft/sec (255 m/s) was calculated for the upper 100 feet (30 meters) of soil and rock observed at borehole RC-11-001, and an average shear wave velocity of 1245 ft/sec (380 m/s) was calculated for the upper 100 feet (30 meters) of soil and rock observed at borehole RC-11-010. The calculations were based on soil shear wave velocities derived from correlations to SPT and estimations for the rock shear wave velocity. The resulting

design envelope ARS curve is presented in Figure 1. A basin factor of 1.0 was assumed for this location and a near fault factor was applied to the data due to the proximity of the faults.

Recommended design spectral acceleration curve data points are provided in Attachment 2. The curve is an envelope for spectral accelerations for both deterministic and probabilistic hazards, both the San Simeon – Hosgri Fault and the Oceanic Fault, and considers both the 835 ft/sec and 1245 ft/sec average shear wave velocities.

Table 4: Active and Potentially Active Faults

Fault Name	Fault Type	Moment magnitude of maximum credible earthquake	Distance from fault to project site - R_{RUP} (miles)	Peak ground acceleration (gravity)
San Simeon - Hosgri	Strike Slip	7.5	2.0	0.48
Oceanic	Reverse	7.4	2.5	0.43

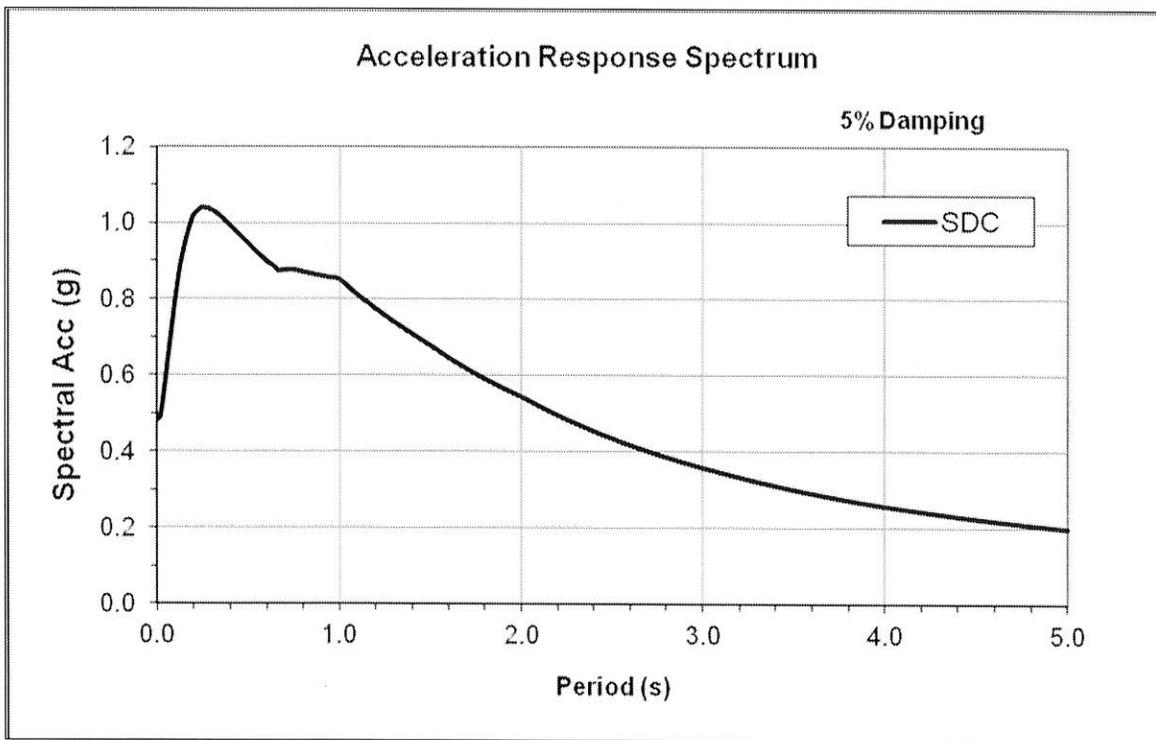


Figure 1: Design ARS Curve

Ground Rupture

Ground rupture hazard at the bridge location is considered low. The *Geologic Map of the San Simeon-Piedras Blancas Region, San Luis Obispo County, California* (Hall, 1976) shows the

Arroyo del Oso Fault crossing State Route 1 at Postmile 65.8. However, the Arroyo del Oso Fault is not considered active or potentially active according to the *2007 Caltrans Fault Database*. No other known active or potentially active faults project toward or cross the bridge location.

Liquefaction

Liquefaction is a near-total loss of soil strength due to an increase in pore water pressure during cyclic loading, such as occurs during an earthquake. Loose sands and gravels with 20 percent fines or less that have the potential of being saturated are susceptible to liquefaction. The Terrace deposit soils found immediately below the ground surface at both abutments 1 and 4 are weakly cemented or contain substantial fine soil particles. The liquefaction potential of these soils is considered low. Liquefaction potential at the locations of the pier 2 columns is considered low because the alluvial soils contain substantial fine soil particles. Liquefaction potential at the locations of the pier 3 columns is considered low because the alluvial soils contain substantial fine soil particles, are medium dense granular soils, or are above the ground water level. Groundwater elevation was observed at elevation 11 and the observed soils in this interval are medium dense silty sand. Loss of soil strength due to liquefaction is a possibility. However, the proposed column cut-off elevation is approximately elevation 8, and therefore there will be no impact to the Extreme Event 1 Limit State design from the potential liquefaction of these soils.

Foundation Recommendations

Bridge Foundations

The following foundation recommendations are for design of the support system of the proposed Arroyo Del Corral Bridge, Br. No. 49-0259, configured as shown on the General Plan sheet dated November 16, 2012.

The proposed pile tip elevations are based on the subsurface conditions, bottom-of-footing elevations, cut-off elevations, the lowest construction joint elevation shown in the plans, the requirements of Standard Specifications Section 49-3.02C(6) and factored loads provided by the Office of Bridge Design, Branch 18 (September 27, 2012). The intermediate support foundations were designed using the Load and Resistance Factor Design (LRFD) method, and the foundations of the end supports were designed using the Working Stress Design (WSD) method.

Driven HP 14X89 piles are recommended for support of Abutment 1 and 4, and 90-inch diameter drilled shafts (CIDH piles) that will penetrate soil and rock are recommended for support of Piers 2 and 3. The nominal resistance of the drilled shafts is based on side resistance within a portion of the penetrated rock. Side resistance for a length of the drilled shafts from the specified tip elevation to a point 4 feet above the specified tip elevation, does not contribute to the calculated nominal resistance. Also, there is no side resistance contribution to the calculated drilled shaft nominal resistances above elevation -35.0 feet at Pier 2 and elevation -6.0 at Pier 3. Base

resistance does not contribute to the calculated nominal resistances of the CIDH piles shown in the Pile Data Table.

The drilled shaft design is based on an ultimate unit side resistance of 3 ksf. The unit side resistance value is based on the following assumptions:

1. The majority of the area of the borehole side walls is considered rough, with undulations and irregularities.
2. The concrete is placed in direct contact with the foundation material. The foundation material has not been disturbed or loosened by the drilling process, nor has a smear zone been created by the drilling and casing process. It is assumed that a zone of soil-like drill cuttings has not been left between the concrete and native ground by the construction processes.

Any construction method that creates a condition that does not meet these assumptions should not be accepted or permitted. Both the ultimate axial and lateral resistance and stiffness of the drilled shaft will be adversely affected, and the foundation performance may differ from the design assumptions and requirements.

Table 5: Pile Foundation Recommendations for Abutments 1 and 4

Support Location	Pile Type	Cut-off Elevation (ft)	LRFD Service-I Limit State Load (kips) per Support		LRFD Service-I Limit State Total Load (kips) per Pile (Compression)	Nominal Resistance (kips)	Design Tip Elevations (ft)	Specified Tip Elevation (ft)	Nominal Driving Resistance Required (kips)
			Total	Permanent					
Abut. 1	HP 14 X 89	30.9	1600	1265	176	360	17.0 (a)	17.0	360
Abut. 4	HP 14 X 89	27.9	1540	1205	159	320	15.0 (a)	15.0	320

Notes:

- 1) Design tip elevations are controlled by: (a) Compression.
- 2) There are no design tip elevations for settlement because the abutment piles are driven to rock

Table 6: Pile Foundation Recommendations for Piers 2 and 3

Support Location	Pile Type	Cut-off Elevation (ft)	Service-1 Limit State Load per Support (kips)	Total Permissible Support Settlement (inches)	Required Factored Nominal Resistance (kips)				Design Tip Elevations (ft)	Specified Tip Elevation (ft)
					Strength Limit		Extreme Event			
					Comp. ($\phi = 0.65$)	Tension ($\phi = 0.7$)	Comp. ($\phi = 1$)	Tension ($\phi = 1$)		
Pier 2	90 inch CIDH	9.7 Lt col 10.1 Rt col	1510	1	2310	0	1790	0	-90.0 (a-I) -65.0(a-II)	-90.0
Pier 3	90 inch CIDH	8.0 Lt col 10.6 Rt col	1510	1	2310	0	1790	0	-61.0 (a-I) -36.0 (a-II)	-61.0

Notes:

- 1) Design tip elevations are controlled by: (a-I) Compression (Strength Limit), (a-II) Compression (Extreme Event).
- 2) There are no design tip elevations for settlement because the CIDH piles at the piers are embedded into rock.

Table 7: Pile Data Table

Location	Pile Type	Nominal Resistance (kips)		Design Tip Elevation (ft)	Specified Tip Elevation (ft)	Nominal Driving Resistance (kips)
		Compression	Tension			
Abut. 1	HP 14 X 89	360	N/A	17.0 (a)	17.0	360
Pier 2	90 inch CIDH	3560	0	-90.0 (a)	-90.0	N/A
Pier 3	90 inch CIDH	3560	0	-61.0 (a)	-61.0	N/A
Abut.4	HP 14 X 89	320	N/A	15.0 (a)	15.0	320

Notes:

- 1) Design tip elevations are controlled by: (a) Compression.
- 2) There are no design tip elevations for settlement because the abutment piles are driven to rock and the CIDH piles at the piers are embedded into rock.

- 3) *The tip elevation of the CIDH piles at Pier 2 and Pier 3 shall not be raised above the specified tip elevations.*

Lateral analysis of Piers 2 and 3

Per request, soil and rock parameters were provided for development of p-y curves using the program LPile (Ensoft, Inc.). The parameters are provided in Attachment 3 of this report.

Approach Fill Earthwork

Recommendations for the settlement and stability analyses of the approach embankments are provided in the Geotechnical Design Report (Appelbaum, August 10, 2012). In summary, the Geotechnical Design Report provides recommendations for 30 day fill delay periods at both approach embankments. The abutment 1 approach embankment slopes was deemed to not meet the required factor of safety against global failure. The GDR recommends the use of select material be used for construction of this embankment. Refer to the Geotechnical Design Report for more information.

Notes to Designer

1. All support locations are to be plotted on the Log of Test Borings, in plan view, as stated in "Memo to Designers" 4-2. The support locations should be plotted prior to requesting a final foundation review.
2. If lateral demands exist on the support piles, the structural design engineer shall indicate on the plans, in the pile data table, the design pile tip elevations required to meet the lateral load demands. If the specified pile tip elevations given in the above pile data table are not adequate for lateral load demands; the Office of Geotechnical Design-North shall be contacted for further recommendations. It is not within the scope of this report to provide considerations for the lateral response of the CIDH piles with regards to the effects of construction methods and the installation of temporary or permanent casings.

Construction Considerations

Rock Cores

1. Rock core samples from the 2011 subsurface investigation are available for bidder viewing at the California Department of Transportation, District 5 Office, 50 Higuera St., San Luis Obispo, CA. Once a request has been made to view the core, the bidders are to allow the State five (5) working days to prepare and display the core. It is highly recommended that

the Contractor inspect/observe the core samples at the Caltrans District 5 facility before bidding.

2. During the 2011 subsurface investigation, rock and soil samples were collected from several borings. Samples were submitted to the Caltrans Transportation laboratory for testing. A summary of the laboratory test data is provided in Attachment 1 to this report.

Foundation Construction

1. Groundwater was encountered during the 2011 subsurface investigation. It is expected that groundwater will be encountered during the construction of all foundations. Wet pile installation methods may be necessary at CIDH support locations as groundwater was observed above the construction joint elevations. Groundwater surface elevation is subject to seasonal fluctuations and may occur at a higher or lower elevation than indicated on the Log of Test Borings (LOTB) sheets and this report.
2. Due to the nature of the Franciscan Mélange foundation rock, the contractor should anticipate foundation conditions that: 1) do not match the vertical distribution shown in any of the boreholes, 2) vary significantly from foundation location to foundation location, and 3) vary significantly in the vertical sequence at each foundation location. The data from the boreholes indicates that the variability will include the rock type distribution, rock weathering, rock fracturing, rock shearing and rock hardness. This variability also extends to the distribution of groundwater and the hydraulic conductivity of the rock.
3. Abutment piles should be driven in predrilled holes per Caltrans 2010 Standard Specifications Section 49-2.01c(4). After pile driving, the holes should be backfilled per this specification.
4. Cast-In-Drilled-Hole (CIDH) concrete piles shall be installed in accordance with the State of California, Department of Transportation, Standard Specifications and Special Provisions. The foundation design is based on concrete being placed in direct contact with the undisturbed foundation material, as described in the Foundations Recommendations section of this Revised Foundation Report.
5. Caving of the foundation materials into CIDH pile excavations is a possibility due to the presence of soil, the presence of intensely weathered rock, the presence of sheared and very intensely fractured rock, and the presence of groundwater. The contractor will use his expertise to determine the appropriate construction techniques for the conditions shown on the LOTB's.

Supplemental Project Information

The following information must be provided to bidders as “Supplemental Project Information”, per the 2010 Caltrans Standard Specifications, Section 2-1.06B.

Information attached to the project plans:

- A. Log of Test Borings (Arroyo Del Corral Bridge, Br. No. 49-0259).

Information included in the Information Handout:

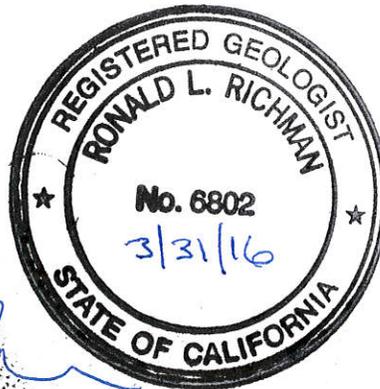
- A. Revised Foundation Report (Arroyo Del Corral Bridge, Br. No. 49-0259) dated December 1, 2014.

Information available for viewing at the Caltrans District 5 Office:

- A. Rock Core samples from the 2011 subsurface investigations.

The Foundation Recommendations included in this Draft Foundation Report are based on specific project information regarding structure type and structure location that has been provided by the Office of Bridge Design South 1. If you have any questions or comments, please contact Ron Richman (805) 549-3385.

Report by:



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Senior Materials & Research Engineer
Office of Geotechnical Design-North

- c: Job File - Branch D Records
Traci Menard - GDN Records

LIST OF ATTACHMENTS

Laboratory Test Data	Attachment 1
Design ARS Curve Data	Attachment 2
Foundation Parameters for LPile	Attachment 3

MATERIAL PROPERTIES SUMMARY

Arroyo Del Corral Bridge
SLO-1-R64.83

DESCRIPTION		RC-11-001		RC-11-002		RC-11-003		RC-11-004	
Station		338+86		337+70		337+72		336+30	
Line		"A1" Line; Rte 1 CL		"A1" Line; Rte 1 CL		"A1", Rte. 1 CL		"A1", Rte. 1 CL	
Distance from Line (Rt. or Lt.)		CL		25' Rt.		23' Lt.		1' Lt.	
Date Sampled		9/13/2011		9/16/2011		9/17/2011		9/17/2011	
Sample ID		1001		1002		1004		U01-1	
Depth (feet)		22.0'-25.0'		23.5'-25.0'		31.0'-32.0'		5.3'-5.7'	
USCS Classification		CL				CL		CH	
PARTICLE SIZE ANALYSIS	50 mm (2")								
	38 mm (1 1/2")								
	25 mm (1")								
	19 mm (3/4")								
	12 mm (1/2")								
	9.5 mm (3/8")						100		
	4.75 mm (No. 4)		100				96		100
	2.36 mm (No. 8)		99				95		98
	1.18 mm (No. 16)		99				89		97
	600 μm (No. 30)		97				80		95
	300 μm (NO. 50)		93				72		90
	150 μm (No. 100)		80				63		83
	75 μm (NO. 200)		68				53		77
5 μm		31				24		51	
1 μm		16				11		41	
Liquid Limit		35				25		51	
Plasticity Index		14				8		32	
CORROSION	Resistivity (ohm-cm)		1055		1884		897		959
	pH		7.39		7.84		8.32		8.40
	Chlorides (ppm)		90		N/A		41		44
	Sulfates (ppm)		302		N/A		523		418
In Situ Dry Density								104.6	
In Situ Moisture Content								20.3	21.0
Specific Gravity								2.67	
Unconfined Compressive Strength									
	(psi)				11,090				

MATERIAL PROPERTIES SUMMARY

Arroyo Del Corral Bridge
SLO-1-R64.83

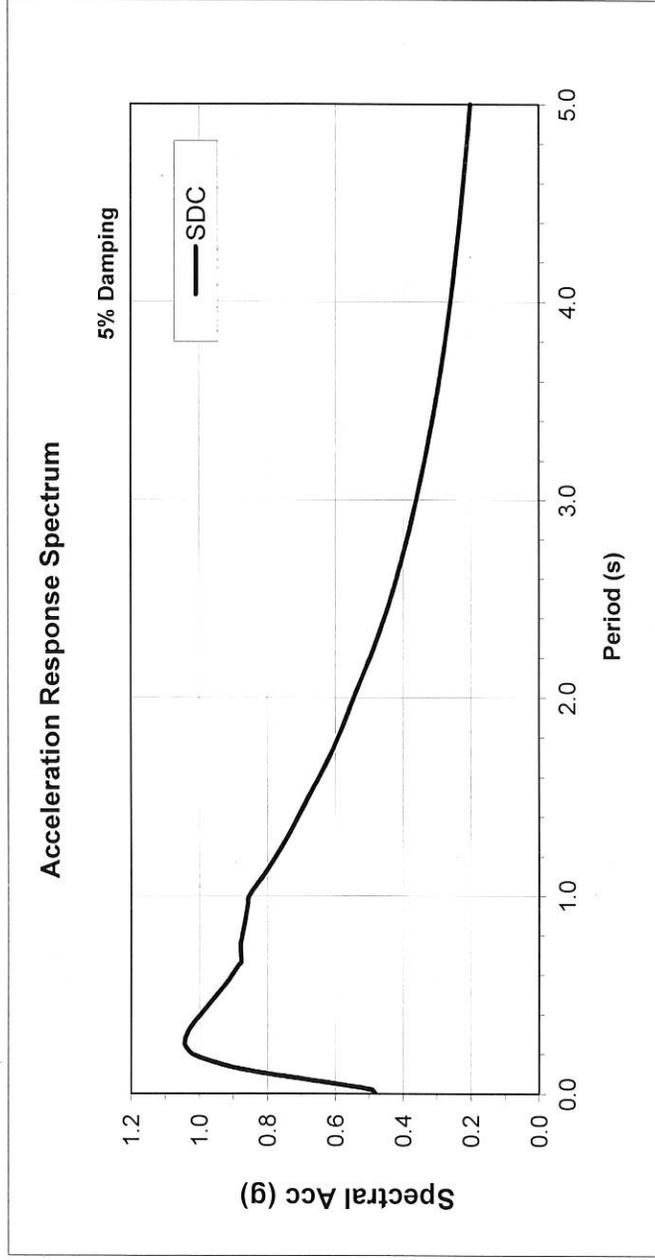
DESCRIPTION		RC-11-010	RC-11-011			
Boring No.		340+42	341+52			
Station		"A1", Rte. 1 CL	"A1", Rte. 1 CL			
Line		1' Lt.	0			
Distance from Line (Rt. or Lt.)						
Date Sampled		10/5/2011	10/8/2011	10/8/2011		
Sample ID		C01-1	C01-1	C02-1		
Depth (feet)		47.0'-47.7'	5.0'-5.5'	47.0'-47.5'		
USCS Classification						
50 mm (2")						
38 mm (1 1/2")						
25 mm (1")						
19 mm (3/4")						
12 mm (1/2")						
9.5 mm (3/8")						
4.75 mm (No. 4)						
2.36 mm (No. 8)						
1.18 mm (No. 16)						
600 µm (No. 30)						
300 µm (No. 50)						
150 µm (No. 100)						
75 µm (NO. 200)						
5 µm						
1 µm						
Liquid Limit						
Plasticity Index						
Resistivity (ohm-cm)						
pH						
Chlorides (ppm)						
Sulfates (ppm)						
In Situ Dry Density			117.5			
In Situ Moisture Content			12.4			
Specific Gravity						
Unconfined Compressive Strength (psi)		4107	285	7219		

Arroyo del Corral Bridge

Bridge No. 49-0259

SDC Controlling Procedure : Probabilistic/Deterministic

Period (s)	SDC
0.010	0.482
0.020	0.491
0.030	0.520
0.050	0.599
0.075	0.700
0.100	0.800
0.120	0.867
0.150	0.939
0.200	1.022
0.250	1.043
0.300	1.036
0.400	0.995
0.500	0.947
0.750	0.878
1.000	0.852
1.500	0.679
2.000	0.545
3.000	0.360
4.000	0.259
5.000	0.201



Deterministic Procedure Data

Fault	San Simeon - Hosgri Fault	R_{rup}	3.23	km
Fault ID	428	R_{jb}	3.23	km
Style	Strike-Slip	R_x	3.23	km
Mmax	7.5	V_{S30}	envelope of 255/380	m/s
Dip	90 deg	Z_{1.0}	N/A	m
Z_{TOR}	0 km	Z_{2.5}	N/A	km

Notes

ARS curve was modified for Near Fault Directivity Effect (SDC Section 6.1.2.1)

ROCK PARAMETERS INPUT DATA FOR LPILE PROGRAM

BRIDGE NAME: Arroyo Del Corral	BRIDGE NO.: 49-0259	EA: 05-492801 EFIS: 0500000576	PIER NO.: 3 BORING NO.: RC-11-010 BORING LOCATION: Station 340+25 CL	TOP OF BORING ELEVATION: 14.93 feet GWS ELEVATION: assume at ground surface
--	-------------------------------	---	--	--

Layer No.	Rock Type	Thickness (feet)	Elevation of layer top (feet)	Effective unit weight (pci)	Uniaxial compressive strength (psi)	Elastic Modulus of rock mass, E_{rm}	Weak rock	
							RQD	k_{rm}
2	9 – weak rock	6.7 feet	-0.8 feet	0.045 pci	139 psi	16,000 psi	0	0.0005
3	6 – strong rock	2.6 feet	-7.5 feet	0.054pci	2780 psi			
4	9 – weak rock	17.7 feet	-10.1 feet	0.045 pci	210 psi	25,000 psi	0	0.0005
5	9 – weak rock	3.0 feet	-27.8 feet	0.051 pci	350 psi	25,000 psi	0	0.0005
6	6 – strong rock	2.4 feet	-30.8 feet	0.058 pci	3820 psi			
7	9 – weak rock	4.0 feet	-33.2 feet	0.051 pci	210 psi	25,000 psi	0	0.0005
8	9 – weak rock	40.2 feet	-37.2 feet	0.045 pci	210 psi	20,000 psi	0	0.0005

* SOIL TYPE	1 Soft clay (Matlock)	5 User specified p-y curves	9 Weak rock (Reese)
	2 Stiff clay with free water (Reese)	6 Strong rock (such as vuggy limestone)	10 Liquefiable sand
	3 Stiff clay without free water (Reese)	7 Silt (with cohesion and internal friction angle)	11 Stiff clay w/o free water with specified initial k
	4 Sand (Reese)	8 API sand (API, 1987)	

Prepared By: Ron Richman Date: August 8, 2012

Memorandum

To: MIKE POPE, CHIEF
Bridge Design Branch 18
Office of Bridge Design South 1
DIVISION OF ENGINEERING SERVICES
STRUCTURES DESIGN – MS 9 4/81

Attn: Prem Rimal
Project Engineer

From: DEPARTMENT OF TRANSPORTATION
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES

Subject: Revised Foundation Report

Date: December 1, 2014

File: 05-SLO-001- PM R65.64
Arroyo Del Oso Bridge
Br. No. 49-0260
EA 05-492801
EFIS 0500000576

Scope of Work

A Revised Foundation Report (FR) is provided for the above referenced project. The proposed project is located near the town of San Simeon in San Luis Obispo County. Construction of a bridge to carry SR 001 over Arroyo Del Oso is proposed. Review of published geologic data and previous geotechnical reports, field reconnaissance, and design calculations were performed as part of the geotechnical investigation. This Foundation Report supersedes the Preliminary Foundation Report for the Arroyo Del Oso Bridge dated March 30, 2007, and the Foundation Report dated February 5, 2013.

The purpose of this report is to document geotechnical conditions and provide foundation recommendations.

Our Office has evaluated the site conditions and geology based on a review of the existing As-Built Plans, available geologic literature and mapping, aerial photograph interpretation, multiple site visits and a subsurface investigation completed between September and November 2011.

The following publications were used to assist in the assessment of site conditions:

1. *Preliminary Foundation Report*, EA 05-492801, Caltrans, Ron Richman, March 30, 2007.
2. *Caltrans ARS Online*.
3. *Geologic Map of the San Luis Obispo County, California*, (Compiled by Lew Rosenberg).
4. *Geologic Map of the San Simeon-Piedras Blancas Region*, San Luis Obispo County, California (Hall, 1976).

5. *Geotechnical Services Design Manual, Version 1.0*, (Division of Engineering Services, August 2009).
6. *Preliminary Geotechnical Report*, EA 05-492801, Caltrans, Chris Jones, January 19, 2001.

Project Description

According to the general plan sheet dated October 5, 2012, a 2 span bridge is proposed to span the perennial stream at the project location. The bridge will be approximately 216 feet in length, approximately 43.5 feet in width, and supported on one two-column intermediate support.

The datum used for the field investigation was found at SLO-001-PM 65.64. The elevation of this 1 inch ipw is elevation 31.079 feet per the NAVD88. The complete description of this datum can be found on the LOTB.

Field Investigation and Testing Program

Field investigations performed at the project site included geotechnical borings and monitoring of groundwater elevations.

The Office of Geotechnical Design-North conducted a subsurface investigation between October and November 2011. Three mud rotary borings were drilled for the design of the bridge foundation. The mud rotary borings were advanced using a self-cased wire line drilling apparatus that provided continuous soil samples and rock cores. Soils were visually classified in accordance with the Caltrans Soil and Rock Logging, Classification, and Presentation Manual (June 2010).

Standard penetration tests (SPT), ASTM test method 1586, were performed at selected depth intervals to estimate in-place density of the native soil. Empirical correlations of soil strength parameters with SPT blow counts were used to estimate strength parameters of in-situ cohesionless soils. Pocket penetrometer measurements of unconfined compressive strength were used to estimate the undrained shear strength of cohesive soils. The maximum depth of investigation was approximately 120 feet.

A summary of the borings drilled during the 2011 subsurface investigation is included below in Table 1.

Table 1: The 2011 Subsurface Investigation Summary

Boring No.	Completion Date	Drill Rig Type	Hammer Type	Hammer Efficiency (%)	Approx. Ground Surface Elevation (ft)	Boring Depth (ft)
RC-11-012	10/11/2011	CS-2000	Automatic	93	30.0	101.0
RC-11-013	10/12/2011	CS-2000	Automatic	93	35.6	97.5
RC-11-019	11/2/2011	CS-2000	Automatic	93	28.9	120.3

Laboratory Testing Program

Laboratory testing was performed on selected samples of the subsurface materials obtained from the 2011 subsurface investigation. Soil samples were also collected and submitted to the Headquarters Geotechnical Laboratory for mechanical analyses, corrosion potential testing, and determination of Atterberg Limits. The corrosion test results for the soil samples may be found in the Corrosion Evaluation section of this report. In addition to the corrosion tests performed on the soil, selected rock samples were tested for unconfined compression strength (ASTM D 2938). The rock specimens for this testing were selected on the basis of the size requirements per the test method. Some of the collected core is considered to be unsuitable for strength testing using the ASTM D2938. Refer to the Log of Test Borings for the site-specific rock and soil data. Laboratory test results are provided in Attachment 1.

Site Geology and Subsurface Conditions

Regional Setting and Area Geology

The project is located within the Coast Ranges geomorphic province of California, on the border of the Santa Lucia Range.

The geology in the vicinity of the project is characterized by marine terrace deposits overlying Franciscan Mélange. Young and old alluvial deposits are deposited within the drainages, where they overlie the Graywacke and Franciscan Mélange. The drainages are steep walled and geologically recent. A dike and sill complex of green-black diabase is exposed along the coastline from approximately Postmile 65.9 to Arroyo de la Cruz (Postmile 66.8).

The marine terrace deposits are composed of loosely consolidated white to orange-brown sand and conglomerate and range from 3 feet to 20 feet in thickness according to Hall (1976). The upper 2 to 4 feet consists of fine grained silty sand which coarsens downward to the conglomerate. The clasts are described by Hall as being subrounded to angular and as large as 4 feet in diameter. The clasts consist of fragments of Jurassic ophiolite, Franciscan rocks Cambria Felsite, dacite and Monterey chert.

The Franciscan Graywacke is described by Hall as thick-bedded, tan, medium-grained sandstone.

The Franciscan Mélange in the vicinity of this project is described by Hall as being pervasively sheared graywacke consisting, in large part, of sheared greenish-black claystone. Exotic clasts may consist of conglomerate, blueschist, schist, metavolcanic rocks or greenstone, chert, graywacke, shale, diabase, serpentinite, and silica-carbonate rocks. The original structure of the unit has been destroyed by shearing and mixing.

The Arroyo del Oso Fault crosses Highway 1 at approximately Postmile 65.8 and intersects the coastline nearby. However, the Arroyo del Oso Fault is not considered active or potentially active according to the *2007 Caltrans Fault Database*.

Subsurface Conditions

Three mud rotary borings (RC-11-012, RC-11-013 and RC-11-019) were conducted in the project area during October 2011 and November 2011. The maximum depth of the investigation was approximately 120 feet. Complete descriptions of the soil and rock are presented on the logs of test borings. A brief summary of the soil and rock descriptions follows.

The borehole logs for the borehole at abutment 1 describes soil from the ground surface to approximately elevation 14 as terrace deposits. The soil is loose clayey sand overlying stiff lean clay. Underlying the terrace deposits, to the deepest point reached by the abutment boreholes at approximately elevation -71, the borehole log describes zones of metamorphosed siltstone (metasiltstone), metamorphosed graywacke (metagraywacke breccia in a sheared metasiltstone matrix, and greenstone. The metasiltstone is described as decomposed, intensely weathered, moderately weathered and slightly weathered, as well as very soft, soft, moderately soft, and moderately hard. It is also described as very intensely fractured. The metagraywacke is described as slightly weathered, as well as moderately hard. It is also described as moderately, intensely and very intensely fractured. The greenstone is described as slightly weathered, hard and intensely fractured.

The borehole logs for the borehole at pier 2 describe soil from the ground surface to approximately elevation 13 as alluvium. The soil is described as very stiff lean clay, very stiff lean clay with sand, and loose clayey gravel. Underlying the alluvial deposits, to the deepest point reached by the pier 2 borehole at approximately elevation -91, the borehole log describes zones of metamorphosed siltstone (metasiltstone), metamorphosed graywacke (metagraywacke) breccia in a sheared metasiltstone matrix, and greenstone. The metasiltstone is described as decomposed, intensely weathered and slightly weathered, as well as very soft, soft, moderately soft and moderately hard. It is also described as very intensely fractured, with some being pervasively sheared and some with slickensides. The metagraywacke is described as slightly weathered, as well as moderately hard. It is also described as moderately and intensely fractured. The greenstone is described as slightly weathered, very hard and intensely fractured.

The borehole logs for the borehole at abutment 3 describes soil from the ground surface to between approximately elevations 16 as terrace deposits. The soil is hard fat clay, medium dense silty sand and medium dense clayey sand, some with gravel. Underlying the terrace deposits, to

the deepest point reached by the abutment boreholes at approximately elevation -62, the borehole log describes zones of metamorphosed siltstone (metasiltstone) and metamorphosed graywacke (metagraywacke) breccia in a sheared metasiltstone matrix. The metasiltstone is described as intensely weathered, moderately weathered, and slightly weathered, as well as soft and moderately soft. It is also described as very intensely fractured. The metagraywacke is described as slightly weathered, hard and intensely fractured.

The Logs of Test Borings providing the complete field descriptions of the subsurface materials will be provided at a future date. They are to be included in the plans.

Groundwater

Two of the boreholes drilled for the subsurface investigation were used to construct open-standpipe observation wells for the purpose of monitoring groundwater elevations. They were constructed by installing 1.5 inch diameter slotted PVC pipe in the boreholes, and backfilling the annulus with number 8 sand to within 5 feet of original ground. The wells were protected against surface water intrusion by sealing the remaining annular space with bentonite chips or grout. Well caps were then installed.

A summary of the ground water observations at the Arroyo Del Oso bridge site are provided below, in Table 2.

Table 2: Groundwater Level Observations

<i>Borehole ID</i>	<i>Date¹</i>	<i>Ground Surface Elevation (feet)</i>	<i>Depth to Groundwater (feet)</i>	<i>Groundwater Elevation (feet)</i>
RC-11-012	11/10/2011	30.0	4.0	26.0
	11/15/2011		4.0	26.0
	11/16/2011		4.9 ¹	25.1 ¹
	2/28/2012		5.1	24.9
	12/11/2012		6.0	24.0
RC-11-019	11/10/2011	28.9	4.9	24.0
	11/15/2011		6.8	22.1
	11/16/2011		22.3 ¹	6.6 ¹
	2/28/2012		5.5	23.4
	12/11/2012		6.7	22.2

¹ Observation wells were bailed after water levels were measured on 11/15/2011. Water levels were measured again on 11/16/2011.

Ground water surface elevations are subject to seasonal fluctuations and may occur at higher or lower elevations depending on preceding seasonal weather conditions and surface water levels at the time of construction.

Scour Evaluation

A Final Hydraulic Report was completed by Structure Hydraulics and Hydrology Branch on May 24, 2012. The report was based on information provided by Structure Design, which included a two-span 5.4 foot deep structure. At pier 2, 6 feet of local scour is predicted. According to the Hydraulics Report, no long term scour is anticipated for this configuration.

Corrosion Evaluation

Representative soil samples taken during the subsurface investigation were tested for corrosion potential. The Department considers a site corrosive to foundation elements if one or more of the following conditions exist for the representative soil and/or water samples taken at the site:

- Chloride concentration is greater than or equal to 500 ppm
- Sulfate concentration is greater than or equal to 2000 ppm
- The pH is 5.5 or less

Since resistivity serves as an indicator parameter for the possible presence of soluble salts, tests for sulfate and chloride are usually not performed unless the resistivity of the soil is 1,000 ohm-cm or less.

The results of the laboratory tests determined that the samples were considered to be non-corrosive. The results are provided in Table 3.

Table 3: Corrosion Test Summary of the Composite Samples

SIC Corrosion Number	Boring Number	Sample Depth (ft)	pH	Minimum Resistivity (ohm-cm)	Chloride Content (ppm)	Sulfate Content (ppm)
C1009	RC-11-012	19.5 – 20.5	8.32	1985	Not tested	Not tested
C1010	RC-11-012	32.0 – 33.0	8.91	1718	Not tested	Not tested

The proposed structure will be located within 0.25 miles of the ocean.

Seismic Recommendations

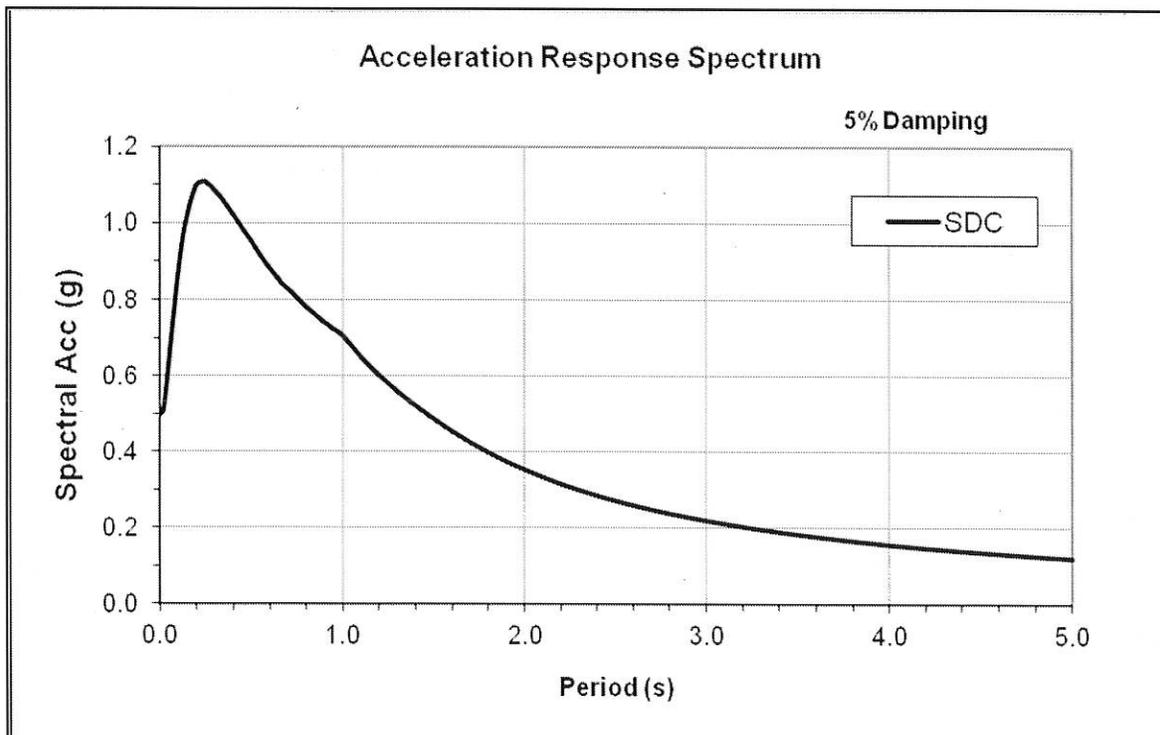
Ground Motion

The project is located within a seismically active region of California. Based on the 2009 *Caltrans Seismic Design Procedure*, the following active and potentially active faults are located

within the vicinity of the project site. The Caltrans ARS Online Tool, analytical spreadsheets and the 2008 USGS Probabilistic Seismic Hazard Analysis Interactive Deaggregation Tool (Beta) were used to develop ARS curves for deterministic and probabilistic seismic prediction models. An average shear wave velocity of 1500 ft/sec (460 m/s) was calculated for the upper 100 feet (30 meters) of soil and rock observed at borehole RC-11-019. The calculations were based on soil shear wave velocities derived from correlations to SPT and estimations for the rock shear wave velocity. The resulting design envelope ARS curve is presented in Figure 1. A basin factor of 1.0 was assumed for this location and a near fault factor was applied to the data due to the proximity of the faults. Recommended design spectral acceleration curve data points are provided in Attachment 2.

Table 4: Active and Potentially Active Faults

Fault Name	Fault Type	Moment magnitude of maximum credible earthquake	Distance from fault to project site - R_{RUP} (miles)	Peak ground acceleration (gravity)
San Simeon - Hosgri	Strike Slip	7.5	1.8	0.50
Oceanic	Reverse	7.4	2.5	0.48



Ground Rupture

Ground rupture hazard at the bridge location is considered low. The *Geologic Map of the San Simeon-Piedras Blancas Region, San Luis Obispo County, California* (Hall, 1976) shows the Arroyo del Oso Fault crossing State Route 1 at Postmile 65.8. However, the Arroyo del Oso Fault is not considered active or potentially active according to the *2007 Caltrans Fault Database*. No other known active or potentially active faults project toward or cross the bridge location.

Liquefaction

Liquefaction is a near-total loss of soil strength due to an increase in pore water pressure during cyclic loading, such as occurs during an earthquake. Loose sands and gravels with 20 percent fines or less that have the potential of being saturated are susceptible to liquefaction. The Terrace deposit soils found immediately below the ground surface at both abutments 1 and 3 are either weakly cemented or contain a substantial percentage of fine grained soil particles. The liquefaction potential of these soils is considered low. The alluvial soils at the locations of the pier 2 columns contain a substantial percentage of fine grained soil particles, and the liquefaction potential is considered low.

Foundation Recommendations

Bridge Foundations

The following foundation recommendations are for design of the support system of the proposed Arroyo Del Oso Bridge, Br. No. 49-0260, configured as shown on the General Plan sheet dated October 5, 2012.

The proposed pile tip elevations are based on the subsurface conditions, bottom-of-footing elevations, cut-off elevations, the construction joint elevation shown in the plans, the requirements of Standard Specifications Section 49-3.02C(6) and factored loads provided by the Office of Bridge Design, Branch 18 (January 4, 2013). All support foundations were designed using the Load and Resistance Factor Design (LRFD) method.

Driven HP 14X89 piles are recommended for support of Abutment 1 and 3, and 72-inch diameter drilled shafts in rock (CIDH piles) are recommended for support of Pier 2. The nominal resistance of the drilled shafts is based on side resistance within a portion of the penetrated rock. Side resistance for a length of the drilled shafts from the specified tip elevation to a point 4 feet above the specified tip elevation, does not contribute to the calculated nominal resistance. Also, there is no side resistance contribution to the calculated drilled shaft nominal resistance above elevation 0.0 feet. Base resistance does not contribute to the calculated nominal resistance of the CIDH piles shown in the Pile Data Table.

The drilled shaft design is based on an ultimate unit side resistance of 3 ksf. The unit side resistance value is based on the following assumptions:

1. The majority of the area of the borehole side walls is considered rough, with undulations and irregularities.
2. The concrete is placed in direct contact with the foundation material. The foundation material has not been disturbed or loosened by the drilling process, nor has a smear zone been created by the drilling and casing process. It is assumed that a zone of soil-like drill cuttings has not been left between the concrete and native ground by the construction processes.

Any construction method that creates a condition that does not meet these assumptions should not be accepted or permitted. Both the ultimate axial and lateral resistance and stiffness of the drilled shaft will be adversely affected, and the foundation performance may differ from the design assumptions and requirements.

Table 5: Pile Foundation Recommendations

Support Location	Pile Type	Cut-off Elevation (ft)	Service-I Limit State Load per Support (kips)	Total Permissible Support Settlement (inches)	Required Factored Nominal Resistance (kips)				Design Tip Elevations (ft)	Specified Tip Elevation (ft)	Nominal Driving Resistance Required (kips)
					Strength Limit		Extreme Event				
					Comp. ($\phi = 0.65$)	Tension ($\phi = 0.7$)	Comp. ($\phi = 1$)	Tension ($\phi = 1$)			
Abut. 1	HP 14 X 89	35.42	1325	1	235	0	N/A	N/A	6.0 (a-I)	6.0	360
Pier 2	72 inch CIDH	17.0	2491	1	2369	0	2805	0	-69.0 (a-I) -54.0 (a-II)	-69.0	N/A
Abut. 3	HP 14 X 89	30.17	1294	1	235	0	N/A	N/A	10.0 (a-1)	10.0	360

Notes:

- 1) Design tip elevations are controlled by: (a-I) Compression (Strength Limit), (a-II) Compression (Extreme Event).
- 2) There are no design tip elevations for settlement because the abutment piles are driven to rock and the CIDH piles at the pier are embedded into rock.

Table 6: Pile Data Table

Location	Pile Type	Nominal Resistance (kips)		Design Tip Elevation (ft)	Specified Tip Elevation (ft)	Nominal Driving Resistance (kips)
		Compression	Tension			
Abut. 1	HP 14 X 89	360	0	6 (a)	6	360
Pier 2	72 inch CIDH	3650	0	-69.0 (a)	-69.0	N/A
Abut. 3	HP 14 X 89	360	0	10 (a)	10	360

Notes:

- 1) *Design tip elevations are controlled by: (a) Compression.*
- 2) *There are no design tip elevations for settlement because the abutment piles are driven to rock and the CIDH piles at the pier are embedded into rock.*
- 3) *The specified tip elevations at the abutments shall not be raised above the design tip elevations for lateral load specified by the structure designer.*
- 4) *The tip elevation of the CIDH piles at Pier 2 shall not be raised above the specified tip elevation.*

Abutment 1 Left and Right Wing Walls

A foundation recommendation is provided for one driven HP 14X89 steel pile for support of the Abutment 1 left and right wing walls. The piles are located at approximately 19.8 feet left and right of centerline station 375+05. The piles have a cut-off elevation of 46.11. The nominal resistances of both piles is 350 kips and the design tip elevations is 6.0 feet.

Lateral analysis of Pier 2

Per request, soil and rock parameters were provided for development of p-y curves using the program LPILE (Ensoft, Inc.). The parameters are provided in Attachment 3 of this report.

Approach Fill Earthwork

Recommendations for the settlement and stability analyses of the approach embankments are provided in the Geotechnical Design Report (Appelbaum, August 10, 2012). In summary, the Geotechnical Design Report provides no fill delay period recommendation for the approach embankments. The approach embankment slopes were also deemed to be stable. Refer to the Geotechnical Design Report for more information.

Notes to Designer

1. All support locations are to be plotted on the Log of Test Borings, in plan view, as stated in "Memo to Designers" 4-2. The support locations should be plotted prior to requesting a final foundation review.
2. If lateral demands exist on the support piles, the structural design engineer shall indicate in the pile data table on the plans, the design pile tip elevations required to meet the lateral load demands. If the specified pile tip elevations given in the above pile data table are not adequate for lateral load demands; the Office of Geotechnical Design-North shall be contacted for further recommendations. It is not within the scope of this report to provide considerations for the lateral response of the CIDH piles with regards to the effects of construction methods and the installation of temporary or permanent casings.

Construction Considerations

Rock Cores

1. Rock core samples from the 2011 subsurface investigation are available for bidder viewing at the California Department of Transportation, District 5 Office, 50 Higuera St., San Luis Obispo, CA. Once a request has been made to view the core, the bidders are to allow the State five (5) working days to prepare and display the core. It is highly recommended that the Contractor inspect/observe the core samples at the Caltrans District 5 facility before bidding.
2. During the 2011 subsurface investigation, rock and soil samples were collected from several borings. Samples were submitted to the Caltrans Transportation laboratory for testing. A summary of the laboratory test data is provided in Attachment 1 to this report.

Foundation Construction

1. Groundwater was encountered during the 2011 subsurface investigation. Groundwater may be encountered during the construction at all foundation locations. Wet pile installation methods may be necessary at CIDH foundation locations as groundwater was observed above the construction joint elevations. Groundwater surface elevation is subject to annual and seasonal fluctuations, and may occur at a higher or lower elevation than indicated on the Logs of Test Borings (LOTB) and in this report.
2. Due to the nature of the Franciscan Mélange foundation rock, the contractor should anticipate foundation conditions that: 1) do not match the vertical distribution shown in any of the boreholes, 2) vary significantly from foundation location to foundation location, and 3) vary significantly in the vertical sequence at each foundation location. The data from the boreholes indicates that the variability will include the rock type distribution, rock weathering, rock fracturing, rock shearing and rock hardness. This variability also extends to the distribution of groundwater and the hydraulic conductivity of the rock.
3. Cast-In-Drilled-Hole (CIDH) concrete piles shall be installed in accordance with the State of California, Department of Transportation, Standard Specifications and Special Provisions. The foundation design is based on concrete being placed in direct contact with the undisturbed foundation material, as described in the Foundations Recommendations section of this Revised Foundation Report.
4. Caving of the foundation materials into CIDH pile excavations is a possibility due to the presence of soil, the presence of decomposed and intensely weathered rock, the presence of sheared and very intensely fractured rock, and the presence of groundwater. The contractor will use his expertise to determine the appropriate construction techniques for the conditions shown on the LOTB's.

Supplemental Project Information

The following information must be provided to bidders as "Supplemental Project Information", per the 2010 Caltrans Standard Specifications, Section 2-1.06B.

Information attached to the project plans:

- A. Log of Test Borings (Arroyo Del Oso Bridge, Br. No. 49-0260).

Information included in the Information Handout:

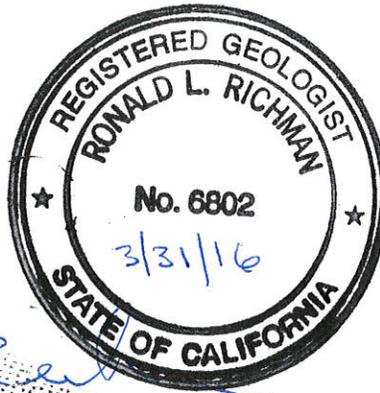
- A. Revised Foundation Report (Arroyo Del Oso Bridge, Br. No. 49-0260) dated December 1, 2014.

Information available for viewing at the Caltrans District 5 Office:

- A. Rock Core samples from the 2011 subsurface investigations.

The Foundation Recommendations included in this Foundation Report are based on specific project information regarding structure type and structure location that has been provided by the Office of Bridge Design South 1. If you have any questions or comments, please contact Ron Richman (805) 549-3385.

Report by:



RONALD L. RICHMAN, P.E. No. 039869, P.G. No. 6802
Senior Materials & Research Engineer
Office of Geotechnical Design-North

c: Job File / Branch D Records
Traci Menard / GDN Records

Laboratory Test Data	Attachment 1
Design ARS Curve Data	Attachment 2
Foundation Parameters for LPile analysis	Attachment 3

LIST OF ATTACHMENTS

Laboratory Test Data	Attachment 1
Design ARS Curve Data	Attachment 2
Foundation Parameters for LPile analysis	Attachment 3

MATERIAL PROPERTIES SUMMARY

Arroyo Del Oso Bridge
SLO-1-R65.64

Boring No. RC-11-012	
Station 375+35	
Line "A1" Line; Rte. 1 CL	
Distance from Line (Rt. or Lt.) 1' Rt.	
DESCRIPTION	10/9/2011
Date Sampled	10/9/2011
Sample ID	U01-1
Depth (feet)	4.0'-4.5'
USCS Classification	CL
50 mm (2")	
38 mm (1 1/2")	
25 mm (1")	
19 mm (3/4")	
12 mm (1/2")	
9.5 mm (3/8")	
4.75 mm (No. 4)	
2.36 mm (No. 8)	
1.18 mm (No. 16)	
600 µm (No. 30)	
300 µm (NO. 50)	
150 µm (No. 100)	
75 µm (NO. 200)	
5 µm	
1µm	
Liquid Limit	47
Plasticity Index	29
Resistivity (ohm-cm)	
pH	
Chlorides (ppm)	
Sulfates (ppm)	
In Situ Dry Density	86.3
In Situ Moisture Content	30.3
Specific Gravity	2.69
Unconfined Compressive Strength (psi)	

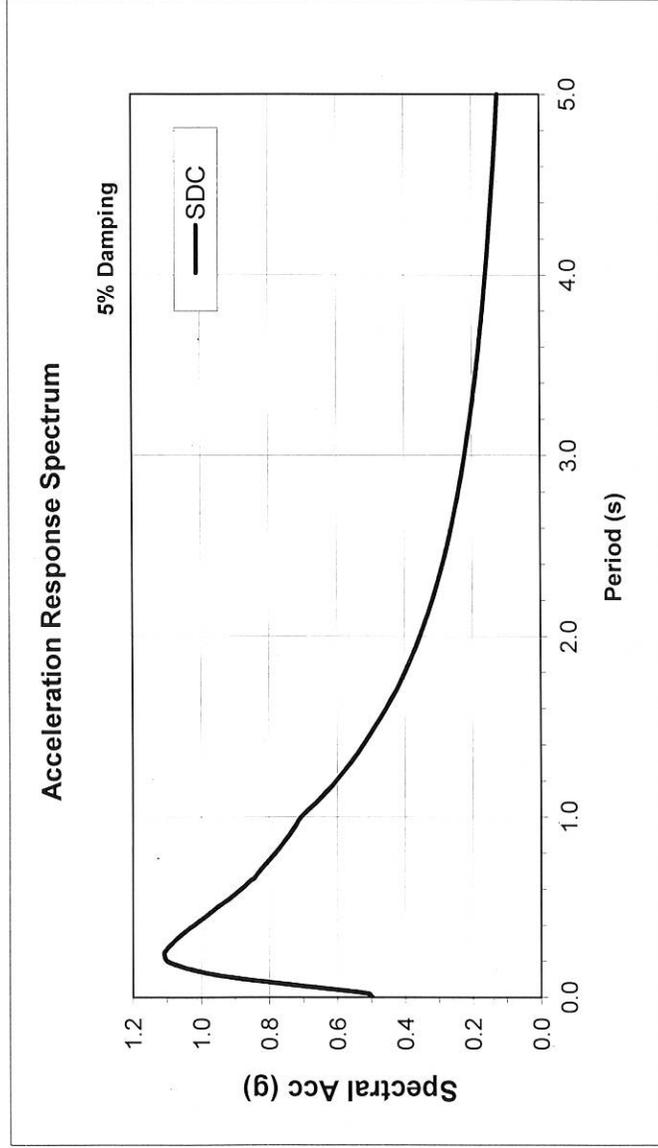
DESCRIPTION	10/9/2011	10/9/2011	10/9/2011	10/9/2011	10/9/2011	10/9/2011
Date Sampled	10/9/2011	10/9/2011	10/9/2011	10/9/2011	10/9/2011	10/9/2011
Sample ID	U01-2	U02-1	U02-2	U03-1	U03-2	U09
Depth (feet)	4.5'-5.0'	8.5'-9.0'	9.0'-9.5'	14.0'-14.5'	14.5'-15.0'	19.5'-20.5'
USCS Classification	CL	CL	CL	CL	CL	CL
50 mm (2")						
38 mm (1 1/2")						
25 mm (1")						
19 mm (3/4")						
12 mm (1/2")						
9.5 mm (3/8")						
4.75 mm (No. 4)						
2.36 mm (No. 8)						
1.18 mm (No. 16)						
600 µm (No. 30)						
300 µm (NO. 50)						
150 µm (No. 100)						
75 µm (NO. 200)						
5 µm						
1µm						
Liquid Limit	100	98	98	97	93	90
Plasticity Index	100	98	98	97	93	90
Resistivity (ohm-cm)						
pH						
Chlorides (ppm)						
Sulfates (ppm)						
In Situ Dry Density	104.4	104.4	104.4	92.7	92.7	92.7
In Situ Moisture Content	21.9	21.9	21.9	30.3	30.3	30.3
Specific Gravity	2.64	2.64	2.64	2.71	2.71	2.71
Unconfined Compressive Strength (psi)						

Arroyo del Oso Bridge

Bridge No. 49-0260

SDC Controlling Procedure : Deterministic

Period (s)	SDC
0.010	0.497
0.020	0.506
0.030	0.540
0.050	0.636
0.075	0.758
0.100	0.871
0.120	0.944
0.150	1.020
0.200	1.100
0.250	1.108
0.300	1.085
0.400	1.021
0.500	0.953
0.750	0.886
1.000	0.848
1.500	0.585
2.000	0.426
3.000	0.265
4.000	0.189
5.000	0.147



Deterministic Procedure Data

Fault	San Simeon - Hosgri Fault	R_{rup}	2.91	km
Fault ID	428	R_{fb}	2.91	km
Style	Strike-Slip	R_x	2.91	km
Mmax	7.5	V_{S30}	460	m/s
Dip	90 deg	$Z_{1.0}$	N/A	m
Z_{TOR}	0 km	$Z_{2.5}$	N/A	km

Notes

ARS curve was modified for Near Fault Directivity Effect (SDC Section 6.1.2.1)

ROCK PARAMETERS INPUT DATA FOR LPILE PROGRAM

BRIDGE NAME: Arroyo Del Oso	BRIDGE NO.: 49-0260	EA: 05-492801 EFIS:0500000576	PIER NO.: 2 BORING NO.: RC-11-019 BORING LOCATION: Station 376+08 CL	TOP OF BORING ELEVATION: 28.91 feet GWS ELEVATION: assume at ground surface
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Layer No.	Rock Type	Thickness (feet)	Elevation of layer top (feet)	Effective unit weight (pci)	Uniaxial compressive strength (psi)	Elastic Modulus of rock mass, E_{rm}	Weak rock	
							RQD	k_{rm}
2	9 - weak rock	10.0 feet	12.1 feet	0.042 pci	104 psi	16,000 psi	0	0.0005
3	9 - weak rock	27.0 feet	2.1 feet	0.045 pci	139 psi	16,000 psi	0	0.0005
4	6 - strong rock	1.1 feet	-24.9 feet	0.058 pci	3820 psi			
5	9 - weak rock	30.0 feet	-26.0 feet	0.051 pci	210 psi	20,000 psi	0	0.0005

* SOIL TYPE	1 Soft clay (Matlock)	5 User specified p-y curves	9 Weak rock (Reese)
	2 Stiff clay with free water (Reese)	6 Strong rock (such as vuggy limestone)	10 Liquefiable sand
	3 Stiff clay without free water (Reese)	7 Silt (with cohesion and internal friction angle)	11 Stiff clay w/o free water with specified initial k
	4 Sand (Reese)	8 API sand (API, 1987)	

Prepared By: Ron Richman Date: August 8, 2012

Memorandum

*Serious Drought
Help Save Water*

To: JOHN FOUCHE
Senior Design Engineer
Central Region Project Development
Office of Design II, Branch C

Date: November 24, 2014

File: 05-492801 (0500000576)
05-SLO-1-64.0/R66.9
Realign Highway

Attn: Kyle Birch
Project Engineer

From: DEPARTMENT OF TRANSPORTATION
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES

Subject: REVISED GEOTECHNICAL DESIGN REPORT: PIEDRAS BLANCAS REALIGNMENT

A revised Geotechnical Design Report (GDR) is provided for the above referenced project to report results of a reanalysis of slope stability. This report supersedes "Geotechnical Design Report for Piedras Blancas Realignment" dated August 10, 2012.

The project proposes to realign Route 1 in San Luis Obispo County from one-third of a mile north of the Piedras Blancas Lighthouse to the Arroyo de la Cruz Bridge to provide protection for the highway against coastal bluff erosion. The project is programmed in the 2010 State Highway Operation and Protection Program (SHOPP) for Right of Way capital and Construction capital in 2013/2014. A Vicinity Map showing the project location is presented as Attachment 1.

The recommendations presented herein are based on reviews of published data, site reconnaissance, subsurface investigations, and laboratory testing. The purpose of this report is to document subsurface geotechnical conditions, provide analyses of anticipated site conditions as they pertain to the project described herein, and to recommend design and construction criteria for the roadway portions of the project. This report also establishes a geotechnical baseline to be used in assessing the existence and scope of differing site conditions.

This report is intended for use by the project design engineer, construction personnel, bidders, and contractors.

Existing Facilities and Proposed Improvements

The project area is located in a rural part of northern San Luis Obispo County on Route 1. The highway closely follows the Pacific Coast between Cambria and Carmel. Route 1 is designated a rural minor arterial and federal aid primary route. It serves regional and interregional traffic, and is shared by recreational users, commuters, cyclists, and limited commercial traffic. From San Simeon to the Monterey County line, Route 1 is a two-lane conventional highway.

The existing highway in the project area is on easement, with underlying ownership held by Hearst Holdings Inc. (Hearst). The highway is also on easements through three additional private parcels. Right of way width typically varies between 60 and 80 feet, with additional right of way width at the locations of the larger drainages.

The posted speed limit in the project area is 55 mph. The design speed of the existing highway based on existing geometric features and current design standards is generally 43 mph or higher. Existing lane widths vary between 10 and 12 feet, and the paved shoulders vary from 1 to 8 feet wide. Existing nonstandard features include horizontal curve radii, vertical curve lengths, superelevation rates, vertical sight distance, lane widths, side slope inclinations, and shoulder widths. The average daily traffic in the project area in 2006 was 2,450 vehicles.

The project area includes four well-drained perennial streams: Arroyo de la Playanos at postmile 65.64, Arroyo del Corral at postmile 64.82, Arroyo del Oso at postmile 65.41, and Arroyo de la Cruz at postmile 66.87. A 90-inch culvert drains Arroyo de la Playanos; a 12-foot by 7-foot box culvert drains Arroyo del Corral; a 102-inch culvert drains Arroyo del Oso; and a bridge spans Arroyo de la Cruz. Thirteen minor drainages are located within the project limits.

Land use is primarily agricultural/cattle ranching, with Hearst being the major property owner. Five private residences are located within the project limits. The Hearst ranch house and one other residence each have their own driveway approach from the highway. The remaining three private residences share a driveway.

Two shoreline access points exist within the project limits, a formal access point at the former Piedras Blancas Motel and an informal access point at the north end of the project area, just south of Arroyo de la Cruz. The former Piedras Blancas Motel is located nearly mid way between the project limits, on the westerly side of Route 1. The property includes two beaches and coastal bluffs. In 2005, the motel was sold to the Trust for Public Land, who purchased the motel to protect the property from private development and to allow public access to the coastline. In 2007, the motel and adjacent property were conveyed into public ownership. The property is managed by California State Parks.

Storms in winter 2000/2001 eroded the shoreline nearly to the highway shoulder in two areas just north of the Piedras Blancas Motel, and to the westerly edge of the right of way at a third location, south of the Motel. Caltrans took immediate measures to protect the highway from further erosion by placing rock slope protection at the sites. The areas were designated Rocks 1, Rocks 2, and Rocks 3 (see Project Layout, Attachment 2 for locations). Shoreline armoring, however, is discouraged by the California Coastal Commission. As a condition of the Coastal Development Permit obtained to construct the shoreline protection it was agreed that the rock slope protection would be removed once a long-term solution for protecting the highway was constructed, or when the permit expires in October 2017.

The rock slope protection was the first phase of a three-phase strategy to protect the highway from shoreline erosion. The second phase, completed in 2003, constructed temporary realignments of the highway at Rocks 1 and Rocks 3. The rock slope protection from Rocks 3 was moved to Rocks 2 after the temporary realignments were completed. The realigned roadway segments are expected to provide an operational life of at least ten years. The rock slope protection at Rocks 2 is halting the shoreline erosion, but high surf periodically inundates the highway and leaves behind rock and other debris. That segment of highway requires inordinate effort by Maintenance to provide a safely traversable roadway.

The first two phases only provided temporary protection for the highway. This project, phase 3, proposes a long-term solution so that the continuing bluff erosion will not adversely affect future operation of the highway. The preferred alternative is to realign the highway inland of the expected 100-year shoreline. Seventeen alignment variations were studied and narrowed down to one: Alignment 2. This alignment was designed to closely follow the 100-year shoreline and minimize environmental impacts. It also avoids impact to cultural resources. The new roadway cross section will consist of two twelve-foot lanes and eight-foot shoulders. Bridges will be constructed over Arroyo de la Playanos, Arroyo del Corral, and Arroyo del Oso to minimize environmental impacts at those sites. The project cost in March 2010 was estimated at \$50.1 million, which includes \$12.8 million for right of way and \$37.2 million for construction.

Pertinent Reports and Investigations

The following publications and references were used to assist in the evaluation of site conditions:

1. *Calculating Earthwork Factors Using Seismic Velocities*, Report No. FHWA-CA-TL-78-23, (Stephens, 1978).
2. *Caltrans ARS Online (v2.3.06)*.
3. *Caltrans Seismic Design Criteria, Version 1.7*, April 2013.
4. *Geologic Map of the San Luis Obispo County, California*, (Compiled by Lew Rosenberg).
5. *Geologic Map of the San Simeon-Piedras Blancas Region, San Luis Obispo County, California* (Hall, 1976).
6. *Preliminary Geotechnical Report* (Jones, January 19, 2001)
7. *Soil Survey of San Luis Obispo County, California, Coastal Part*, (United States Department of Agriculture, Natural Resource Conservation Service).

Field reviews of the project area have been performed by personnel from this office to determine potential geologic and geotechnical issues that may impact the construction and performance of the

facility over its design life. In addition, a subsurface investigation was conducted to provide information for the design of bridge foundations, assess foundation conditions for embankment construction, and assess global stability of proposed cut and fill slopes.

Physical Setting

The project is located within the Coast Range Geomorphic Province and is bordered to the east by the Santa Lucia Range and to the west by the Pacific Ocean. The geomorphology along this section of Route 1 is characterized by broad, gently sloping coastal marine terraces dissected by local drainages. The drainages are steep walled and geologically recent.

Climate

The San Simeon coastal area has a mild marine climate. The average January and July temperatures are 52° and 56° Fahrenheit, respectively. Average annual precipitation is approximately 25 inches. Almost all of the precipitation falls between November and April. It is not uncommon for the area to experience high intensity, short duration rainfall events that deposit as much as 4 inches of rain in a 24 hour period.

Regional Geology and Seismicity

The geology along the project section of Highway 1 is characterized by marine terrace deposits overlying a basement unit of Franciscan Melange. Young and old alluvial deposits fill the local drainages. The drainages are steep walled and geologically recent. A dike and sill complex of green-black diabase is present along the coastline from approximately Postmile 65.9 to Arroyo de la Cruz (Postmile 66.8). A geologic map is presented as Attachment 3.

According to Hall (1976), the marine terrace deposits are composed of loosely consolidated white to orange-brown sand and conglomerate, and range from 3 feet to 20 feet in thickness. The upper 2 to 4 feet consists of fine grained silty sand, which coarsens downward to the conglomerate.

The Franciscan Melange is a chaotic mixture of sandstone and associated shale, altered volcanic rocks, and lesser amounts of thin bedded chert, serpentinite, diabase-gabbro, conglomerate, and blueschist metamorphic rocks. The tectonic origin of the Franciscan is reflected by its chaotic content and pervasively sheared matrix.

The project is located within a seismically active region of California. There are several earthquake faults in close proximity to the project area. Table 1 lists the active and potentially active faults in the project vicinity as described in Caltran's 2012 *Fault Database*. Corresponding Moment Magnitudes and distances to the project area are also given. A fault map is included in the attachments to this report.

Table 1: Active and Potentially Active Faults

Fault	Moment Magnitude of Maximum Credible Earthquake ¹	Type of Fault ²	Distance to Fault from Project Area (kilometers) ³	
			Southerly Project Limit	Northerly Project Limit
San Simeon Fault Zone (Arroyo Laguna Section)	7.3	SS	4.7	3.7
Oceanic – West Huasna	6.9	R	3.4	0.5
Hosgri	7.3	SS	5.5	5.2
San Simeon Fault Zone (Arroyo del Oso Section)	6.2	SS	2.1	1.5
San Gregorio Fault Zone (Sur Region Section)	7.4	SS	7.2	4.8

Soil Survey Mapping

According to *Soil Survey of San Luis Obispo County, California, Coastal Part* (United States Department of Agriculture, Natural Resource Conservation Service) the following soil types are present in the project area. Included in the soil descriptions are recommended values for the erodibility factor, “K,” to be used in the Universal Soil Loss Equation (USLE):

- 106: Baywood fine sand, 15 to 30 percent slopes; somewhat excessively drained; form on toeslopes of dunes; parent material is Eolian sands; K=0.17.
- 111: Camarillo sandy loam; somewhat poorly drained; form on toeslopes of floodplains and alluvial fans; parent material is alluvium derived from sedimentary rock; K=0.28.
- 113: Capistrano sandy loam; well drained; form on toeslopes of dunes; parent material is Eolian sands; K=0.20.
- 120: Concepcion loam, 2 to 5 percent slopes; moderately well drained; form on toeslopes of terraces; parent material is alluvium derived from sedimentary rock; K=0.32.
- 121: Concepcion loam, 5 to 9 percent slopes; moderately well drained; form on toeslopes of terraces; parent material is alluvium derived from sedimentary rock; K=0.32.
- 128: Cropley clay, 2 to 9 percent slopes; moderately well drained; form on toeslopes of alluvial flats and alluvial fans; parent material is alluvium derived from sedimentary rock; K=0.15.

¹ According to *Caltrans 2012 Fault Database*

² SS=strike-slip fault; R=reverse fault; N=normal fault

³ Perpendicular distance to fault or fictitious extension of fault

- 143: Gazos-Lodo clay loam, 15 to 30 percent slopes; well drained; form on backslopes and summits of hills and mountains; parent material is residuum weathered from sandstone and shale; K=0.20.
- 201: San Simeon sandy loam, 15 to 30 percent slopes; moderately well drained; form on backslopes and summits of hills; parent material is residuum weathered from sandstone; K=0.28.

The distribution of the different soil types through the project area is as follows:

Table 2: Soil Type Distribution

Station Limits ("A1" Line)	Soil Classification							
	106	111	113	120	121	128	143	201
293+60 to 325+50			X					
325+50 to 329+00		X						
329+00 to 338+00					X			
338+00 to 341+00		X						
341+00 to 349+00				X				
349+00 to 352+50			X					
352+50 to 369+50				X				
369+50 to 373+00	X							
373+00 to 375+50				X				
375+50 to 378+00						X		
378+00 to 393+00				X				
393+00 to 396+00								X
396+00 to 406+50					X			
406+50 to 435+00								X
435+00 to 438+00							X	
438+00 to 451+00					X			

Exploration

Field investigations performed at the project site included visual evaluations of existing slopes, geotechnical borings, and monitoring of groundwater elevations.

Drilling and Sampling

Sixteen mud rotary borings (RC-11-001 through RC-11-0014, RC-11-016, and RC-11-019) and two hollow-stem auger borings (A-11-017 and A-11-018) were conducted in the project area between September and November 2011 to provide information for this report and the Foundation Reports for three proposed bridges. The maximum depth of investigation was approximately 121 feet.

Table 3: 2011 Subsurface Investigation Summary

Boring No.	Completion Date	Drill Rig Type	Hammer Type	Hammer Efficiency (%)	Location		Ground Surface Elevation (ft)	Boring Depth (ft)
					Station ("A1" Line)	Offset		
RC-11-001	9/16/2011	CS-2000	Automatic	93	338+86	CL	15.7	120
RC-11-002	9/16/2011	CS-2000	Automatic	93	337+70	25' Rt	34.5	50
RC-11-003	9/17/2011	CS-2000	Automatic	93	337+72	23' Lt	30.3	45.5
RC-11-004	9/17/2011	CS-2000	Automatic	93	336+30	1' Lt	23.8	39.5
RC-11-005	9/20/2011	CS-2000	Automatic	93	327+97	1' Lt	18.8	120
RC-11-006	9/21/2011	CS-2000	Automatic	93	329+16	21' Rt	32.6	35.5
RC-11-007	9/21/2011	CS-2000	Automatic	93	326+77	21' Rt	33.1	40.5
RC-11-008	10/4/2011	CS-2000	Automatic	93	329+15	20' Lt	30.5	39.3
RC-11-009	10/5/2011	CS-2000	Automatic	93	326+73	21' Lt	31.6	43.3
RC-11-010	10/7/2011	CS-2000	Automatic	93	340+42	1' Lt	14.9	120.7
RC-11-011	10/9/2011	CS-2000	Automatic	93	341+52	CL	33.7	58.5
RC-11-012	10/11/2011	CS-2000	Automatic	93	375+35	1' Rt	30.0	101
RC-11-013	10/12/2011	CS-2000	Automatic	93	377+39	CL	35.6	97.5
RC-11-014	10/18/2011	CS-2000	Automatic	93	357+66	14' Rt.	32.9	26
RC-11-016	10/19/2011	CS-2000	Automatic	93	420+79	75' Lt.	37.4	15
A-11-017	10/19/2011	CS-2000	Automatic	93	408+01	68' Rt.	86.2	16
A-11-018	10/19/2011	CS-2000	Automatic	93	371+00	19' Rt.	70.2	21.5
RC-11-019	11/2/2011	CS-2000	Automatic	93	376+22	8' Rt.	28.9	120.3

The mud rotary borings were advanced using a self-cased wireline drilling apparatus that provided continuous soil samples. Soils were visually classified in accordance with the Caltrans Soil and Rock Logging, Classification, and Presentation Manual (June 2010). Soil samples were also collected and submitted to the Headquarters Geotechnical Laboratory for mechanical analyses, triaxial testing, one-dimensional consolidation testing, corrosion potential testing, Expansion Index

testing, and determination of Atterburg limits. Standard penetration tests (SPT), ASTM test method 1586, were performed at selected depth intervals to estimate in-place density of the native soil. Empirical correlations of soil strength parameters with SPT blow counts were used to estimate strength parameters of in-situ cohesionless soils. Pocket penetrometer measurements of unconfined compressive strength and triaxial test results were used to estimate the undrained shear strength of clay samples.

Site Geology and Subsurface Conditions

Lithology

The primary geologic units within the new highway limits are Pleistocene marine terrace deposits, Q_{mt} and Q_{tm} , and modern stream channel deposits, Q_{hc} . The marine terrace deposits are composed of loosely consolidated white to orange-brown sand and conglomerate, and range from 3 feet to 20 feet in thickness according to Hall (1976). The upper 2 to 4 feet consists of fine grained silty sand, which coarsens downward to the conglomerate. The clasts are described by Hall as being subrounded to angular and as large as 4 feet in diameter. The clasts consist of fragments of Jurassic ophiolite, Franciscan rocks, Cambria Felsite, dacite, and Monterey chert.

Subsurface Conditions

The soils encountered during subsurface investigation are consistent with the formations indicated on the geologic map. The borings at the abutments of the bridges generally encountered 3 feet to 20 feet of marine terrace deposits overlying Franciscan Graywacke and Franciscan Melange. The terrace deposits consisted of medium dense silty sand, sandy silt, and clayey sand; and very stiff to hard clay. Borehole logs describe the bedrock as consisting of zones of metamorphosed siltstone (metasiltstone), metamorphosed graywacke (metagraywacke), and metagraywacke breccia in a metasiltstone matrix. The metasiltstone is described as fresh and slightly weathered, with variable hardness from very soft to moderately hard. It is also described as very intensely fractured with some considered to be sheared. The metagraywacke is described as fresh and slightly weathered; hard and moderately hard; and intensely and very intensely fractured.

The borings at the bridge intermediate supports, in the drainages, encountered up to 40 feet of alluvium overlying bedrock. The alluvium consisted of soft clay and very loose to medium dense silty sand and clayey sand. The bedrock descriptions are consistent with those at the abutment borings.

Two auger borings, A-11-017 and A-11-018, were conducted in cut sections to sample the material that will be used for embankment construction. Boring A-11-017, located 68 feet right of "A1" Station 408+01, encountered 3 feet of loose clayey sand overlying decomposed metasiltstone. The metasiltstone was described as weathered to a lean clay soil. Boring A-11-018, located 19 feet right of "A1" Station 371+00, encountered 18 feet of very loose to very dense silty sand overlying

metasandstone. Some of the sand was weakly to moderately cemented. The metasandstone was very intensely weathered to decomposed and varied between moderately soft and moderately hard.

Groundwater

Several of the boreholes drilled during the subsurface investigation were instrumented as open-standpipe observation wells to monitor groundwater elevations. Long-term monitoring wells were constructed by installing 1½” slotted PVC pipe in the open boreholes and backfilling the annulus with #8 sand to within 5 feet of original ground. The wells were protected against surface water intrusion by sealing the remaining annular space with bentonite chips or grout. Well caps were then installed. Some borings were left open for a few days after completion of drilling to measure groundwater elevations after levels had stabilized. The latter borings were abandoned by backfilling the holes with bentonite chips.

Table 4: Groundwater Observations

<i>Boring ID</i>	<i>Date⁴</i>	<i>Surface Elevation (feet)</i>	<i>Depth to Groundwater (feet)</i>	<i>Groundwater Elevation (feet)</i>
RC-11-001	11/10/2011	15.7	4.3	11.4
	11/15/2011		4.1	11.6
	11/16/2011		4.2	11.5
	2/28/2012		3.8	11.9
RC-11-003	11/10/2011	30.3	13.5	16.8
	11/15/2011		13.7	16.6
	11/16/2011		16.6	13.7
	3/1/2012		15.5	14.8
RC-11-005	11/10/2011	18.8	0.0	18.8
	11/15/2011		0.0	18.8
	11/16/2011		0.5	18.3
	3/1/2012		0.3	18.5
RC-11-008	11/10/2011	30.5	9.7	20.8
	11/15/2011		9.8	20.7
	11/16/2011		22.9	7.6
	3/1/2012		11.5	19.0
RC-11-009	11/10/2011	31.6	9.1	22.5
	11/15/2011		9.1	22.5
	11/16/2011		11.0	20.6
	3/1/2012		8.5	23.1

⁴ Observation wells were bailed after water levels were measured on 11/15/2011. Water levels were measured again on 11/16/2011.

<i>Boring ID</i>	<i>Date</i>	<i>Surface Elevation (feet)</i>	<i>Depth to Groundwater (feet)</i>	<i>Groundwater Elevation (feet)</i>
RC-11-010	11/10/2011	14.9	4.6	10.3
	11/15/2011		4.2	10.7
	11/16/2011		4.4	10.5
	2/28/2012		3.9	11.0
RC-11-011	11/10/2011	33.7	8.9	24.8
	11/15/2012		9.0	24.7
	11/16/2012		30.9	2.8
	2/28/2012		10.9	22.8
RC-11-012	11/10/2011	30.0	4.0	26.0
	11/15/2011		4.0	26.0
	11/16/2011		4.9	25.1
	2/28/2012		5.1	24.9
RC-11-014	11/10/2011	32.9	5.9	27.0
	2/28/2012		6.3	26.6
RC-11-015	11/10/2011	30.0	5.5	24.5
	11/15/2011		5.6	24.4
	11/16/2011		5.6	24.4
	2/28/2012		6.1	23.9
A-11-016	10/27/2011	37.4	Dry	N/A
A-11-018	10/27/2011	70.2	Dry	N/A
RC-11-019	11/10/2011	28.9	4.9	24.0
	11/15/2011		6.8	22.1
	11/16/2011		22.3	6.6
	2/28/2012		5.5	23.4

Project Site Seismicity

Ground Motion

Peak ground acceleration (PGA) in the project area due to an earthquake on one of the nearby faults was estimated using *Caltrans ARS Online (v2.3.06)*, a web-based tool that calculates both deterministic and probabilistic acceleration response spectra for any location in California based on criteria provided in Appendix B of *Caltrans Seismic Design Criteria*. The procedure used by ARS Online was developed to calculate the minimum seismic design requirements for bridges on State highways. The method calculates design response spectra over a range of periods. The design response spectrum is based on the envelope of a deterministic and a probabilistic spectrum. The deterministic spectrum is calculated as the arithmetic average of median response spectra computed using the Chiou & Youngs and Campbell & Bozorgnia ground motion prediction equations (CY-CB GMPE). These equations are applied to all faults in or near California considered to be active in the

last 700,000 years (late Quaternary age) and capable of producing a moment magnitude earthquake of 6.0 or greater.

The probabilistic spectrum is obtained from the *2008 USGS Seismic Hazard Map* for the 5% in 50 years probability of exceedance (or 975 year return period). The spectral values are adjusted with a soil amplification factor based on an average of the Boore-Atkinson (2008), Campbell Bozorgnia (2008), and Chiou-Youngs (2008) ground motion prediction models. For sites underlain by soils having an average shear wave velocity for the upper 30 meters of soil (V_{S30}) of less than 300 meters per second, the *2009 USGS Probabilistic Seismic Hazard Analysis Interactive Deaggregation Tool* is used to develop the probabilistic spectrum.

The controlling fault in the project area is the San Simeon Fault Zone (Arroyo Laguna Section), a slip strike fault with a maximum magnitude of 7.3. The peak ground acceleration at the southerly end of the project is estimated to be 0.45 g (gravity). The peak ground acceleration is estimated to be 0.47 g at the northerly project limit. The deterministic spectrum with a soil amplification factor for a V_{S30} of 450 meters per second governed the design response spectrum for both ends of the project site. The V_{S30} was estimated from a P-S log of boring RC-11-001.

Ground Rupture

Ground rupture hazard at the project location is considered moderately low. The *Geologic Map of the San Simeon-Piedras Blancas Region, San Luis Obispo County, California* (Hall, 1976) shows the Arroyo del Oso Fault crossing the project site. However, the Arroyo del Oso Fault is not considered active or potentially active according to the *2012 Caltrans Fault Database*. No other known active or potentially active faults project towards or cross the highway alignment within the project limits. Therefore, there is little potential for surface fault rupture to occur and no mitigation efforts are necessary.

Liquefaction

Soil liquefaction occurs when loose, water-saturated soils lose shear strength in response to the sudden shaking from an earthquake and begin behaving like a liquid, reducing their ability to support embankments and structures. Loose sands and gravels with 35 percent fines or less that have the potential of being saturated are susceptible to liquefaction. Generally, the younger and looser the sediment, and the shallower the water table, the more susceptible the soil is to liquefaction. Sediments most susceptible to liquefaction include historical and late Holocene-age river channel and flood plain deposits, and poorly compacted fills. Bedrock and dense soils, including well-compacted fills, have a low susceptibility to liquefaction. Liquefaction is most prevalent in areas where groundwater lies within 30 feet of the ground surface; liquefaction rarely occurs in areas with groundwater deeper than 50 feet.

Liquefaction potential in the project area is moderate, as groundwater is high and some of the on-site marine terrace deposits consist of loose cohesionless soils. These deposits are not laterally continuous, however, and large areas are not expected to liquefy.

Corrosion

Representative soil samples taken during the subsurface investigation were tested for corrosion potential. The Department considers a site corrosive to foundation elements if one or more of the following conditions exist for the representative soil and/or water samples taken at the site:

- Chloride concentration is greater than or equal to 500 ppm
- Sulfate concentration is greater than or equal to 2000 ppm
- The pH is 5.5 or less

Since resistivity serves as an indicator parameter for the possible presence of soluble salts, tests for sulfate and chloride are usually not performed unless the resistivity of the soil is 1,000 ohm-cm or less.

Table 5: Corrosion Test Summary

Boring	Depth	SIC Number	Minimum Resistivity (Ohm-Cm)	pH	Chloride Content (ppm)	Sulfate Content (ppm)
RC-11-001	16.5'-18'	C1000	837	7.17	121	51
RC-11-001	22'-25'	C1001	1055	7.39	90	302
RC-11-002	19'-20'	C1002	1884	7.84	N/A	N/A
RC-11-002	29'-30'	C1003	897	8.32	41	523
RC-11-003	31'-32'	C1004	959	8.40	44	418
RC-11-005	19.5'-20.5'	C1005	588	6.65	92	823
RC-11-005	47'-48'	C1006	748	8.99	106	329
RC-11-006	11'-12'	C1007	1800	8.43	N/A	N/A
RC-11-008	13'-14'	C1008	1505	8.57	N/A	N/A
RC-11-012	19.5'-20.5'	C1009	1985	8.32	N/A	N/A
RC-11-012	32'-33'	C1010	1718	8.91	N/A	N/A
Corrosive if:				≤ 5.5	≥ 500	≥ 2000

Based on corrosion test results, the site is considered non-corrosive to foundation elements. However, because much of the project area is within 1000 feet of the Pacific Ocean, the site is considered corrosive to above-ground structural elements.

Geotechnical Analysis and Design

Embankment Settlement

Settlement analyses were performed at the proposed locations of the highest embankments along the highway alignment using soil strength parameters obtained from field and laboratory testing. Elastic settlement in cohesionless soils was calculated using Hough’s Method, which correlates soil grain size distribution and SPT values with a bearing capacity factor that is used in a settlement equation. Settlement in cohesive soils was calculated using recompression indices obtained from consolidation tests on undisturbed soil samples collected during the subsurface investigation. Based on analysis of the consolidation curves, the clay soils encountered in the subsurface investigation were determined to be preconsolidated, meaning that at some time in the past the clay has been subjected to a greater stress than in the present.

The following table summarizes the calculated settlements at the locations of borings in fill sections.

Table 6: Embankment Settlement

Station	Boring ID	Embankment Height (feet)	Elastic Settlement		Total Settlement (inches)
			Cohesionless Soils (inches)	Cohesive Soils (inches)	
326+77	RC-11-007	11.5	1.1	0.0	1.1
329+16	RC-11-006	10	0.6	0.0	0.6
336+30	RC-11-004	24	0.0	1.9	1.9
337+72	RC-11-003	17	0.0	0.7	0.7
341+52	RC-11-011	10.5	0.8	0.0	0.8
357+66	RC-11-014	10	1.2	0.3	1.5
375+35	RC-11-012	19	0.7	2.8	3.5
377+39	RC-11-013	8	0.6	1.2	1.8
420+79	RC-11-016	16	1.0	0.0	1.0

The calculated settlement is elastic settlement that should mostly occur during construction. A 30-day fill delay period is recommended for the approach embankments at Arroyo Del Corral, however, to allow for any consolidation settlement, and to prevent differential settlement of the embankments during construction of the bridge abutments. The fill delay period will also minimize down-drag on the pile foundations by insuring that most of the consolidation of the foundation soils will occur before installation of the piles. It is recommended that the magnitude and rate of settlement of the fill be monitored by periodically reading the elevation of surface monuments during the fill delay period.

Embankment Stability

The embankments proposed for this project will generally be constructed with side slopes inclined at 4:1 or flatter, except at some of the bridge approaches where slopes inclinations as steep as 2:1 are proposed. The global stability of these slope geometries was evaluated by modeling the slopes in SLOPE/W, a slope stability computer program. Factors of safety were calculated using the Morgenstern-Price method, a limit equilibrium type of analysis for assessing slope stability that satisfies both force equilibrium and moment equilibrium equations of statics. A design factor of safety of 1.5, the minimum factor of safety for a Caltrans critical facility, was specified for a static analysis of long term global stability. A factor of safety of 1.1 was specified for a dynamic analysis of slope stability with an applied horizontal seismic load of 0.16g. Caltrans Guidelines for Foundation Investigations and Reports dated June 2002 recommends using one-third of the horizontal (PGA) with an upper limit of 0.2g for the seismic assessment of slopes and retaining systems with a minimum factor of safety of 1.1.

For the purpose of evaluating slope stability, it was assumed that embankments would be constructed using on-site soils. Embankment soil strength parameters were based on triaxial test results on material extracted from borings A-11-017 and A-11-018. Long-term stability was modeled using effective stress strength parameters, and short term stability (during construction) was modeled using total stress strength parameters. Strength parameters of the foundation soils were estimated from SPT blow count correlations in cohesionless soils, and pocket penetrometer measurements of unconfined compressive strength in cohesive soils. A phreatic water surface was modeled in the slope stability analysis based on groundwater measurements taken during the subsurface investigation. Traffic loading was modeled in the analysis by applying a 240-psf surcharge over the paved portion of the embankment, as specified in Caltrans Standard Plans.

Based on slope stability analyses the proposed embankments are expected to be globally stable, both during construction and over the long term.

Cuts and Excavations

Cut slopes along the new highway alignment will typically be inclined at 3:1 or flatter. This configuration is expected to be globally stable; slopes this steep occur naturally within the project area and appear to be performing satisfactorily with the exception of some damage due to erosion. Cuts are expected to encounter mixed soil types, which may include layers of granular non-cohesive soil that may subject to erosion. The cuts will be particularly susceptible to erosion if water is allowed to sheet flow over the cut face from the slopes above. This is evident from the condition of some of the existing cut slopes. Top-of-cut ditches or landform grading should be specified for long cut slopes where offsite drainage will sheet flow down the slope face. Slough and debris can be expected to collect at bottom of cut slopes during rainstorms, particularly during the first winter following construction. The Landscape Architecture Branch should be consulted for recommendations regarding erosion control measures to be employed on exposed cut faces in the project area.

The material in the proposed cuts can be expected to be readily rippable. Based on correlations between seismic velocity and earthwork factors detailed in Report No. FHWA-CA-TL-78-23, *Calculating Earthwork Factors Using Seismic Velocities* (Stevens, 1978), an earthwork factor of 0.91 should be used for earthwork quantity calculations. This figure is based on an average seismic velocity of 1500 feet per second in soil estimated from a seismic refraction study conducted for a project immediately south of the current realignment project.

Expansive Soils

Soils from boring A-11-017 were tested for expansion potential. The measured Expansion Index was 102. Soils having an Expansion Index between 91 and 130 are considered to have a high potential for expansion. Expansive soils swell when wetted and shrink when dried. Desiccation cracks often develop when the soils shrink. The shrink-swell properties of expansive soils will often cause a phenomenon called "slope creep" on sloping ground; there is always a horizontal component of expansive soil movement on sloping ground, so the periodic swelling and shrinkage of expansive soils on a slope, together with the forces of gravity, will result in an ongoing conveyance or creep of soil down the face of the slope.

Surficial failures often occur on slopes composed of expansive soils. Multiple cycles of swelling and shrinking loosen the surficial soils. During periods of heavy precipitation these loose soils become saturated with water while the lower, better consolidated, clay strata prevent infiltration of water. Excess pore water pressures develop and the saturated surficial soil mass slides down slope.

Potential problems with roadways constructed over expansive soils include heave and reflective cracking. Roadway structural sections over expansive subgrade soils are typically thickened to increase confining pressure and resist uplift forces. Uplift forces under shoulder structural sections, however, are sometimes overlooked. It is recommended that the total thickness of the travelled way structural section be maintained under the shoulders of the realigned highway to resist uplift from expansive soils. Less expensive aggregate subbases can be substituted for some of the aggregate base thickness to reduce the cost of this mitigation measure.

Permeable Blanket Construction

Project Development has designated three areas of embankment to be constructed on a permeable material layer to allow for transmission of ground water from one side of the embankment to the other. It is recommended that the original ground in those sections, from catch point to catch point, be sub excavated 18 inches and replaced with Class 1, Type B Permeable Material encapsulated in Class B3 subgrade enhancement geotextile. Subgrade enhancement geotextile along the sides of the excavation shall be cut 3 feet longer than the depth of the excavation and the excess shall be lapped over the top of the permeable material prior to placing the top layer of geotextile. See Permeable Blanket Details, Attachment 5 for construction details.

Construction Considerations

Foundation soils are generally adequate to support the proposed highway embankments throughout the project limits. Localized areas of unconsolidated or saturated foundation materials, however, may require stripping and recompaction, or removal of material deemed unsuitable. If standing water or unsuitable material is encountered to a depth where it cannot be economically removed, it is recommended that the unsuitable material be sub excavated 18 inches and replaced with a permeable blanket as specified above. The permeable material will allow water to fill its pore spaces without a loss of strength. The subgrade enhancement geotextile will act as a separator, preventing the soils around the fabric from filling the voids in the permeable material, and preventing the permeable material from penetrating the soft soils beneath the geotextile. The subgrade enhancement geotextile will also serve to reinforce the subgrade soil. The permeable blanket will provide a dry and stable working platform for embankment or drainage structure construction.

Temporary construction slopes are the responsibility of the contractor. Examples of temporary construction slopes include embankments to support haul roads, side slopes of trenches, and temporary back slopes to provide room for construction of retaining walls. The following recommendations are provided merely for estimating the potential footprint of temporary slopes. According to Cal-OSHA guidelines, the native soils in the project area would primarily be classified as Type B soils. Temporary slopes up to 20 feet in height in Type B soils may be constructed at a maximum slope inclination of 1:1. If steeper slopes are necessary to avoid infringing on designated Environmentally Sensitive Areas (ESA), soil reinforcement will be necessary or retaining walls may be constructed. Design of reinforced embankments and retaining walls shall be performed by a registered engineer. Plans shall be submitted to the Resident Engineer for his approval.

Recommendations

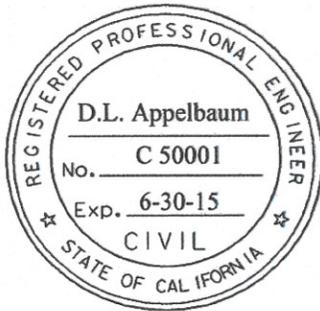
The following list summarizes the recommendations provided in this report. Refer to the preceding sections for details.

- Roadway embankments must be constructed with slope inclinations of 2:1 or flatter.
- A 30-day fill delay period with periodic monitoring of settlement is recommended for the approach embankments at Arroyo Del Corral.
- Cut slopes are to be constructed with slope inclinations of 3:1 or flatter. Top of cut ditches or landform grading should be specified to help prevent erosion on long cut slopes where offsite drainage will sheet flow over the cut face.
- Re-vegetate all exposed slopes and implement erosion control measures to increase resistance to shallow slope instabilities.

- Design roadway structural sections, including shoulder sections, thick enough to resist uplift forces from expansive subgrade soils.

Closure

The recommendations contained in this report are based on specific project information that has been provided by Office of Design II, Branch C. If any conceptual changes are made during final project design, the Office of Geotechnical Design – North, Branch D should review those changes to determine if the recommendations contained in this report are still applicable. Any questions regarding the recommendations contained herein should be directed to the attention of Dan Appelbaum, (805) 549-3745, or Mike Finegan, (805) 549-3194, at the Office of Geotechnical Design – North, Branch D.



Supervised by,

Handwritten signature of Daniel L. Appelbaum in blue ink.

DANIEL L. APPELBAUM, PE
Transportation Engineer
Geotechnical Design – North
Branch D

Handwritten signature of Michael S. Finegan in blue ink.

MICHAEL S. FINEGAN, PE, Chief
Geotechnical Design - North
Branch D

- c: Roy Bibbens / GDN File (E-copy)
Paul Martinez – Project Manager (E-copy)
GeoDOG - Digital Archive of Geotechnical Data (E-copy)
R.E. Pending File
Eric Karlson – District Materials Engineer (E-copy)
Job File / Branch D Records

Mr. John Fouche
November 24, 2014
Page 18

Revised Geotechnical Design Report
Piedras Blancas Realignment
05-SLO-1-64.0/66.9
EA 05-492801, Project ID 0500000576

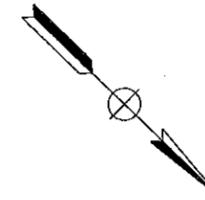
LIST OF ATTACHMENTS

ATTACHMENT 1	VICINITY MAP
ATTACHMENT 2	PROJECT LAYOUT
ATTACHMENT 3	GEOLOGIC MAP
ATTACHMENT 4	EARTHQUAKE FAULTS
ATTACHMENT 5	PERMEABLE BLANKET DETAILS
ATTACHMENT 6	BORING RECORDS
ATTACHMENT 7	MATERIAL PROPERTIES

STATE OF CALIFORNIA
 DEPARTMENT OF TRANSPORTATION
**PROJECT PLANS FOR CONSTRUCTION ON
 STATE HIGHWAY**

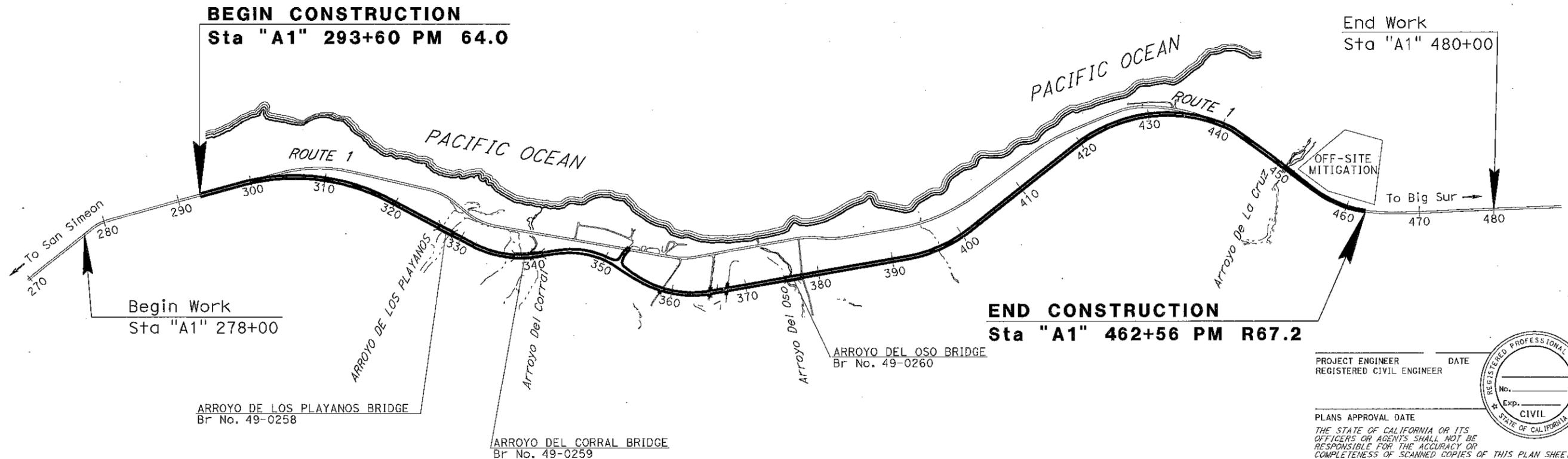
IN SAN LUIS OBISPO COUNTY
 NEAR SAN SIMEON ON ROUTE 1 FROM
 POINT PIEDRAS BLANCAS, PM 64.0 TO
 ARROYO DE LA CRUZ BRIDGE, PM R67.2

TO BE SUPPLEMENTED BY STANDARD PLANS DATED MAY 2010



Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
05	SLO	1	64.0/R67.2		

LOCATION MAP



VICINITY MAP
NO SCALE

ATTACHMENT 1

PROJECT MANAGER
 PAUL MARTINEZ

 DESIGN ENGINEER
 JOHN FOUCHE

PROJECT ENGINEER _____ DATE _____
 REGISTERED CIVIL ENGINEER



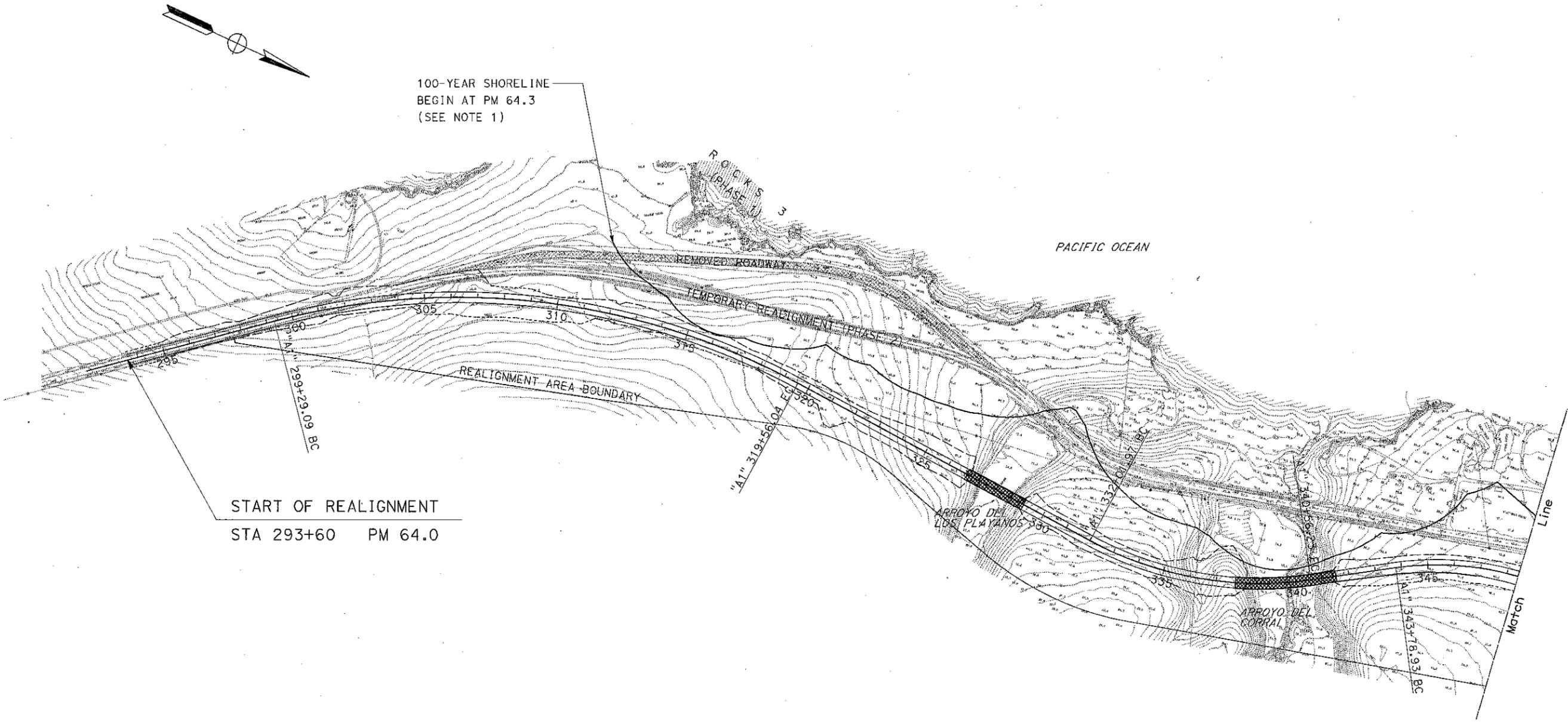
PLANS APPROVAL DATE _____
 THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENCIES SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

CONTRACT No.	05-492801
PROJECT ID	0500000576

THE CONTRACTOR SHALL POSSESS THE CLASS (OR CLASSES) OF LICENSE AS SPECIFIED IN THE "NOTICE TO BIDDERS."

LAST REVISION 1 DATE 05/11/10 BY 100000

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans GEOTECHNICAL DESIGN
 SUPERVISING ENGINEER: MIKE FINEGAN
 CALCULATED/DESIGNED BY: []
 CHECKED BY: []
 REVISED BY: []
 DATE REVISED: []



LEGEND
 BRIDGE

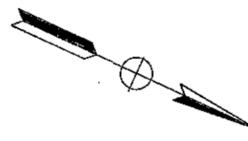
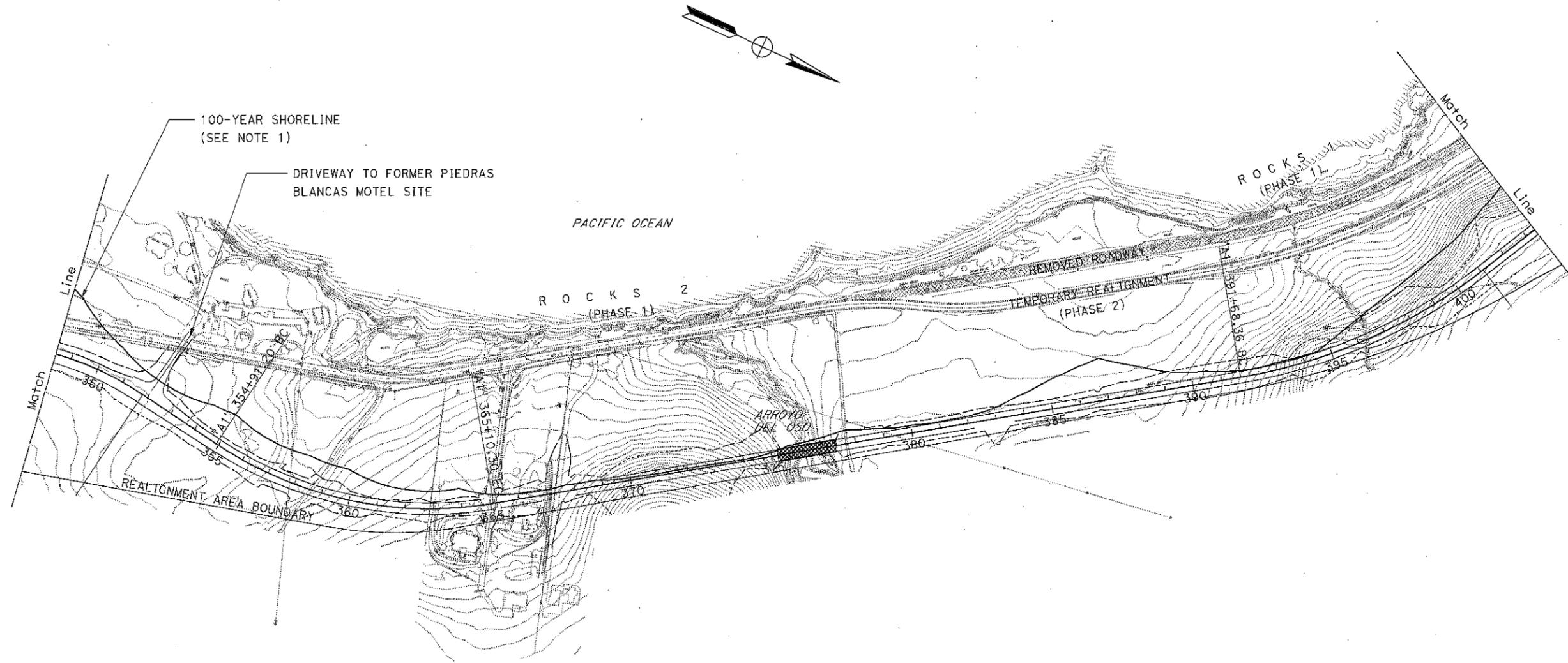
NOTES:
 1. This line is the recommended minimum position of the realigned highway with a 100-year design life per the 2006 Supplemental Preliminary Geotechnical Report. It is a conservative estimate based on the shoreline's position from 1957-2005. No recommendations are made before post mile 64.3.

ATTACHMENT 2
 PAGE 1 OF 3
 SCALE: 1"=200'

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION					
PIEDRAS BLANCAS REALIGNMENT PROJECT LAYOUT					
Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	1	64.0-R67.2	1	3

LAST REVISION DATE: [] BY: []

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION Gilbane GEOTECHNICAL DESIGN	SUPERVISING ENGINEER MIKE FINEGAN	CALCULATED-DESIGNED BY CHECKED BY	REVISOR BY DATE REVISED



LEGEND
 BRIDGE

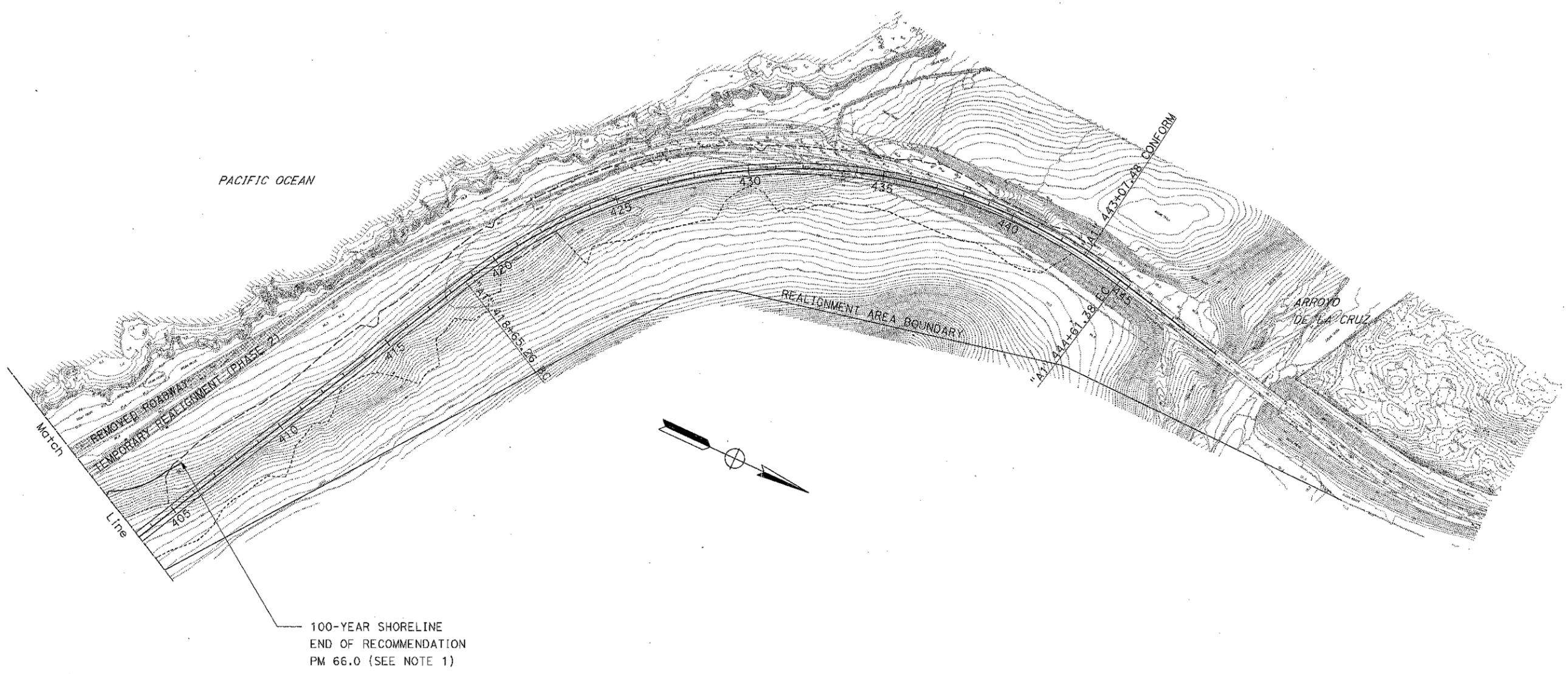
NOTES:
 1. This line is the recommended minimum position of the realigned highway with a 100-year design life per the 2006 Supplemental Preliminary Geotechnical Report. It is a conservative estimate based on the shoreline's position from 1957-2005.

ATTACHMENT 2
 PAGE 2 OF 3
 SCALE: 1"=200'

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION					
PIEDRAS BLANCAS REALIGNMENT PROJECT LAYOUT					
Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	1	64.0-R67.2	2	3

LAST REVISION DATE: 01/11/05 BY: JAC

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION	SUPERVISING ENGINEER	CHECKED BY	CALCULATED-DESIGNED BY	REVISOR	DATE
				MIKE FINEGAN	
Caltrans GEOTECHNICAL DESIGN					



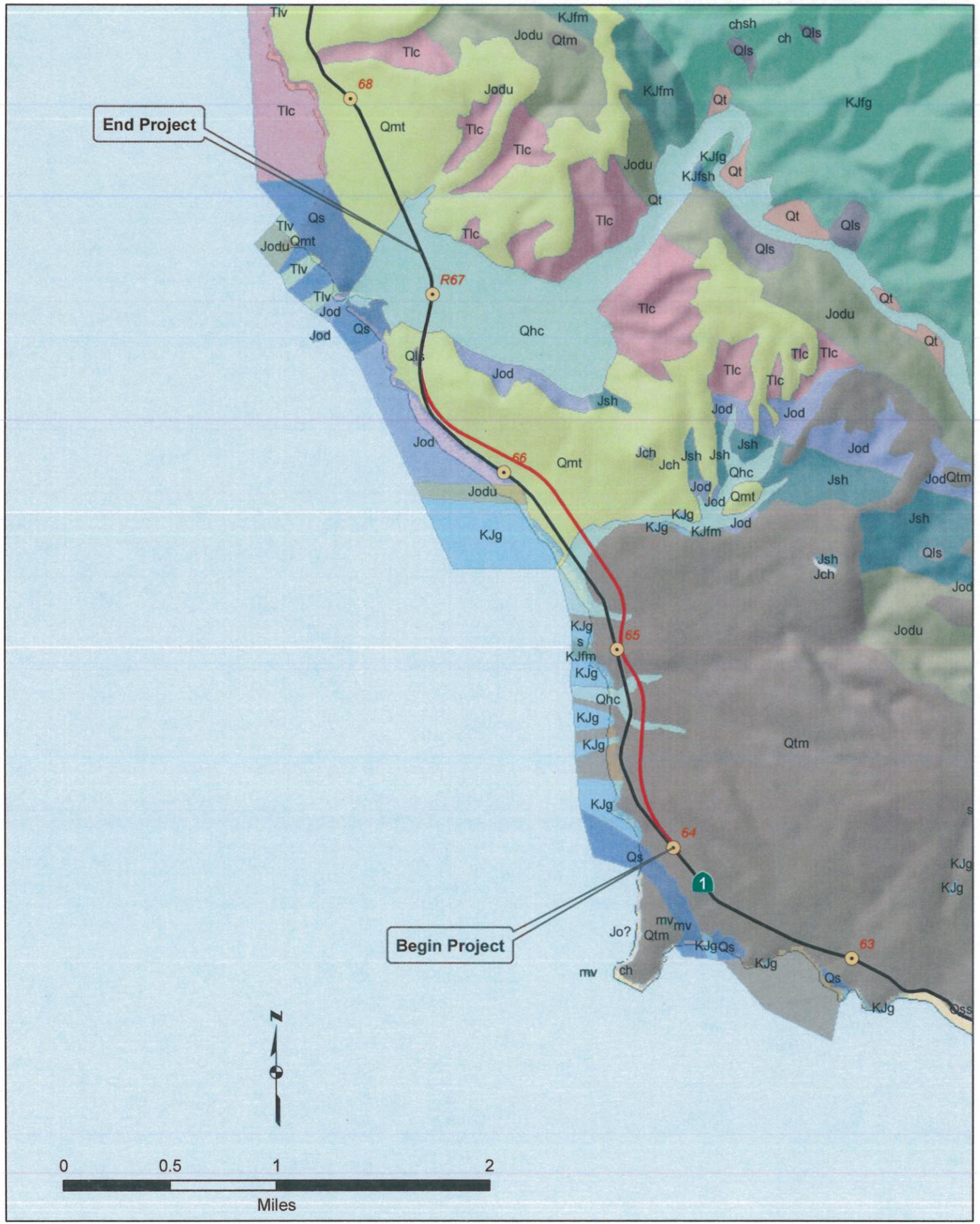
ATTACHMENT 2
PAGE 3 OF 3
SCALE: 1"=200'

NOTES:
1. This line is the recommended minimum position of the realigned highway with a 100-year design life per the 2006 Supplemental Preliminary Geotechnical Report. It is a conservative estimate based on the shoreline's position from 1957-2005. No recommendations are made after post mile 66.0.

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION					
PIEDRAS BLANCAS REALIGNMENT PROJECT LAYOUT					
Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	1	64.0-R67.2	3	3

Geologic Map

Piedras Blancas Realignment
 05-SLO-001-64.0/R67.2
 05-492801

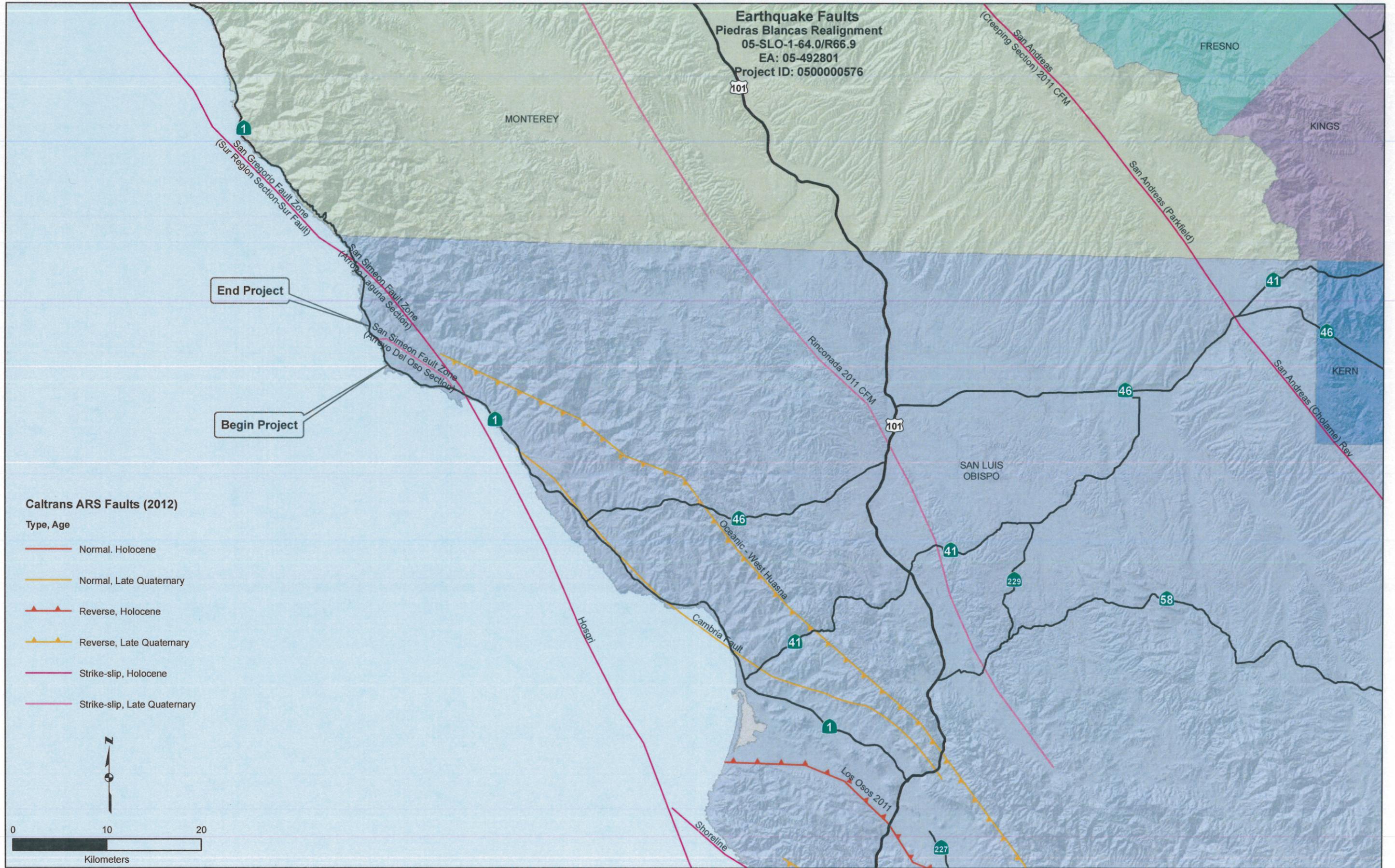


- Exist Alignment
- Proposed Alignment
- Whole Postmiles

Geologic Units

UNIT

- Qs: Latest Holocene Beach Sand
- Qhc: Modern Stream Channel Deposits
- Qls: Landslide Deposits
- Qt: Early to Late Pleistocene Stream Terrace Deposits
- Qmt: Pleistocene Marine Terrace Deposits
- Qtm: Pleistocene Marine Terrace Deposits
- Qss: San Simeon Terrace
- Tlc: Lospe Formation, Conglomerate
- Tlv: Lospe Formation, Volcanic Rocks
- KJfg: Franciscan Graywacke
- KJfm: Franciscan Melange
- KJfsh: Franciscan, Shale
- KJg: Unnamed Marine Graywacke
- Jod: Ophiolite, Dike and Sill Complex
- Jodu: Diorite and Ultramafic Rocks
- Jsh: Unnamed Shale
- ch: Chert
- mv: Metavolcanic Rocks
- s: Serpentinite
- sh: Shale

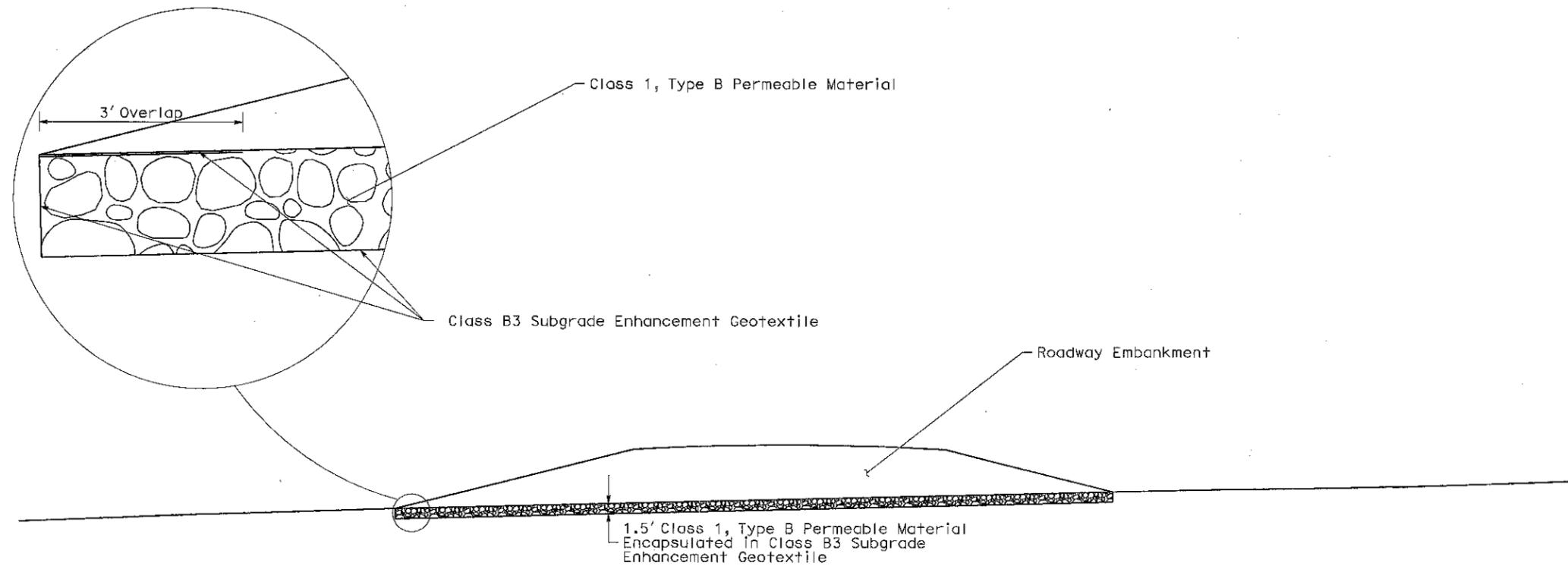


STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans GEOTECHNICAL DESIGN

SUPERVISING ENGINEER
 MIKE FINEGAN

CALCULATED-DESIGNED BY
 CHECKED BY

REVISED BY
 DATE REVISED



PERMEABLE BLANKET DETAILS

ATTACHMENT 5

PAGE 1 OF 1
 NO SCALE

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION					
PIEDRAS BLANCAS REALIGNMENT CONSTRUCTION DETAILS					
Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SLO	1	64.0-R67.2	1	1

LAST REVISION DATE: 05/13/2010

LOGGED BY Z. Dellamas	BEGIN DATE 9-17-11	COMPLETION DATE 9-17-11	BOREHOLE LOCATION (Lat/Long or North/East and Datum) 2451207.4 ft / 5586158.0 ft NAD83	HOLE ID RC-11-004
DRILLING CONTRACTOR Caltrans	BOREHOLE LOCATION (Offset, Station, Line) 1' Lt Sta 336+30 A1		SURFACE ELEVATION 24 ft NAVD88	
DRILLING METHOD Rotary Wire-Line	DRILL RIG CS 2000 (truck)		BOREHOLE DIAMETER 4.5 in	
SAMPLER TYPE(S) AND SIZE(S) (ID) SPT, Punch Core	SPT HAMMER TYPE Deidrich Automatic 140 #30" drop		HAMMER EFFICIENCY, Eri 93%	
BOREHOLE BACKFILL AND COMPLETION	GROUNDWATER DURING DRILLING AFTER DRILLING (DATE) READINGS		TOTAL DEPTH OF BORING 39.0 ft	

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks		
0	0		Fat CLAY with SAND (CH); hard; very dark brown; dry; medium and fine SAND ; trace organincs; PP=4.5 tsf.	X	1	2	7	100									
	1						3										
	2						4										
21.81	2						2			83							
	3		Very stiff; moist; PP=3.5 tsf. Yellowish brown specks; PP=3.0 tsf.	X	3	4	16	100									
19.81	4							7									
	5							9									
17.81	6							4			29						
	7		METAMORPHIC ROCK (META SANDSTONE); massive; dark brown; decomposed; soft; very intensely fractured; (Lean CLAY; moist; few fine SAND).	X	5	7	22	100									
15.81	8							8									
	9							14									
13.81	10							6			100						
	11		METAMORPHIC ROCK (META SILTSTONE AND GRAYWACKE); massive; dark gray; intensely weathered and decomposed; varies from moderately soft to very soft; very intensely fractured; (Lean CLAY; moist; few fine SAND). Graywacke fragments, 2" maximum.	X	7	22	53	100									
11.81	12							21									
	13							32									
9.81	14							8			100	0					
	15		METAMORPHIC ROCK (META SILTSTONE AND GRAYWACKE); massive; dark gray; intensely weathered and decomposed; varies from moderately soft to very soft; very intensely fractured; (Lean CLAY; moist; few fine SAND). Graywacke fragments, 2" maximum.	X	9				100	0							
7.81	16																
	17																
5.81	18							10			67	0					
	19																
3.81	20																
	21																
1.81	22																
	23																
-0.19	24																
	25																

(continued)

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Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE BORING RECORD				HOLE ID RC-11-004	
DIST. 05	COUNTY SLO	ROUTE 1	POSTMILE 64.0/R67.2	PROJECT ID 0500000576	
PROJECT OR BRIDGE NAME Piedras Blancas Realignment					
BRIDGE NUMBER		PREPARED BY D. Appelbaum		DATE 3-5-12	SHEET 1 of 2

5 BR - STANDARD PIEDRASBLANCAS.GPJ DRAFT CALTRANS LIBRARY OCT 2011.GLB 3/2/12

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks		
-2.19	25		METAMORPHIC ROCK (Meta Siltstone and Graywacke) (continued).		10			67	0								
-4.19	26																
-6.19	27																
-8.19	28																
-10.19	29						11			100	0						
-12.19	30																
-14.19	31																
-16.19	32																
-18.19	33																
-20.19	34						12			100	0						
-22.19	35																
-24.19	36																
-26.19	37																
-28.19	38																
-30.19	39																
	40		Bottom of borehole at 39.0 ft bgs														
	41		Groundwater Not Measured														
	42		This Boring Record was developed in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2010) except as noted on the Soil or Rock Legend or below.														
	43																
	44																
	45																
	46																
	47																
	48																
	49																
	50																
	51																
	52																
	53																
	54																
	55																



Department of Transportation
 Division of Engineering Services
 Geotechnical Services
 Office of Geotechnical Design - North

REPORT TITLE BORING RECORD				HOLE ID RC-11-004	
DIST. 05	COUNTY SLO	ROUTE 1	POSTMILE 64.0/R67.2	PROJECT ID 0500000576	
PROJECT OR BRIDGE NAME Piedras Blancas Realignment					
BRIDGE NUMBER			PREPARED BY D. Appelbaum	DATE 3-5-12	SHEET 2 of 2

LOGGED BY Z. Dellamas	BEGIN DATE 10-18-11	COMPLETION DATE 10-18-11	BOREHOLE LOCATION (Lat/Long or North/East and Datum) 2453216.7 ft / 5585729.7 ft NAD83	HOLE ID RC-11-014
DRILLING CONTRACTOR Caltrans			BOREHOLE LOCATION (Offset, Station, Line) 14' Rt Sta 357+66 A1	SURFACE ELEVATION 33 ft NAVD88
DRILLING METHOD Rotary Wire-Line			DRILL RIG CS 2000 (truck)	BOREHOLE DIAMETER 4.5 in
SAMPLER TYPE(S) AND SIZE(S) (ID) SPT, Punch Core			SPT HAMMER TYPE Deidrich Automatic 140 #30" drop	HAMMER EFFICIENCY, ERI 93%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER DURING DRILLING READINGS	AFTER DRILLING (DATE) 6.3 ft on 2-28-12
				TOTAL DEPTH OF BORING 26.0 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
0	0		SILTY SAND (SM); medium dense; brown; moist; fine SAND; some fines; few organics.		1	1 2 5	7								
30.87	2		SILT with SAND (ML); medium dense; very dark brown; moist; fine SAND.		2										
28.87	4														
26.87	6		SANDY lean CLAY (CL); stiff; very dark brown; moist; medium and fine SAND ; PP=2.0.		3	2 3 5	8								
24.87	8				4										
22.87	10		Poorly graded SAND with SILT (SP-SM); loose; light gray; moist; fine SAND ; weak cementation.		5	3 3 3	6								
20.87	12		Well-graded SAND with SILT (SW-SM); loose; gray; moist; trace fine GRAVEL.		6			57							
18.87	14														
16.87	16		Dark gray; few fine and coarse GRAVEL ; few organics.		7	2 1 4	5								
14.87	18		Well-graded SAND with CLAY, GRAVEL, and COBBLES (SW-SC); loose; yellowish brown; moist; little fine and coarse GRAVEL ; 5% SANDSTONE COBBLES.		8										
12.87	20														
10.87	22		METAMORPHIC ROCK (META SILTSTONE); dark gray; intensely weathered; moderately soft; very intensely fractured; clasts, 2" maximum.		9	19 38 50/5.5'	88/12								
8.87	24				10			38	0						

(continued)

5 BR - STANDARD PIEDRASBLANCAS.GPJ DRAFT CALTRANS LIBRARY OCT 2011.GLB 3/2/12



Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE BORING RECORD				HOLE ID RC-11-014	
DIST. 05	COUNTY SLO	ROUTE 1	POSTMILE 64.0/R67.2	PROJECT ID 0500000576	
PROJECT OR BRIDGE NAME Piedras Blancas Realignment					
BRIDGE NUMBER		PREPARED BY D. Appelbaum		DATE 3-5-12	SHEET 1 of 2

5 BR - STANDARD PIEDRASBLANCAS.GPJ DRAFT CALTRANS LIBRARY OCT 2011.GLB 3/2/12

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
6.87	25		METAMORPHIC ROCK (Meta Siltstone) (continued).	X	11	50/5"	REF								
	26		Bottom of borehole at 26.0 ft bgs												
	27		Installed Open-standpipe Observation Well 10-18-2011												
4.87	28		This Boring Record was developed in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2010) except as noted on the Soil or Rock Legend or below.												
	29														
	30														
	31														
0.87	32														
	33														
	34														
	35														
	36														
	37														
	38														
	39														
	40														
	41														
	42														
	43														
	44														
	45														
	46														
	47														
	48														
	49														
	50														
	51														
	52														
	53														
	54														
	55														



Department of Transportation
 Division of Engineering Services
 Geotechnical Services
 Office of Geotechnical Design - North

REPORT TITLE BORING RECORD				HOLE ID RC-11-014	
DIST. 05	COUNTY SLO	ROUTE 1	POSTMILE 64.0/R67.2	PROJECT ID 0500000576	
PROJECT OR BRIDGE NAME Piedras Blancas Realignment					
BRIDGE NUMBER		PREPARED BY D. Appelbaum		DATE 3-5-12	SHEET 2 of 2

LOGGED BY Z. Dellamas	BEGIN DATE 10-19-11	COMPLETION DATE 10-19-11	BOREHOLE LOCATION (Lat/Long or North/East and Datum) 2457584.0 ft / 5581508.4 ft NAD83	HOLE ID RC-11-016
DRILLING CONTRACTOR Caltrans			BOREHOLE LOCATION (Offset, Station, Line) 75' Lt Sta 420+79 A1	SURFACE ELEVATION 37 ft NAVD88
DRILLING METHOD Rotary Wire-Line			DRILL RIG CS 2000 (truck)	BOREHOLE DIAMETER 4.5 in
SAMPLER TYPE(S) AND SIZE(S) (ID) SPT, Punch Core			SPT HAMMER TYPE Deidrich Automatic 140 #/30" drop	HAMMER EFFICIENCY, ERI 93%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER DURING DRILLING AFTER DRILLING (DATE) READINGS	TOTAL DEPTH OF BORING 15.0 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
0	0		SILTY SAND (SM); loose; very dark brown; moist; fine SAND; some fines; trace organics.		1	3	5								
35.36	2				2										
33.36	4		CLAYEY SAND (SC); dense; dark yellowish brown; moist; from coarse to fine SAND; some fines.		3	8	25								
31.36	6				4	13									
29.36	8				5	22									
27.36	10		METAMORPHIC ROCK (META SANDSTONE); dark yellowish brown; varies from moderately to intensely weathered; varies from moderately soft to moderately hard; intensely fractured.		6	50/4"									
25.36	12		Varies from intensely weathered to decomposed; (CLAYEY SAND; very dense; moist; from coarse to fine SAND; some fines).		7	50/5"									
23.36	14				REF										
15	15		Bottom of borehole at 15.0 ft bgs												
21.36	16		Groundwater Not Encountered												
19.36	18		This Boring Record was developed in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2010) except as noted on the Soil or Rock Legend or below.												
17.36	20														
15.36	22														
13.36	24														
	25														

5 BR - STANDARD, PIEDRASBLANCAS.GPJ DRAFT CALTRANS LIBRARY OCT 2011.GLB 3/2/12



Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE BORING RECORD				HOLE ID RC-11-016	
DIST. 05	COUNTY SLO	ROUTE 1	POSTMILE 64.0/R67.2	PROJECT ID 0500000576	
PROJECT OR BRIDGE NAME Piedras Blancas Realignment					
BRIDGE NUMBER		PREPARED BY D. Appelbaum		DATE 3-5-12	SHEET 1 of 1

LOGGED BY Z. Dellamas	BEGIN DATE 10-19-11	COMPLETION DATE 10-19-11	BOREHOLE LOCATION (Lat/Long or North/East and Datum) 2457108.2 ft / 5582710.9 ft NAD83	HOLE ID A-11-017
DRILLING CONTRACTOR Caltrans			BOREHOLE LOCATION (Offset, Station, Line) 68' Rt Sta 408+01 A1	SURFACE ELEVATION 86 ft NAVD88
DRILLING METHOD Hollow-Stem Auger			DRILL RIG CS 2000 (truck)	BOREHOLE DIAMETER 6 in
SAMPLER TYPE(S) AND SIZE(S) (ID) SPT			SPT HAMMER TYPE Deidrich Automatic 140 #/30" drop	HAMMER EFFICIENCY, ERI 93%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER DURING DRILLING AFTER DRILLING (DATE) READINGS	TOTAL DEPTH OF BORING 16.0 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
84.20	0		CLAYEY SAND (SC); loose; dark brown; moist; fine SAND; some fines; trace organics.		1	2 2 4	6								
82.20	4		METAMORPHIC ROCK (META SILTSTONE); laminated; dark gray; decomposed; varies from soft to very soft; very intensely fractured; (Lean CLAY with SAND; hard; medium and fine SAND; PP=4.5 tsf).		2	16 14 16	30								
76.20	10				3	8 13 24	37								
70.20	16		Bottom of borehole at 16.0 ft bgs		4	8 50/5"	50/5								
	17		Groundwater Not Encountered												
	18		This Boring Record was developed in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2010) except as noted on the Soil or Rock Legend or below.												

5 BR - STANDARD PIEDRASBLANCAS.GPJ DRAFT CALTRANS LIBRARY OCT 2011.GLB 3/2/12



Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE BORING RECORD				HOLE ID A-11-017
DIST. 05	COUNTY SLO	ROUTE 1	POSTMILE 64.0/R67.2	PROJECT ID 0500000576
PROJECT OR BRIDGE NAME Piedras Blancas Realignment				
BRIDGE NUMBER	PREPARED BY D. Appelbaum	DATE 3-5-12	SHEET 1 of 1	

LOGGED BY Z. Dellamas	BEGIN DATE 10-19-11	COMPLETION DATE 10-19-11	BOREHOLE LOCATION (Lat/Long or North/East and Datum) 2454411.1 ft / 5585168.3 ft NAD83	HOLE ID A-11-018
DRILLING CONTRACTOR Caltrans			BOREHOLE LOCATION (Offset, Station, Line) 19' Rt Sta 371+00 A1	SURFACE ELEVATION 70 ft NAVD88
DRILLING METHOD Hollow-Stem Auger			DRILL RIG CS 2000 (truck)	BOREHOLE DIAMETER 6 in
SAMPLER TYPE(S) AND SIZE(S) (ID) SPT			SPT HAMMER TYPE Deidrich Automatic 140 #30" drop	HAMMER EFFICIENCY, ERI 93%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER DURING DRILLING AFTER DRILLING (DATE) READINGS	TOTAL DEPTH OF BORING 21.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
0	0		CLAYEY SAND (SC); very loose; very dark brown; moist; fine SAND; some fines; trace organics.	1	0 1 1	2								
68.20	2													
66.20	4		Dense; dark brown.	2	24 16 14	30								
64.20	6													
62.20	8													
60.20	10		Very dense.	3	35 24 19	43								
58.20	12													
56.20	14													
54.20	16			4	28 15 23	38								
52.20	18													
50.20	20		METAMORPHIC ROCK (META SANDSTONE); dark brown; varies from very intensely weathered to decomposed; varies from moderately hard to moderately soft; very intensely fractured; (SILTY SAND; very dense; moist; fine SAND; some fines; trace fine GRAVEL).	5	15 24 12	36								
48.20	22		Bottom of borehole at 21.5 ft bgs Groundwater Not Encountered											
46.20	24		This Boring Record was developed in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2010) except as noted on the Soil or Rock Legend or below.											

5 BR - STANDARD PIEDRASBLANCAS.GPJ DRAFT CALTRANS LIBRARY OCT 2011.GLB 3/2/12



Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE BORING RECORD				HOLE ID A-11-018	
DIST. 05	COUNTY SLO	ROUTE 1	POSTMILE 64.0/R67.2	PROJECT ID 0500000576	
PROJECT OR BRIDGE NAME Piedras Blancas Realignment					
BRIDGE NUMBER		PREPARED BY D. Appelbaum		DATE 3-5-12	SHEET 1 of 1

MATERIALS PROPERTIES SUMMARY
PIEDRAS BLANCAS REALIGNMENT
 SLO-1-64.0/R67.2

DESCRIPTION	RC-11-001		RC-11-002		RC-11-003		RC-11-004	
	Station	Line	Station	Line	Station	Line	Station	Line
	338+86	"A1", Rte. 1 CL	337+70	"A1", Rte. 1 CL	337+72	"A1", Rte. 1 CL	336+30	"A1", Rte. 1 CL
	0		25' Rt.		23' Lt.		1' Lt.	
	9/13/2011	9/14/2011	9/16/2011	9/17/2011	9/17/2011	9/17/2011	9/17/2011	9/17/2011
	1000	C01-1	1002	1003	1004	U01-1	U01-1	U01-2
	16.5'-18.0'	66.0'-67.0'	19.0'-20.0'	29.0'-30.0'	31.0'-32.0'	5.4"-5.8"	5.4"-5.8"	5.8"-6.0"
	ML	CL			CL			CH
PARTICLE SIZE ANALYSIS	50 mm (2")							
	37.5 mm (1 1/2")							
	25 mm (1")							
	19 mm (3/4")							
	12.5 mm (1/2")							
	9.5 mm (3/8")				100			100
	4.75 mm (No. 4)		100		96			100
	2.36 mm (No. 8)		99		95			98
	1.18 mm (No. 16)		99		89			97
	600 um (No. 30)		97		80			95
	300 um (No. 50)		93		72			90
	150 um (No. 100)		80		63			83
	75 um (No. 200)		88		53			77
5 um		45		24			51	
1 um		27		11			41	
Liquid Limit	46	35		25			51	
Plasticity Index	17	14		8			32	
Expansion Index								
CORROSION	Resistivity (ohm-cm)	837	1055	1884	897	959		
	pH	7.17	7.39	7.84	8.32	8.40		
	Chlorides (ppm)	121	90	N/A	41	44		
	Sulfates (ppm)	51	302	N/A	523	418		
DENSITY AND MOISTURE CONTENT	Dry Density (pcf)					104.6	21.0	
	Moisture (%)					20.3		
	Dry Density (pcf)							
	Moisture (%)							
CUE TRIAXIAL	Specific Gravity					2.67		
	Friction Angle (°)							
	Cohesion (psf)							
	Friction Angle (°)							
REMOLED 90% IN SITU	Friction Angle (°)							
	Cohesion (psf)							
	Friction Angle (°)							
	Cohesion (psf)							
Unconfined	Compressive Strength (psi)		11090					
	Consolidation Index (Cc)					0.13		
	Recompression Index (Cr)					0.03		
Consol.	Initial Void Ratio					0.59		

MATERIALS PROPERTIES SUMMARY
PIEDRAS BLANCAS REALIGNMENT
 SLO-1-64.0/R67.2

DESCRIPTION		Boring No.	RC-11-05						
Station		327+97	"A1" Rte. 1 CL						
Line		1' Lt.							
Offset									
Date Sampled	9/18/2011	9/18/2011	9/18/2011	9/19/2011	9/19/2011	9/19/2011	9/19/2011	9/19/2011	
Sample ID	1005	C01-1	1006	C02-1	C03-1	C04-1	C05-1	C06-1	
Depth Below OG	19.5'-20.5'	34.0'-34.6'	47.0'-48.0'	71.0'-71.5'	81.0'-82.0'	94.5'-95.5'	101.0'-102.0'	109.0'-110.0'	
USCS Classification	CL		SC-SM						
PARTICLE SIZE ANALYSIS	50 mm (2")								
	37.5 mm (1 1/2")		100						
	25 mm (1")		96						
	19 mm (3/4")		96						
	12.5 mm (1/2")		96						
	9.5 mm (3/8")		96						
	4.75 mm (No. 4)	100	93						
	2.36 mm (No. 8)	98	88						
	1.18 mm (No. 16)	95	82						
	600 um (No. 30)	91	74						
	300 um (No. 50)	83	66						
	150 um (No. 100)	53	56						
	75 um (No. 200)	34	47						
	5 um	27	21						
1 um	32	13							
Liquid Limit	32	22							
Plasticity Index	18	7							
CORROSION	Expansion Index								
	Resistivity (ohm-cm)	588	748						
	pH	6.65	8.99						
	Chlorides (ppm)	92	106						
	Sulfates (ppm)	823	329						
	Dry Density (pcf)	141.5	138.6	137.5	139.9	135.1	140.2		
	Moisture (%)								
	Dry Density (pcf)								
	Moisture (%)								
	Specific Gravity								
CUE TRIAXIAL	Friction Angle (°)								
	Cohesion (psf)								
	Friction Angle (°)								
	Cohesion (psf)								
	Friction Angle (°)								
	Cohesion (psf)								
	Friction Angle (°)								
	Cohesion (psf)								
	Unconfined Compressive Strength (psi)	165.2	45.6	95.8	104.9	61.0	68.0		
	Consolidation Index (Cc)								
Recompression Index (Cr)									
Initial Void Ratio									

MATERIALS PROPERTIES SUMMARY PIEDRAS BLANCAS REALIGNMENT

SLO-1-64.0/R67.2

Boring No.	RC-11-006	RC-11-007	RC-11-008	RC-11-009	RC-11-010	RC-11-011
Station	329+16	326+77	329+15	326+73	340+42	341+52
Line	"A1", Rte. 1 CL					
Offset	21' Rt.	21' Rt.	20' Lt.	21' Lt.	1' Lt.	0
Date Sampled	9/21/2011	9/21/2011	10/4/2011	10/5/2011	10/5/2011	10/8/2011
Sample ID	1007	C01-1	1008	C01-1	C01-1	C02-1
Depth Below OG	11.0'-12.0'	18.5'-19.5'	13.0'-14.0'	4.5'-5.0'	47.0'-47.7'	5.0'-5.5'
USCS Classification	CL		CL			47.0'-47.5'
50 mm (2")						
37.5 mm (1 1/2")						
25 mm (1")						
19 mm (3/4")						
12.5 mm (1/2")						
9.5 mm (3/8")	100		100			
4.75 mm (No. 4)	97		99			
2.36 mm (No. 8)	84		95			
1.18 mm (No. 16)	79		88			
600 um (No. 30)	75		81			
300 um (No. 50)	71		74			
150 um (No. 100)	65		69			
75 um (No. 200)	59		65			
5 um	31		29			
1 um	16		15			
Liquid Limit	28		25			
Plasticity Index	10		12			
Expansion Index						
Resistivity (ohm-cm)	1800		1505			
pH	8.43		8.57			
Chlorides (ppm)	N/A		N/A			
Sulfates (ppm)	N/A		N/A			
Dry Density (pcf)		141.3		123.8	133.7	117.5
Moisture (%)				10.2	6.3	12.4
Dry Density (pcf)						
Moisture (%)						
Specific Gravity						
Friction Angle (°)						
Cohesion (psf)						
Friction Angle (°)						
Cohesion (psf)						
Friction Angle (°)						
Cohesion (psf)						
Friction Angle (°)						
Cohesion (psf)						
Unconfined Compressive Strength (psi)		126.6		331.2	166.1	284.5
Consolidation Index (cc)						
Recompression Index (Cr)						
Initial Void Ratio						
Consol.						7219

MATERIALS PROPERTIES SUMMARY
PIEDRAS BLANCAS REALIGNMENT

SLO-1-64.0/R67.2

DESCRIPTION		RC-11-012 375+35 "A1", Rte. 1 CL 1' Rt.									
Boring No.	Station	10/9/2011	10/9/2011	10/9/2011	10/9/2011	10/9/2011	10/9/2011	10/9/2011	10/9/2011	10/9/2011	10/10/2011
Line	Offset	U01-1	U01-2	U02-1	U02-2	U03-1	U03-2	U03-1	U03-2	U03-1	U03-2
Date Sampled	Sample ID	4'0"-4'6"	4'6"-5'0"	8'6"-9'0"	9'0"-9'6"	14'0"-14'6"	14'6"-15'0"	14'0"-14'6"	14'6"-15'0"	14'0"-14'6"	14'6"-15'0"
Depth Below OG	USCS Classification	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL
PARTICLE SIZE ANALYSIS	50 mm (2")										
	37.5 mm (1 1/2")										
	25 mm (1")										
	19 mm (3/4")										
	12.5 mm (1/2")										
	9.5 mm (3/8")			100							
	4.75 mm (No. 4)	100		98						100	
	2.36 mm (No. 8)	99		98						97	
	1.18 mm (No. 16)	98		97						93	
	600 um (No. 30)	98		96						90	
300 um (No. 50)	95		91						85		
150 um (No. 100)	72		65						78		
75 um (No. 200)	66		60						70		
5 um	49		44						29		
1 um	36		32						16		
Liquid Limit	47		41						45		
Plasticity Index	29		23						24		
Expansion Index											
CORROSION	Resistivity (ohm-cm)										1985
	pH										8.32
MOISTURE AND DENSITY	Chlorides (ppm)										N/A
	Sulfates (ppm)										N/A
IN SITU	Dry Density (pcf)	86.3		104.4							159.8
	Moisture (%)	30.3	21.9	21.9	24.0			92.7	32.7	30.3	N/A
DENSITY AND MOISTURE CONTENT	Dry Density (pcf)										N/A
	Moisture (%)										N/A
IN SITU	Specific Gravity										
	Friction Angle (°)	2.69		2.64				2.71			
RECORDED 90% TRIAXIAL	Cohesion (psf)										
	Friction Angle (°)										
UNCONTAINED	Cohesion (psf)										
	Friction Angle (°)										
CONSOLIDATION	Unconfined Compressive Strength (psi)										622.9
	Consolidation Index (Cc)			0.20				0.32			
INITIAL VOID RATIO	Recompression Index (Cr)			0.03				0.05			
	Initial Void Ratio	0.95		0.58				0.82			

MATERIALS PROPERTIES SUMMARY
PIEDRAS BLANCAS REALIGNMENT
 SLO-1-64.0/R67.2

DESCRIPTION	RC-11-014		A-11-017		A-11-018	
	Station	357+66	408+01	371+00	Line	"A1", Rte. 1 CL
Offset	14' Rt.		68' Rt.		19' Rt.	
Date Sampled	10/18/2011	10/18/2011	10/19/2011	10/19/2011	10/19/2011	10/19/2011
Sample ID	U01-1	U01-3	1013	BULK	1014	BULK
Depth Below OG	5'8"-6'0"	6'4"-6.8"	5.0'-6.5'	0'-16'	5.0'-6.5'	0'-21.5'
USCS Classification	CL	CL	ML	CL	SC	SC
PARTICLE SIZE ANALYSIS	50 mm (2")					
	37.5 mm (1 1/2")					
	25 mm (1")					
	19 mm (3/4")					
	12.5 mm (1/2")					
	9.5 mm (3/8")			100		
	4.75 mm (No. 4)	100		99		
	2.36 mm (No. 8)	97	100	99		
	1.18 mm (No. 16)	94	98	99		
	600 um (No. 30)	91	96	97	100	100
300 um (No. 50)	84	83	95	95	95	
150 um (No. 100)	58	66	88	51	46	
75 um (No. 200)	50	53	81	39	37	
5 um	38	21	21	50	25	26
1 um	31	13	32	15	17	17
Liquid Limit	35	38	45	22	22	22
Plasticity Index	20	6	22	8	8	8
Expansion Index			102			
CORROSION	Resistivity (ohm-cm)					
	pH					
MOISTURE CONTENT	Chlorides (ppm)					
	Sulfates (ppm)					
DENSITY AND MOISTURE CONTENT	Dry Density (pcf)	100.6				
	Moisture (%)	23.8	21.3			
IN SITU	Dry Density (pcf)			113.5		125.1
	Moisture (%)			16.6		10.9
CUE TRIAXIAL	Specific Gravity	2.62				
	Friction Angle (°)					
REMOVED 90% IN SITU	Cohesion (psf)					
	Friction Angle (°)					
UNCONFINED COMPRESSIVE STRENGTH	Cohesion (psf)			8.9		14.8
	Friction Angle (°)			607.7		187.2
CONSOLIDATION INDEX	Cohesion (psf)			19.6		25.3
	Friction Angle (°)			355.7		97.5
RECOMPRESSION INDEX	Unconfined Compressive Strength (psi)					
	Consolidation Index (Cc)					
INITIAL VOID RATIO	Recompression Index (Cr)					
	Initial Void Ratio	0.63				

FOUNDATION REVIEW

DIVISION OF ENGINEERING SERVICES GEOTECHNICAL SERVICES

- To: Structure Design
1. Design
 2. R.E. Pending File
 3. Specifications & Estimates
 4. File

Date: 2/28/13

Alroyo De Los Playanos Br.
Structure Name

05 - 560 - 001 - R64.6
District County Route km Post
mi:

- Geotechnical Services
1. GD - North ; South ; West
 2. GS File Room

District Project Development
District Project Engineer

050000576
05 - 492801 49 - 0258
E.A. Number Structure Number

Foundation Report By: R. Richman

Dated: 2/18/13

Reviewed By: M. Pope (SD)

R. Price (GS)

General Plan Dated: 11/13/12

Foundation Plan Dated: 8/23/12

No changes. The following changes are necessary.

FOUNDATION CHECKLIST

Pile Types and Design Loads

- Pile Lengths
 - Predrilling
 - Pile Load Test
 - Substitution of H Piles For Concrete Piles
- Yes No

Footing Elevations, Design Loads, and Locations

- Seismic Data
- Location of Adjacent Structures and Utilities
- Stability of Cuts or Fills
- Fill Time Delay

Effect of Fills on Abutments and Bents

- Fill Surcharge
- Approach Paving Slabs
- Scour
- Ground Water
- Tramie Seals/Type D Excavation

Michael R. Pope 18
Structure Design Bridge Design Branch No.

[Signature]
Geotechnical Services

FOUNDATION REVIEW

DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES

- To: Structure Design
1. Design
 2. P.E. Pending File
 3. Specifications & Estimates
 4. File

Date: 2/28/13 / 3/14/13

Arroyo Del Corral Br.
Structure Name

05 - 560 - 001 - R. 64.8
District County Route km Post

- Geotechnical Services
1. GD - North ; South ; West
 2. GS File Room

District Project Development District Project Engineer 05 am 576 E.A. Number 05-492001 Structure Number 49-0259

Foundation Report By: R. Richman Dated: 2/15/13

Reviewed By: M. Lopez (SD) R. Price (GS)

General Plan Dated: 11/16/12 Foundation Plan Dated: 11/16/12

No changes. The following changes are necessary.

FOUNDATION CHECKLIST		
<p>Pile Types and Design Loads</p> <p><input checked="" type="checkbox"/> Pile Lengths</p> <p><input checked="" type="checkbox"/> Predrilling</p> <p><input checked="" type="checkbox"/> Pile Load Test</p> <p><input checked="" type="checkbox"/> Substitution of H Piles For Concrete Piles <input type="checkbox"/> Yes <input type="checkbox"/> No</p>	<p><input checked="" type="checkbox"/> Footing Elevations, Design Loads, and Locations</p> <p><input checked="" type="checkbox"/> Seismic Data</p> <p><input checked="" type="checkbox"/> Location of Adjacent Structures and Utilities</p> <p><input checked="" type="checkbox"/> Stability of Cuts or Fills</p> <p><input checked="" type="checkbox"/> Fill Time Delay</p>	<p><input checked="" type="checkbox"/> Effect of Fills on Abutments and Bents</p> <p><input checked="" type="checkbox"/> Fill Surcharge</p> <p><input checked="" type="checkbox"/> Approach Paving Slabs</p> <p><input checked="" type="checkbox"/> Scour</p> <p><input checked="" type="checkbox"/> Ground Water</p> <p><input checked="" type="checkbox"/> Tremie Seals/Type D Excavation</p>

Michael R. Payne 18
Structure Design Bridge Design Branch No.

[Signature]
Geotechnical Services

FOUNDATION REVIEW

DIVISION OF ENGINEERING SERVICES GEOTECHNICAL SERVICES

To: Structure Design

1. Design
2. R.E. Pending File
3. Specifications & Estimates
4. File

Geotechnical Services

1. GD - North; South; West
2. GS File Room

Date: 2/28/13

Arroyo Del Oso Bl.
Structure Name

05-520-001-R.65.6
District County Route km Post

District Project Development
District Project Engineer

05-492801 49-0260
E.A. Number Structure Number

Foundation Report By: R. Richman

Dated: _____

Reviewed By: M. Pope (SD)

R. Price (GS)

General Plan Dated: 10/5/12

Foundation Plan Dated: 10/5/12

No changes. The following changes are necessary.

FOUNDATION CHECKLIST

Pile Types and Design Loads

- Pile Lengths
- Predrilling
- Pile Load Test
- Substitution of H Piles For Concrete Piles Yes No

- Footing Elevations, Design Loads, and Locations
- Seismic Data
- Location of Adjacent Structures and Utilities
- Stability of Cuts or Fills
- Fill Time Delay

Effect of Fills on Abutments and Bents

- Fill Surcharge
- Approach Paving Slabs
- Scour
- Ground Water
- Tremie Seals/Type D Excavation

Michael R. Pope 18
Structure Design Bridge Design Branch No.

R. Price
Geotechnical Services

State of California – Department of Transportation
Division of Engineering Services
Structure Design Services

Structure Hydraulics and Hydrology

FINAL HYDRAULIC REPORT

Piedras Blancas Realignment

Arroyo Del Oso

Bridge No. 49-0260 (New Structure)

Arroyo Del Corral

Bridge No. 49-0259 (New Structure)

Arroyo De Los Playanos

Bridge No. 49-0258 (New Structure)

Realignment of State Route 1 in the County of San Luis Obispo

05-SLO-1-PM-64.0 R 67.2

EA 0500000576

May 24, 2012

PREPARED BY:
Ronald McGaugh

REVIEWED BY:
Ginger Lu

This report has been prepared under my direction as the professional engineer in responsible charge of the work, in accordance with the provisions of the Professional Engineers Act of the State of California

REGISTERED ENGINEER

REGISTRATION NUMBER C 61217



Ronald L. McGaugh



General:

It is proposed to realign the existing State Route which includes three new structures. Arroyo Del Oso is proposed to be a two span structure 216 feet long, 43.5 feet wide, precast/pre-tensioned I-girder, with 4 ft. diameter columns. Arroyo Del Corral is proposed as a three span cast-in-place/pre-stress box girder, 380 feet long, and 43.5 feet wide with 5.5 ft diameter columns. Arroyo De Los Playanos is a proposed two span structure 240 feet long, 43.5 feet wide, cast-in-place/pre-stress box girder, with 4 ft. diameter columns.

This evaluation is based on:

:

- Caltrans' Bridge Maintenance Records.
- APS plans submitted by Structure Design
- The General Plans dated February 2012 in English units.
- Field photo documentation and bridge site submittal information received by this office dated September 2009.
- US Geological Survey (Regional Regression Method) Magnitude and Frequency of Floods in California--Bulletin 77-21. Used for the National Stream Statistics Program.
- HEC 18, Evaluating Scour at Bridges, 4th Edition.
- NRCS TR20 Hydraulic Modeling software

All elevations for this structure are based on the NAVD88

Flood History:

There are no flood problems that affect the existing flow for the proposed structures at this new alignment location. It is anticipated that the proposed structures will not cause any flooding or any impoundment of water.

Basin:

The watersheds are in the western slopes of the southern part of the Santa Lucia Range, next to the Pacific Ocean. Elevations range from approximately 500 feet at the higher elevations to approximately 20 feet at the proposed bridge sites. These watersheds have low potential for debris yield. Average channel slope near the bridge site is estimated at 3%. This basin is mostly undeveloped rural and medium densely pasture type lands. The average annual precipitation within the watersheds range from 20 to 40 inches. Arroyo Del Oso drains approximately 1.26 square miles. Arroyo Del Corral drains approximately 2 square miles. Arroyo De Los Playanos drains approximately 1/2 square mile.

Drift:

Historical flows did not indicate a problem with drift but due to the rapid runoff and the steep slopes, it is still recommended that at least 3 foot of freeboard is needed for these coastal structures.

Discharge:

Since these watersheds are un-gauged the National Streamflow Statistics program (NSS) and the NRCS TR20 software was used to estimate the discharges Shown in Table 1

Stream	Q ₁₀₀
Arroyo Del Oso	1800 ft ³ /s
Arroyo Del Corral	3060 ft ³ /s
Arroyo De Los Playanos	2200 ft ³ /s

Table 1

Streambed:

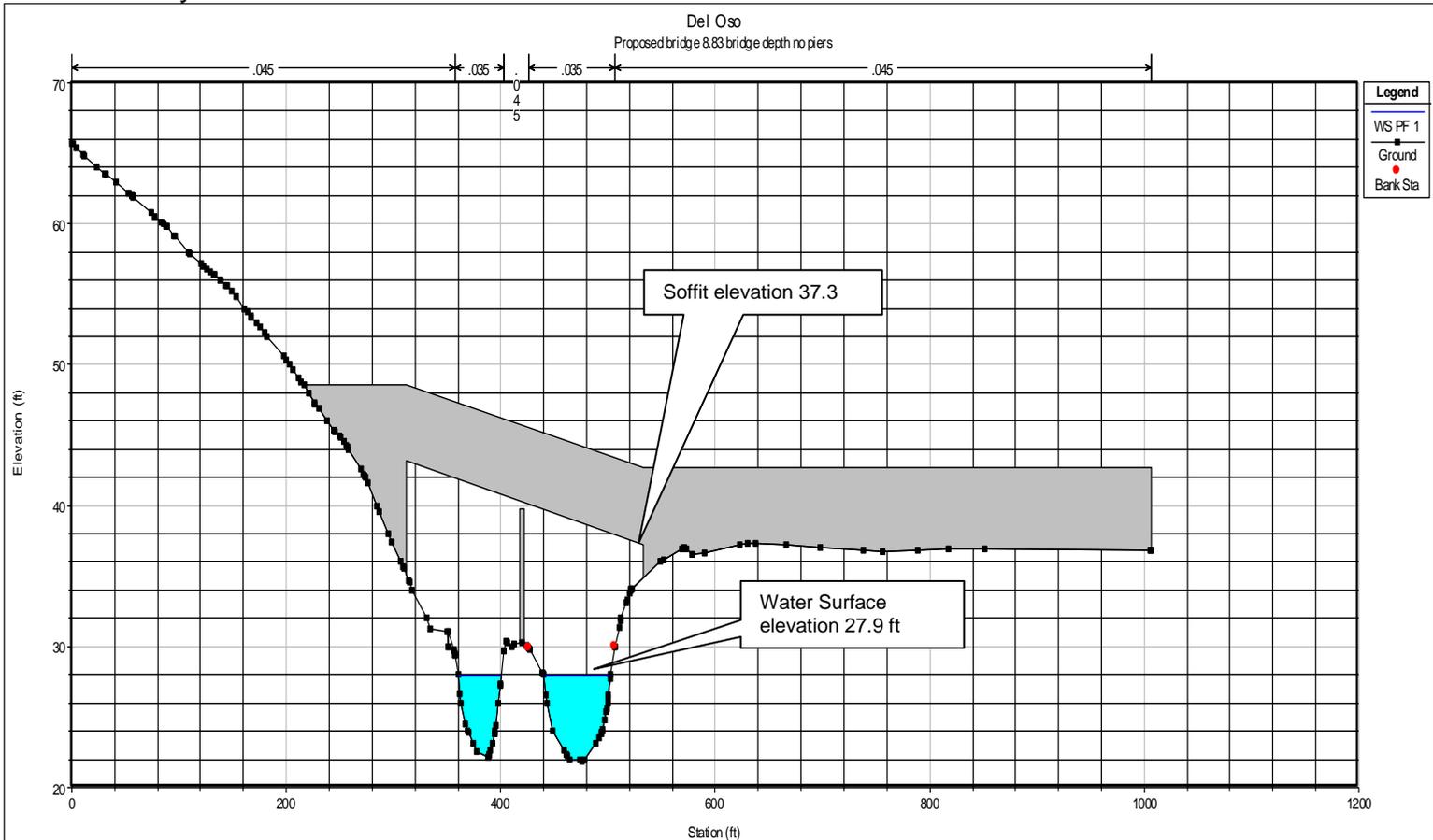
The existing channels carrying the anticipated flows to the proposed structures are relatively straight and deeply incised. From the General Plan it is anticipated that the bridges will have minimal hydraulic skew normal to the centerline of the channel. The natural channel bottom consists of sand, cobbles, gravels, boulders and is relatively scour resistant. The natural channel bottom for Arroyo Del Corral is more densely vegetated, and an environmentally sensitive area.

Proposed Design:

Arroyo Del Oso 49-0260

For the hydraulic modeling, the lowest point of the superstructure was used for the freeboard calculation. All calculations were done using the HEC-RAS software version 4.1. Channel degradation. For this project, from a comparison of the historic cross sections of the existing structures on the old alignment, the rate of degradation is less than 0.05 ft/year. Total long term degradation for 20 years would be 0 feet. These proposed structures do not cause any contraction scour.

Arroyo Del Oso 49-0260



Based on the General Plans, the proposed parameters for Arroyo Del Oso are as follows:

$Q_{100} = 1800$ cfs

Water Surface elevation is 27.9 ft

Manning's $n = 0.035$

Slope = 0.03 ft/ft

Modeled upstream lowest chord deck elevation approximately 37.3 ft.

Structure depth = 5.4 feet Freeboard = 9.4 ft.

Minimum Soffit Elevation = 30.9 ft.

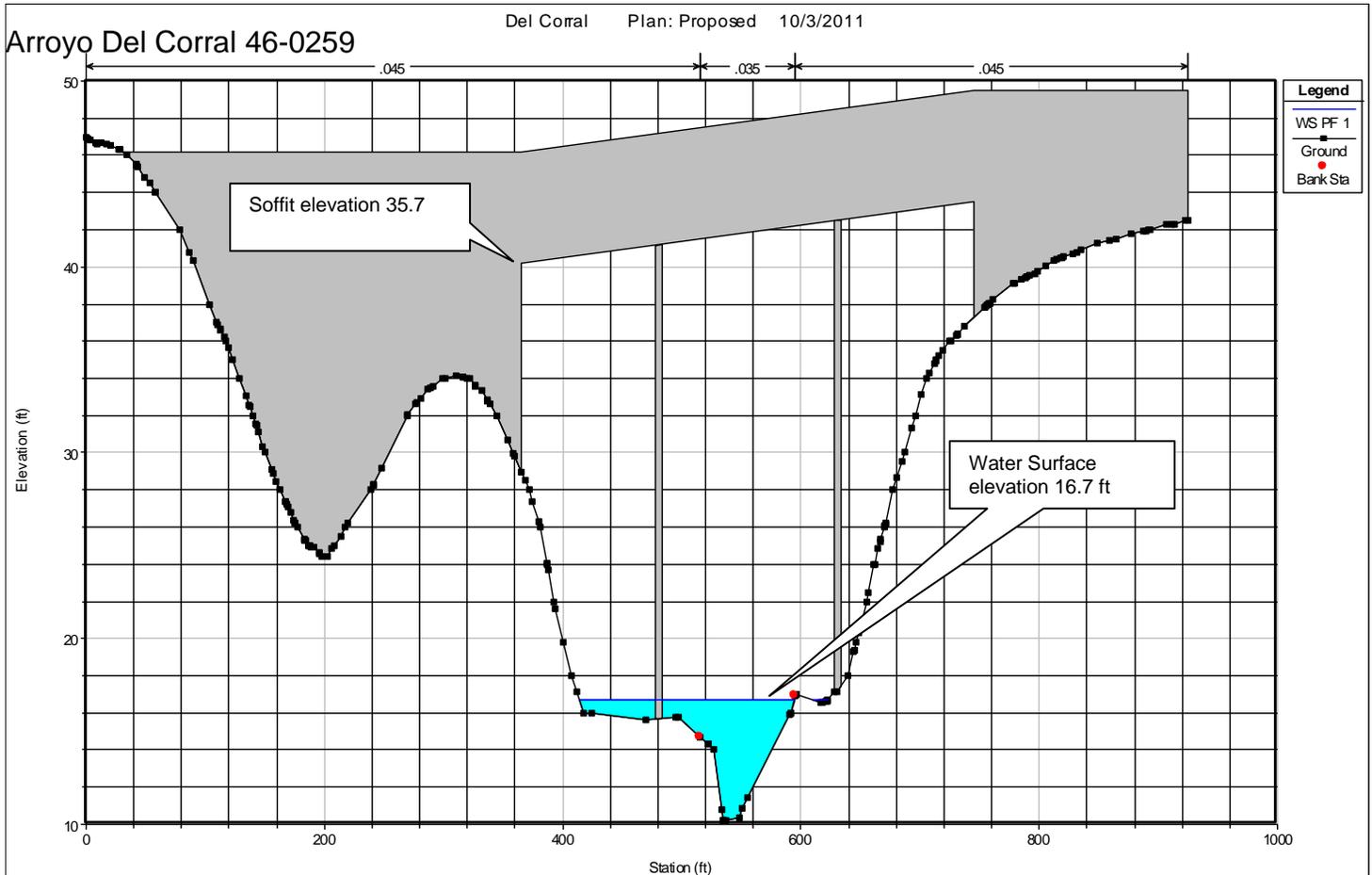
Local Pier scour = 6 ft.....hydraulic skew = 0.

Contraction Scour = 0 ft.....Degradation = 0

The Modeled upstream lowest chord deck elevation is the lowest allowable elevation that would insure a 3 ft freeboard.

Arroyo Del Corral 46-0259

All calculations were done using the HEC-RAS software version 4.1. Channel degradation. For this project, from a comparison of the historic cross sections of the existing structures on the old alignment, the rate of degradation is less than 0.05 ft/year. Total long term degradation for 20 years would be 0 feet. These proposed structures do not cause any contraction scour.



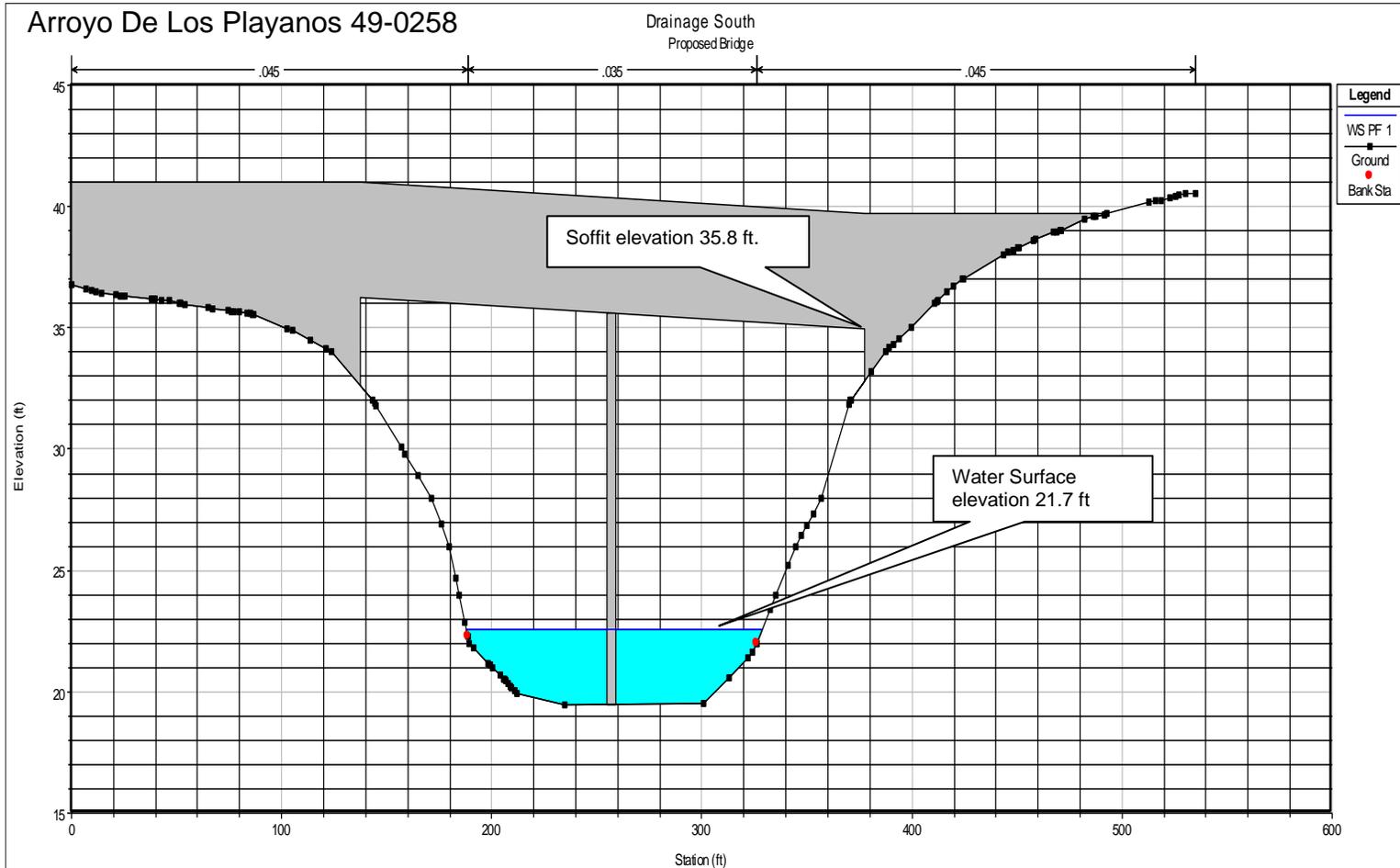
Based on the General Plans, the proposed parameters for Arroyo Del Corral are as follows:

- $Q_{100} = 3060$ cfs
- Manning's $n = 0.035$
- Modeled upstream lowest chord deck elevation approximately 40.2 ft
- Structure depth = 6.0 feet
- Minimum Soffit Elevation = 19.7 ft
- Local Pier scour = 5.5 ft.....hydraulic skew = 0.
- Contraction Scour = 0 ft.....Degradation = 0
- Water Surface elevation is 16.7 ft
- Slope = 0.03 ft/ft
- Freeboard = 19.0 ft.

The modeled upstream lowest chord deck elevation that would insure a 3 ft freeboard.

Arroyo De Los Playanos 49-0258

All calculations were done using the HEC-RAS software version 4.1. Channel degradation. For this project, from a comparison of the historic cross sections of the existing structures on the old alignment, the rate of degradation is less than 0.05 ft/year. Total long term degradation for 20 years would be 0 feet. These proposed structures do not cause any contraction scour.



Based on the General Plans, the proposed parameters for Arroyo De Los Playanos are as follows:

- Q₁₀₀= 1800 cfs
- Manning's n=0.035
- Modeled upstream lowest chord deck elevation approximately 34.9 ft.
- Structure depth =4.8 feet
- Minimum Soffit Elevation = 25.5 ft.
- Local Pier scour = 5.8 ft.....hydraulic skew =0.
- Contraction Scour =0 ft.....Degradation =0
- Water Surface elevation is 22.5 ft.
- Slope = 0.03 ft/ft
- Freeboard = 14.1 ft.

The minimum soffit elevation is the lowest allowable elevation that would insure a 3 ft freeboard.

Scour:

The scour calculations are based on worst case conditions since there is no Preliminary Foundation Report at this time. Total scour consists of Pier Scour + Contraction Scour + Long Term Channel degradation. For this project, from a comparison of the historic cross sections of the existing structures on the old alignment, the rate of degradation is less than 0.05 ft/year. Total long term degradation for 20 years would be 0 feet.

Tidal:

There is no anticipated tidal influence in the immediate vicinity of this structure, and there is no anticipated backwater. These structures are proposed to be located on the pacific coast. A study of the tides indicates a rise to approximately elevation 7 feet in the project site area. There has been a study that shows the proposed rate of beach erosion. This erosion was taken into account during the alignment/ APS design phase of the project and will not be covered in this report.

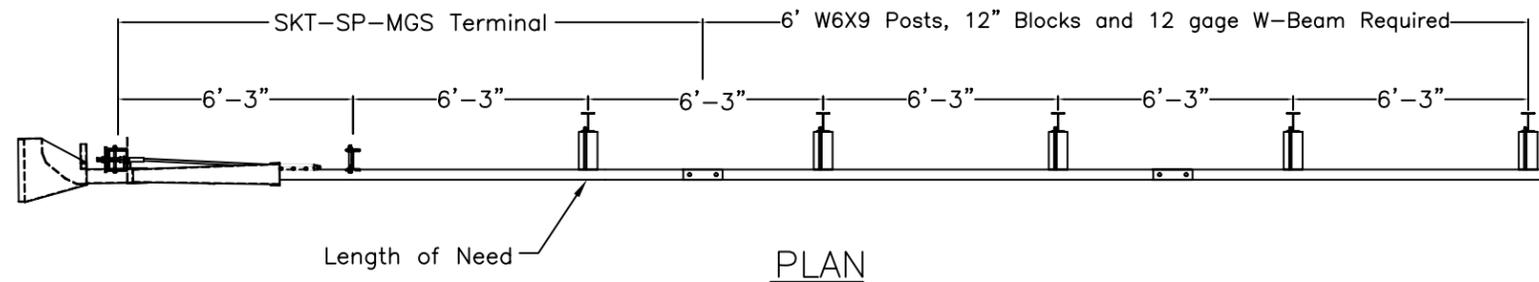
Design Parameters and Recommendations:

Below is a summary of key design parameters based on the hydrology and hydraulic analysis performed in a HEC-RAS model for these structures:

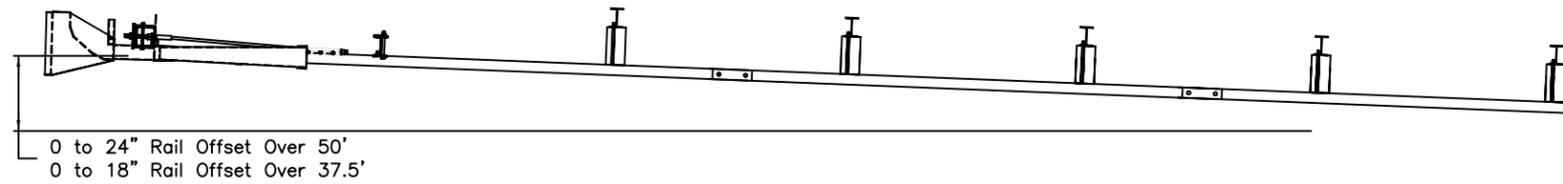
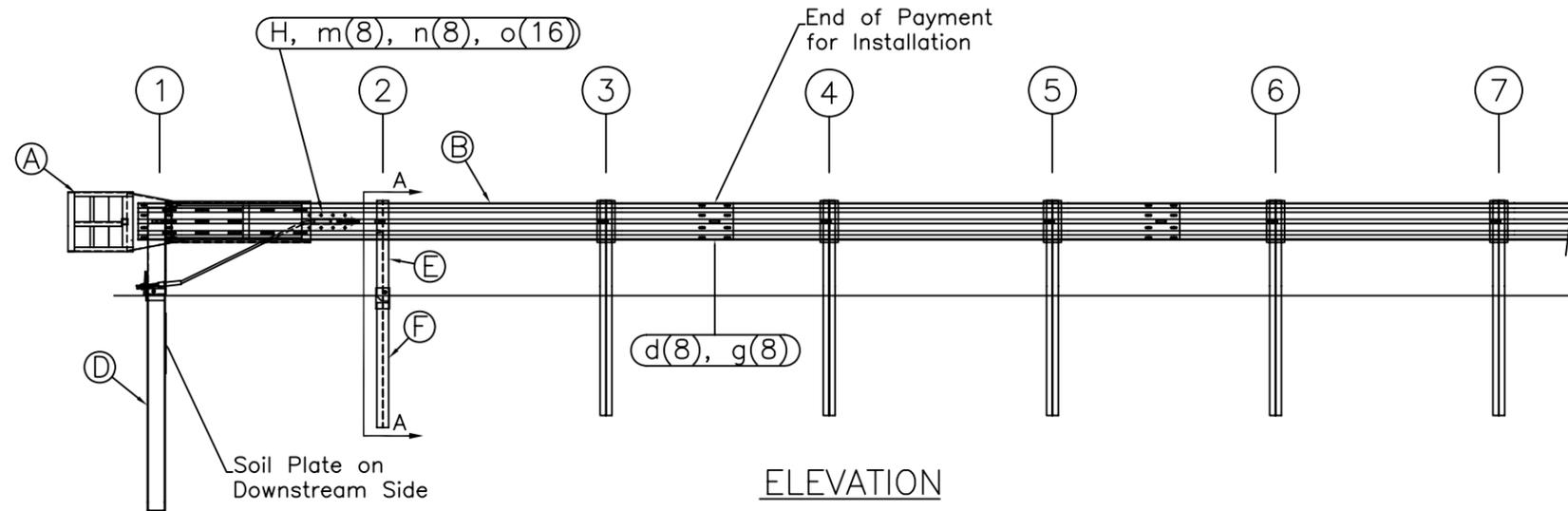
HYDROLOGIC/HYDRAULIC SUMMARY			
	Arroyo Del Oso	Arroyo Del Corral	Arroyo De Los Playanos
Drainage Area (mi ²)	1.26	2.0	0.5
Water Surface Elevation (ft)	27.9	16.7	21.7
Design Q ₁₀₀ Discharge (cfs)	1800	3060	2200
Minimum soffit Elevation (feet)	30.9	19.7	24.7
Average Velocity (ft/s)	4.8	7.4	7.3
Pier Scour Elevation (ft)	6	5.5	5.8
Flood plain data are based upon information available when the plans were prepared and are shown to meet federal requirements. The accuracy of said information is not warranted by the State and interested or affected parties should make their own investigation. Addendums may be necessary as Foundation Reports are completed.			

Hydraulic models and hydrologic calculations are available upon request.

If any of the structures are revised it is recommend that the plans be resubmitted to this office.



TRAFFIC →



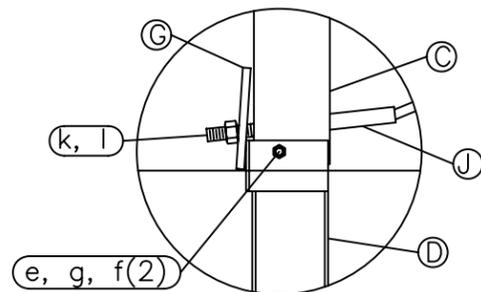
OPTIONAL FLARED INSTALLATION
25:1 maximum flare rate

ITEM	QTY	BILL OF MATERIALS	ITEM NO.
A	1	IMPACT HEAD	S3000
B	1	W-BEAM GUARDRAIL END SECTION, 12 Ga.	MGS-SF1303
C	1	FIRST POST TOP (6X6X $\frac{1}{2}$ Tube)	TPHP1A
D	1	FIRST POST BOTTOM (6' W6X15)	TPHP1B
E	1	SECOND POST ASSEMBLY TOP	UHP2A
F	1	SECOND POST ASSEMBLY BOTTOM	HP3B
G	1	BEARING PLATE	E750
H	1	CABLE ANCHOR BOX	S760
J	1	BCT CABLE ANCHOR ASSEMBLY	E770

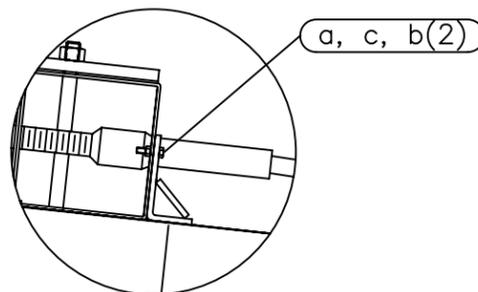
HARDWARE (ALL DIMENSIONS IN INCHES)			
a	2	5/16 x 1 HEX BOLT GRD 5	B5160104A
b	4	5/16 WASHER	W0516
c	2	5/16 HEX NUT	N0516
d	9	5/8 Dia. x 1 1/4 SPLICE BOLT (POST #2)	B580122
e	1	5/8 Dia. x 9 HEX BOLT GRD 5	B580904A
f	3	5/8 WASHER	W050
g	10	5/8 Dia. H.G.R NUT	N050
h	1	3/4 Dia. x 8 1/2 HEX BOLT GRD A449	B340854A
j	1	3/4 Dia. HEX NUT	N030
k	2	1 ANCHOR CABLE HEX NUT	N100
l	2	1 ANCHOR CABLE WASHER	W100
m	8	CABLE ANCHOR BOX SHOULDER BOLT	SB58A
n	8	1/2 A325 STRUCTURAL NUT	N055A
o	16	1 1/16 OD x 9/16 ID A325 STR. WASHER	W050A

GENERAL NOTES:

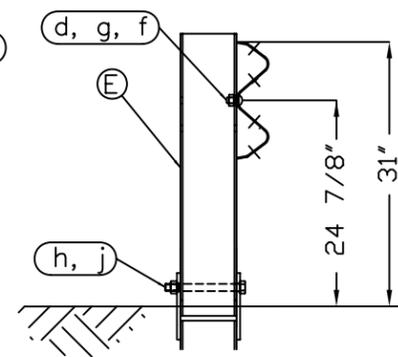
- All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
- The lower sections of the Posts 1&2 shall not protrude more than 4 in above the ground (measured along a 5' cord). Site grading may be necessary to meet this requirement.
- The lower sections of the hinged posts should not be driven with the upper post attached. If the post is placed in a drilled hole, the backfill material must be satisfactorily compacted to prevent settlement.
- When competent rock is encountered, a 12" \varnothing post hole, 20 in. deep cored into the rock surface may be used if approved by the engineer for post 1. Granular material will be placed in the bottom of the hole, approximately 2.5" deep to provide drainage. The first post can be field cut to length, placed in the hole and backfilled with suitable backfill. The soil plate may be trimmed if required.
- A site evaluation should be considered if there is less than 25' between the outlet side of the terminal and any adjacent driving lane.
- The breakaway cable assembly must be taut. A locking device (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening nuts.



Post #1 Connection Detail



Impact Head Connection Detail



SECTION A-A
Post #2



SKT-SP-MGS Terminal Midwest Guardrail System 31" Top of Rail		Sheet:	1
		Date:	02/24/10
Drawing Name: SKT-SP-S-MGS		By:	JRR
		Scale:	None
		Rev:	0

**ET-31™ Guardrail End Treatment
NCHRP Report 350 Test Level 3
System Length 53'-1 1/2" (16.19 m)**

For specific assembly, maintenance, or repair details refer to the state or specifying agency's standard drawings and/or Trinity standard layout drawings.

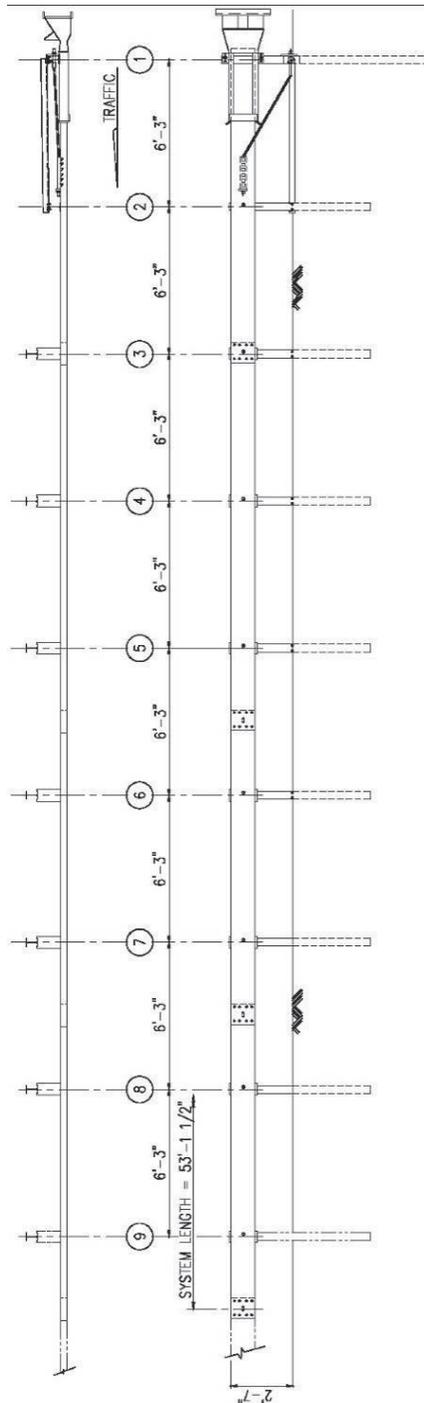
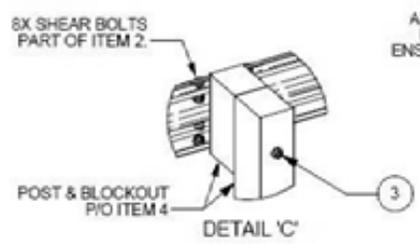


Figure 4 (TL-3)

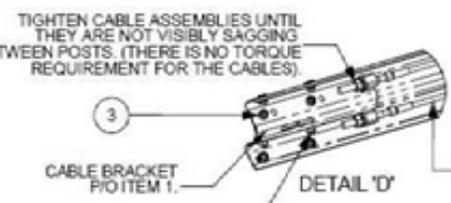
[This drawing represents one version of the 53'-1 1/2" (16.19 m) system]



ATTACH SLIDER BRACKET P/O ITEM 1 TO END OF GUARDRAIL PANEL AS SHOWN. ENSURE THAT HEX NUTS ARE AWAY FROM TRAFFIC SIDE.

SLIDE GUARDRAIL PANEL P/O ITEM 1 OVER END OF GUARD RAIL 1 SECURE IN PLACE USING HARDWARE PROVIDED. ENSURE THAT HEX NUTS ARE ON TRAFFIC SIDE.

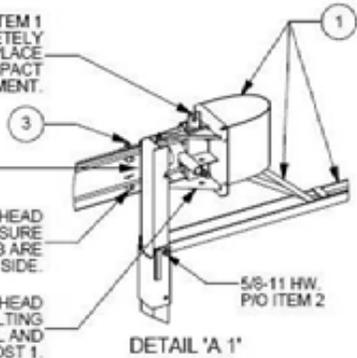
Item	Qty	Part Description	Part#	UOM
1	1.00	X-Tension Terminal Component A, B	E070201	EACH
2	1.00	X-Tension Hardware Kit, 01.01 For XT-TEN	E070202	EACH
3	1.00	X-Tension System Hardware Kit, 01.01, XTGTSS1	E070203	EACH
4	1.00	X-Tension GT Guardrail Component K & L	E070208	EACH



TIGHTEN CABLE ASSEMBLIES UNTIL THEY ARE NOT VISIBLY SAGGING BETWEEN POSTS. (THERE IS NO TORQUE REQUIREMENT FOR THE CABLES).

BEFORE INSTALLATION OF GUARDRAIL TO BLOCKOUTS, SECURE BLOCKOUT FROM ROTATION WITH A 16d GALVANIZED NAIL (ALL POST)

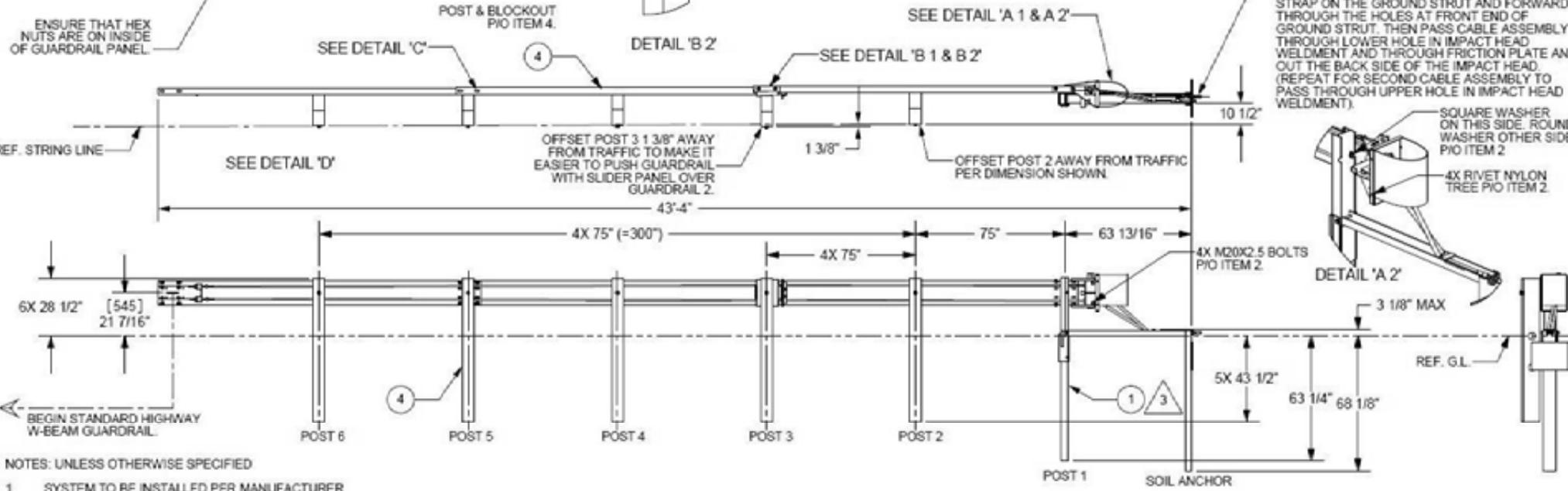
USING A PRY BAR TURN FRICTION PLATE P/O ITEM 1 COUNTER CLOCKWISE UNTIL IS COMPLETELY AGAINST LOCKING MECHANISM, SECURE IN PLACE USING 4X BOLTS P/O ITEM 2 ON SIDE OF IMPACT HEAD WELDMENT.



NO BLOCKOUT AT POST 1.

WHEN MOUNTING IMPACT HEAD WELDMENT TO GUARD RAIL ENSURE THAT HEX NUTS P/O ITEM 3 ARE ON TRAFFIC SIDE.

USE BLOCKOUTS TO HOLD HEAD WELDMENT UP WHILE BOLTING IT TO THE GUARDRAIL PANEL AND POST 1.



- NOTES: UNLESS OTHERWISE SPECIFIED
- SYSTEM TO BE INSTALLED PER MANUFACTURER SPECIFICATIONS.
 - ONLY TIGHTEN THE CABLE ASSEMBLIES USING THE NUTS AT THE CABLE BRACKET (SEE DETAIL 'D'). DO NOT TIGHTEN THE CABLES AT THE FRONT OF THE GROUND ANCHOR.
 - WHEN DRIVING STEEL POST, ENSURE THAT A DRIVING CAP WITH TIMBER OR PLASTIC INSERT IS USED TO PREVENT DAMAGE TO THE GALVANIZING TO THE TOP OF THE POST.

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The information here on is proprietary to Barrier Systems Inc. shall not be disclosed, duplicated or used otherwise without the express written approval of Barrier Systems Inc.						
B	SEE ECN# 942	8/31/07	AEM			
A	SEE ERW 531	8/08/07	AEM			
REV.	CHANGES	DATE	BY	REQ'D	NEXT ASSY.	ITEM

SCALE: 1:50

Standard Tolerance
 Angular ± 1/2°
 Fractional ± 1/32"
 Dec. XXXX ± .010
 Dec. XXX ± .005

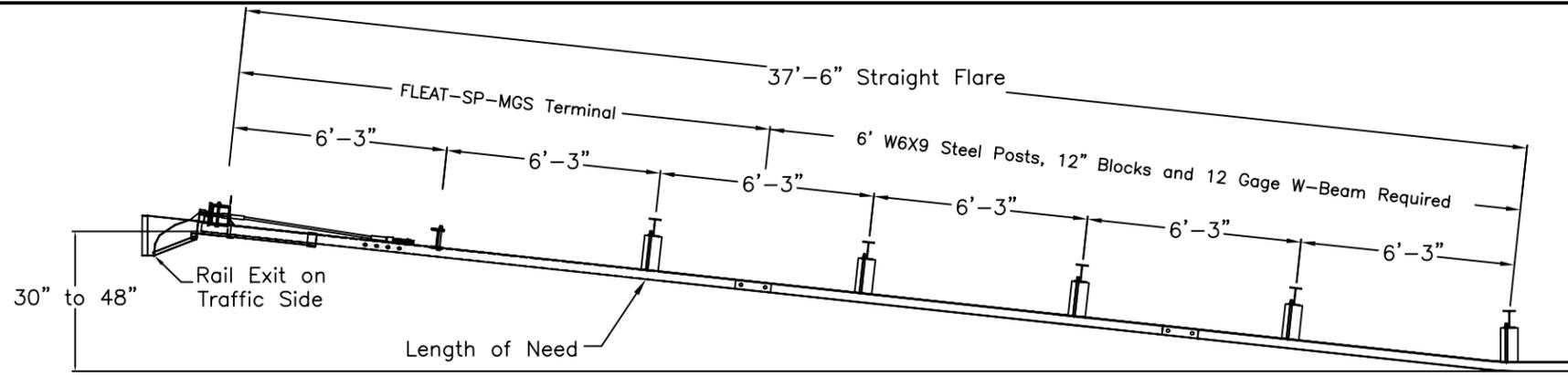
DESIGNED BY: DATE: INTL:
 08/30/07 AEM

APPROVED BY: TITLE:
 X-TENSION GUARDRAIL TERMINAL SYSTEM
 CRT TIMBER POST TO TIMBER BLOCKOUT

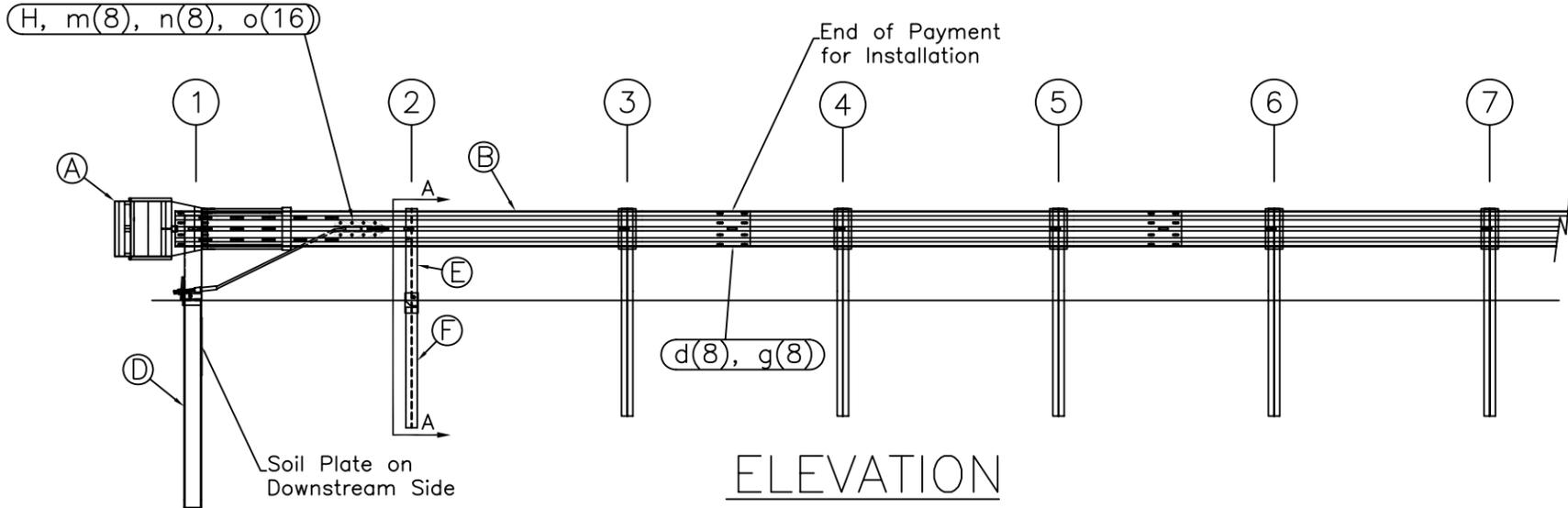
BARRIER SYSTEMS INC

180 RIVER RD. RIO VISTA, CA 94571
 TEL: 707-374-6600 FAX: 707-374-6801

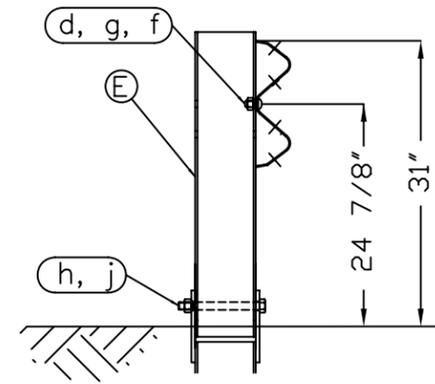
SHEET	DRAWING NUMBER	REV
1 OF 1	XTGTSS1	B



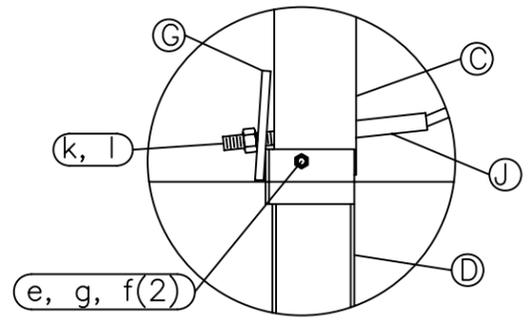
PLAN



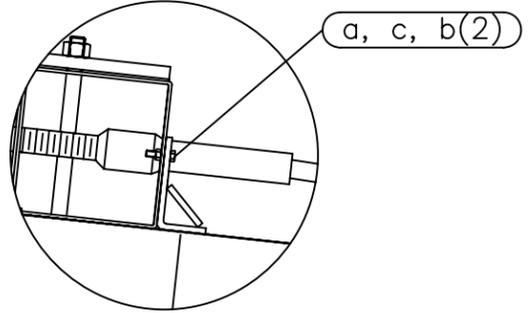
ELEVATION



SECTION A-A
Post #2



Post #1 Connection Detail



Impact Head Connection Detail

ITEM	QTY	BILL OF MATERIALS	ITEM NO.
A	1	IMPACT HEAD	F3000
B	1	W-BEAM GUARDRAIL END SECTION, 12 Ga.	MGS-SF1303
C	1	FIRST POST TOP (6X6X $\frac{1}{8}$ " Tube)	TPHP1A
D	1	FIRST POST BOTTOM (6' W6X15)	TPHP1B
E	1	SECOND POST ASSEMBLY TOP	UHP2A
F	1	SECOND POST ASSEMBLY BOTTOM	HP3B
G	1	BEARING PLATE	E750
H	1	CABLE ANCHOR BOX	S760
J	1	BCT CABLE ANCHOR ASSEMBLY	E770

HARDWARE (ALL DIMENSIONS IN INCHES)			
a	2	5/16 x 1 HEX BOLT GRD 5	B5160104A
b	4	5/16 WASHER	W0516
c	2	5/16 HEX NUT	N0516
d	9	5/8 Dia. x 1 1/4 SPLICE BOLT (POST #2)	B580122
e	1	5/8 Dia. x 9 HEX BOLT GRD 5	B580904A
f	3	5/8 WASHER	W050
g	10	5/8 Dia. H.G.R NUT	N050
h	1	3/4 Dia. x 8 1/2 HEX BOLT GRD A449	B340854A
j	1	3/4 Dia. HEX NUT	N030
k	2	1 ANCHOR CABLE HEX NUT	N100
l	2	1 ANCHOR CABLE WASHER	W100
m	8	CABLE ANCHOR BOX SHOULDER BOLT	SB58A
n	8	1/2 A325 STRUCTURAL NUT	N055A
o	16	1 1/16 OD x 9/16 ID A325 STR. WASHER	W050A

GENERAL NOTES:

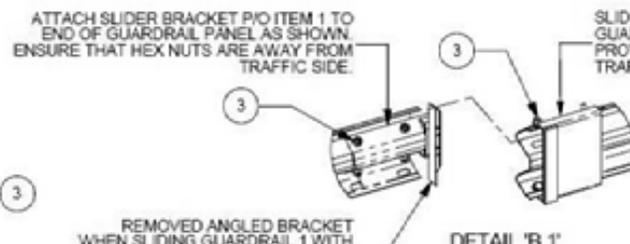
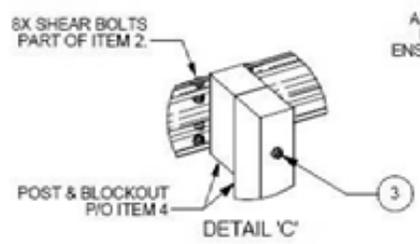
- All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
- The lower sections of the Posts 1&2 shall not protrude more than 4 in above the ground (measured along a 5' cord). Site grading may be necessary to meet this requirement.
- The lower sections of the hinged posts should not be driven with the upper post attached. If the post is placed in a drilled hole, the backfill material must be satisfactorily compacted to prevent settlement.
- When competent rock is encountered, a 12" Ø post hole, 20 in. deep cored into the rock surface may be used if approved by the engineer for post 1. Granular material will be placed in the bottom of the hole, approximately 2.5" deep to provide drainage. The first post can be field cut to length, placed in the hole and backfilled with suitable backfill. The soil plate may be trimmed if required.
- The breakaway cable assembly must be taut. A locking device (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening nuts.

Big Spring, TX
Phone: 432-263-2435
or Phone: 330-346-0721

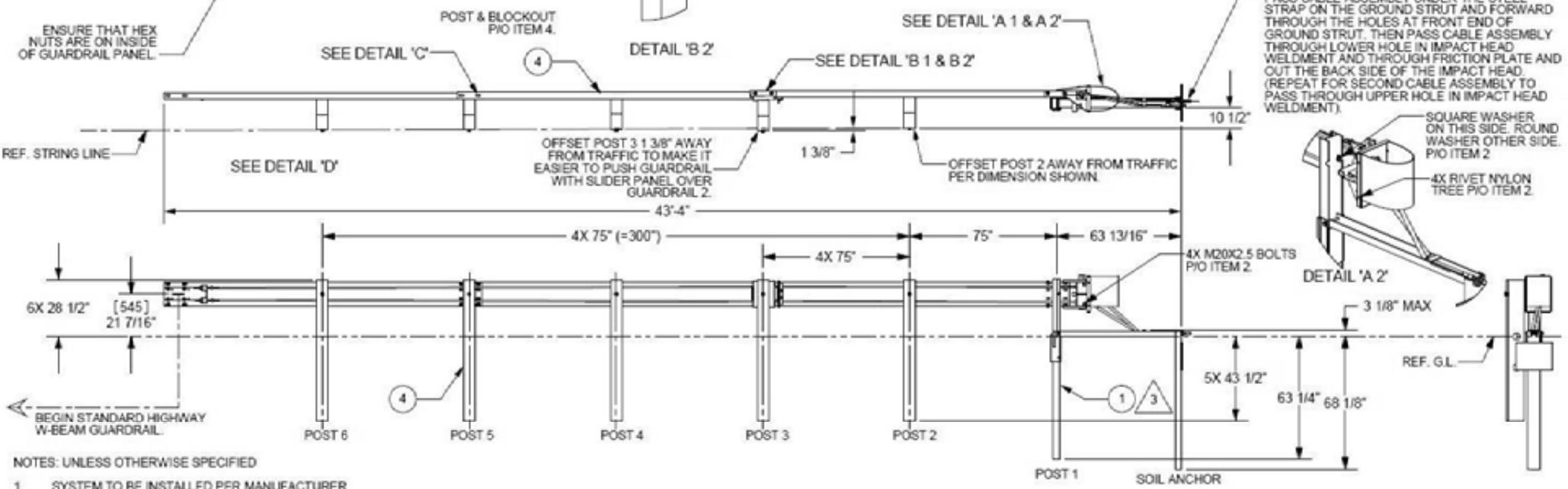
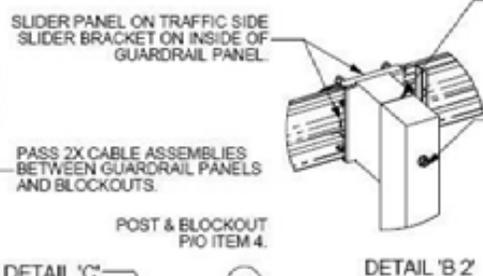
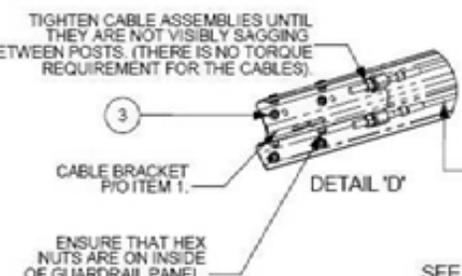
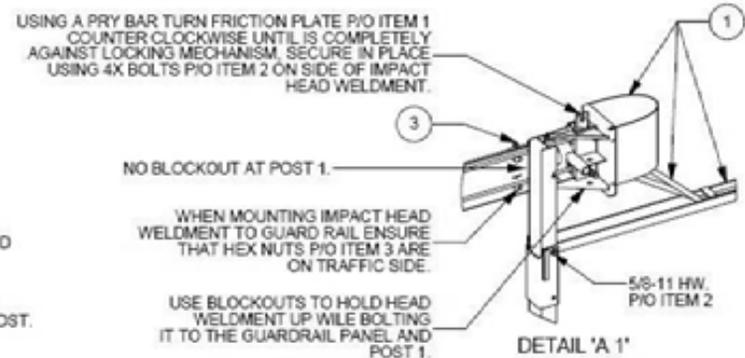
**FLEAT-SP-MGS Terminal
Midwest Guardrail System
31" Top of Rail**

Drawing Name: **FLT-SP-S-MGS** Scale: **None**

Sheet: **1**
Date: **02/24/10**
By: **JRR**
Rev: **0**



Item	Qty	Part Description	Part#	UOM
1	1.00	X-Tension Terminal Component A, B	E070201	EACH
2	1.00	X-Tension Hardware Kit, 01.01 For XT-TEN	E070202	EACH
3	1.00	X-Tension System Hardware Kit, 01.01, XTGTSS1	E070203	EACH
4	1.00	X-Tension GT Terminal Component K & L	E070208	EACH



- NOTES: UNLESS OTHERWISE SPECIFIED
- SYSTEM TO BE INSTALLED PER MANUFACTURER SPECIFICATIONS.
 - ONLY TIGHTEN THE CABLE ASSEMBLIES USING THE NUTS AT THE CABLE BRACKET (SEE DETAIL 'D'). DO NOT TIGHTEN THE CABLES AT THE FRONT OF THE GROUND ANCHOR.
 - WHEN DRIVING STEEL POST, ENSURE THAT A DRIVING CAP WITH TIMBER OR PLASTIC INSERT IS USED TO PREVENT DAMAGE TO THE GALVANIZING TO THE TOP OF THE POST.

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B	SEE ECN# 942	8/31/07	AEM			
A	SEE ERW 531	8/08/07	AEM			
REV.	CHANGES	DATE	BY	REQ'D	NEXT ASSY.	ITEM

SCALE: 1:50

Standard Tolerance
 Angular ± 1/2°
 Fractional ± 1/32"
 Dec. XXXX ± .010
 Dec. XXX ± .005

DESIGNED BY: DATE: INTL:
 08/30/07 AEM

APPROVED BY: TITLE:
 X-TENSION GUARDRAIL TERMINAL SYSTEM
 CRT TIMBER POST TO TIMBER BLOCKOUT

BARRIER SYSTEMS INC

180 RIVER RD. RIO VISTA, CA 94571
 TEL: 707-374-6600 FAX: 707-374-6801

SHEET	DRAWING NUMBER	REV
1 OF 1	XTGTSS1	B

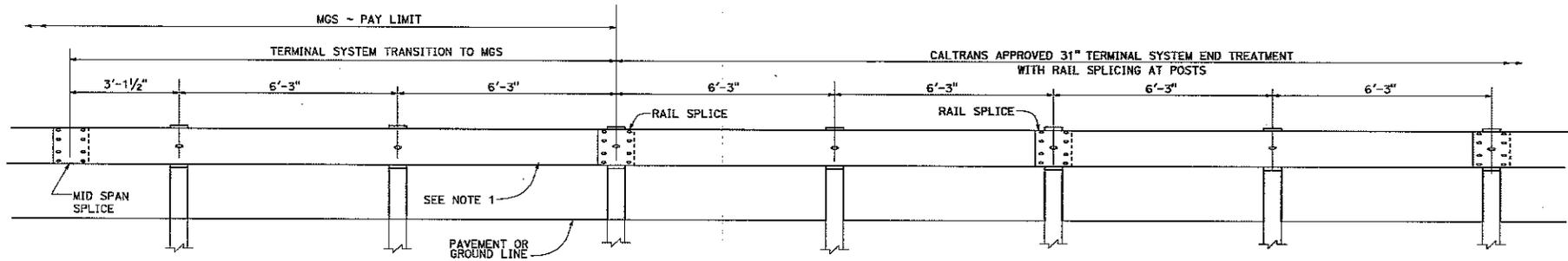
DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET TOTAL No. SHEETS

REGISTERED CIVIL ENGINEER	DATE
PLANS APPROVAL DATE	



THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

NOTE:
1. USE 15'-7 1/2" LENGTH RAIL.



**TRANSITION DETAIL FOR 31" TERMINAL SYSTEM END TREATMENT
WITH RAIL SPLICING AT POSTS TO MIDWEST GUARDRAIL SYSTEM**

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
 CALTRANS
 FUNCTIONAL SUPERVISOR
 CALCULATED-DESIGNED BY
 CHECKED BY
 REVISED BY
 DATE REVISED

BORDER LAST REVISED 7/2/2010

USERNAME =>st114640
DGN FILE => mgs transition details.dgn

RELATIVE BORDER SCALE
IS IN INCHES



UNIT 0000

PROJECT NUMBER & PHASE

00000000001

CALCULATED DATE PLOTTED => 22-FEB-2014
 DGN FILE NAME PLOTTED => 12335



Survey
Marker





Survey Marker

Survey Marker

Survey Marker

Rocks II:
just south of Arroyo del Oso



Mean High Tide Line

Arroyo del Oso Culvert Outlet



Survey Marker

Arroyo del Oso Culvert Outlet



Survey Marker

Rocks I

Native Rock Begins Here

Survey Marker

Survey Marker

Survey Marker

Survey Marker

Survey Marker

Mean High Tide Line

